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- Year One - Semester Two: 282
- Year Two - Semester One: 282
- Year Two - Semester Two: 283
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- Year One - Semester Two: 297
- Year Two - Semester One: 298
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Welcome to the Faculty of Engineering and Information Technologies at the University of Sydney.

As one of the top 50 engineering and technology universities in the world, our graduates have the ability to lead and shape the future. Studying with us, you'll develop your skills of analysis and invention so you can effectively design, create and build structures, systems and products that matter.

The outstanding calibre of our academic staff means we consistently rank among the top one percent of research universities in the world. As a student, you'll be taught by some of these leading researchers, and in some cases you'll have the chance to contribute to their work.

The extracurricular activities you'll enjoy, together with the opportunities for internships, international exchange and to work on industry-sponsored projects, offer you the kinds of different experiences that employers really value.

You might spend part of your degree overseas, or you might choose to work with local communities, or even become a student mentor, tutor or ambassador. We have over ten different student clubs and societies and even a Formula Society of Automotive Engineers team who design, construct and race a small racing car each year. Students with outstanding academic ability can also join the Advanced Engineering and Talented IT programs.

Whichever way you choose to get involved, you'll be doing it alongside a passionate group of students who are all interested in making a genuine difference within our own community and beyond.

I hope you enjoy your educational journey with us, a faculty that inspires, challenges and supports tomorrow's leaders.

Professor Archie Johnston
Dean, Faculty of Engineering and Information Technologies
Welcome
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, 2013. 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**

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<td>Electrical Engineering (Power Engineering)</td>
<td>BE(Electrical)(Power Engineering)</td>
<td>192</td>
</tr>
<tr>
<td></td>
<td>Mechanical Engineering</td>
<td>BE(Mechanical)</td>
<td>192</td>
</tr>
<tr>
<td></td>
<td>Mechanical Engineering (Space)</td>
<td>BE(Mechanical)(Space)</td>
<td>192</td>
</tr>
<tr>
<td></td>
<td>Mechatronic Engineering</td>
<td>BE(Mechatronic)</td>
<td>192</td>
</tr>
<tr>
<td></td>
<td>Mechatronic Engineering (Space)</td>
<td>BE(Mechatronic)(Space)</td>
<td>192</td>
</tr>
<tr>
<td></td>
<td>Project Engineering and Management (Civil)</td>
<td>BE(Project Engg &amp; Mngt)(Civil)</td>
<td>192</td>
</tr>
<tr>
<td></td>
<td>Software Engineering</td>
<td>BE(Software)</td>
<td>192</td>
</tr>
<tr>
<td></td>
<td>BPM Bachelor of Project Management</td>
<td>BPM</td>
<td>144</td>
</tr>
<tr>
<td>HH061</td>
<td>Bachelor of Project Management (Software)</td>
<td>BPM(Software)</td>
<td>144</td>
</tr>
<tr>
<td>HH062</td>
<td>Bachelor of Project Management (Built Environment)</td>
<td>BPM(Built Environment)</td>
<td>144</td>
</tr>
<tr>
<td>HH041</td>
<td>Bachelor of Information Technology*</td>
<td>Computer Science</td>
<td>192</td>
</tr>
<tr>
<td></td>
<td>BIT Bachelor of Information Technology*</td>
<td>BIT(ComputerScience)</td>
<td>192</td>
</tr>
<tr>
<td></td>
<td>Information Systems</td>
<td>BIT(InformationSystems)</td>
<td>192</td>
</tr>
</tbody>
</table>

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

### Combined degrees

<table>
<thead>
<tr>
<th>Code</th>
<th>Course title &amp; stream</th>
<th>Abbreviation</th>
<th>Credit points</th>
</tr>
</thead>
<tbody>
<tr>
<td>HH016</td>
<td>Bachelor of Engineering*/Bachelor of Arts*</td>
<td>BE/BA</td>
<td>240</td>
</tr>
<tr>
<td>HH014</td>
<td>Bachelor of Engineering*/Bachelor of Commerce*</td>
<td>BE/BCom</td>
<td>240</td>
</tr>
<tr>
<td>HH046</td>
<td>Bachelor of Engineering*/Bachelor of Design in Architecture*</td>
<td>BE/BDesArch</td>
<td>240</td>
</tr>
<tr>
<td>HH018</td>
<td>Bachelor of Engineering*/Bachelor of Laws</td>
<td>BE/LLB</td>
<td>288</td>
</tr>
<tr>
<td>HH021</td>
<td>Bachelor of Engineering*/Bachelor of Medical Science*</td>
<td>BE/BMedSc</td>
<td>240</td>
</tr>
<tr>
<td>HH015</td>
<td>Bachelor of Engineering*/Bachelor of Science*</td>
<td>BE/BSc</td>
<td>240</td>
</tr>
<tr>
<td>HH047</td>
<td>Bachelor of Information Technology*/Bachelor of Arts*</td>
<td>BIT/BA</td>
<td>240</td>
</tr>
<tr>
<td>HH042</td>
<td>Bachelor of Information Technology*/Bachelor of Commerce*</td>
<td>BIT/BCom</td>
<td>240</td>
</tr>
<tr>
<td>HH051</td>
<td>Bachelor of Information Technology*/Bachelor of Laws*</td>
<td>BIT/LLB</td>
<td>288</td>
</tr>
<tr>
<td>HH048</td>
<td>Bachelor of Information Technology*/Bachelor of Medical Science*</td>
<td>BIT/BMedSc</td>
<td>240</td>
</tr>
<tr>
<td>HH049</td>
<td>Bachelor of Information Technology*/Bachelor of Science*</td>
<td>BIT/BSc</td>
<td>240</td>
</tr>
<tr>
<td>HH063</td>
<td>Bachelor of Engineering*/Bachelor of Project Management*</td>
<td>BE/BPM</td>
<td>240</td>
</tr>
</tbody>
</table>

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

### Graduate diplomas

<table>
<thead>
<tr>
<th>Code</th>
<th>Course title</th>
<th>Abbreviation</th>
<th>Credit points</th>
</tr>
</thead>
<tbody>
<tr>
<td>HF041</td>
<td>Graduate Diploma in Computing</td>
<td>GradDipComp</td>
<td>48</td>
</tr>
<tr>
<td>HF044</td>
<td>Graduate Diploma in Engineering</td>
<td>GradDipEng</td>
<td>36</td>
</tr>
<tr>
<td>HF045</td>
<td>Graduate Diploma in Engineering (Professional Engineering)</td>
<td>GradDipEng(ProfEng)</td>
<td>48</td>
</tr>
<tr>
<td>HF042</td>
<td>Graduate Diploma in Information Technology</td>
<td>GradDipIT</td>
<td>36</td>
</tr>
<tr>
<td>HF043</td>
<td>Graduate Diploma in Information Technology Management</td>
<td>GradDipITM</td>
<td>36</td>
</tr>
<tr>
<td>HF023</td>
<td>Graduate Diploma in Project Management</td>
<td>GradDipPM</td>
<td>36</td>
</tr>
</tbody>
</table>
### 5 Graduate certificates

<table>
<thead>
<tr>
<th>Code</th>
<th>Course title</th>
<th>Abbreviation</th>
<th>Credit points</th>
</tr>
</thead>
<tbody>
<tr>
<td>HF046</td>
<td>Graduate Diploma in Project Leadership</td>
<td>GradDipPL</td>
<td>36</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td><strong>Graduate certificates</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>HG027</td>
<td>Graduate Certificate in Engineering</td>
<td>GradCertEng</td>
<td>24</td>
</tr>
<tr>
<td>HG025</td>
<td>Graduate Certificate in Information Technology</td>
<td>GradCertIT</td>
<td>24</td>
</tr>
<tr>
<td>HG026</td>
<td>Graduate Certificate in Information Technology Management</td>
<td>GradCertITM</td>
<td>24</td>
</tr>
<tr>
<td>HG006</td>
<td>Graduate Certificate in Project Management</td>
<td>GradCertPM</td>
<td>24</td>
</tr>
<tr>
<td>HG028</td>
<td>Graduate Certificate in Project Leadership</td>
<td>GradCertPL</td>
<td>24</td>
</tr>
</tbody>
</table>
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

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

<table>
<thead>
<tr>
<th>Degree/Stream</th>
<th>Flexible entry program</th>
<th>AAM requirement</th>
</tr>
</thead>
<tbody>
<tr>
<td>BE(Aero)</td>
<td>A</td>
<td>65</td>
</tr>
<tr>
<td>BE(Aero)(Space)</td>
<td>A</td>
<td>75</td>
</tr>
<tr>
<td>BE(Biomedical)</td>
<td>B</td>
<td>70</td>
</tr>
<tr>
<td>BE(Chem)</td>
<td>A</td>
<td>always allowed</td>
</tr>
<tr>
<td>BE(Civil)</td>
<td>A</td>
<td>always allowed</td>
</tr>
<tr>
<td>BE(Civil)(Construction)</td>
<td>A</td>
<td>65</td>
</tr>
<tr>
<td>BE(Civil)(Environmental)</td>
<td>A</td>
<td>65</td>
</tr>
<tr>
<td>BE(Civil)(Geotechnical)</td>
<td>A</td>
<td>65</td>
</tr>
<tr>
<td>BE(Civil)(Structures)</td>
<td>A</td>
<td>65</td>
</tr>
<tr>
<td>BE(Electrical)</td>
<td>B</td>
<td>always allowed</td>
</tr>
<tr>
<td>BE(Electrical)(Computer)</td>
<td>B</td>
<td>65</td>
</tr>
<tr>
<td>BE(Electrical)(Power)</td>
<td>B</td>
<td>65</td>
</tr>
<tr>
<td>BE(Electrical)(Telecom)</td>
<td>B</td>
<td>65</td>
</tr>
<tr>
<td>BE(Mechanical)</td>
<td>A</td>
<td>always allowed</td>
</tr>
<tr>
<td>BE(Mech)(Space)</td>
<td>A</td>
<td>75</td>
</tr>
</tbody>
</table>
3 Transferring Streams or Degrees

1. Students admitted to specific undergraduate Engineering, IT or Project Management single degrees or streams, and the combined BE/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 BE 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 be 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 BE/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 be able to complete the new stream in the normal time period.

4 Time limits

1. Unless the course rules specify differently:
   (a) A student must complete all the requirements for a coursework doctorate, within ten calendar years of first enrolment;
   (b) A student must complete all the requirements for a combined BE, single or combined BIT, and BCST within ten calendar years of first enrolment;
   (c) A student must complete all the requirements for a single (non combined) BE 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 IT for permission, supplying detailed reasons and evidence to support the request.

6 Credit for previous study

1. Conditions for the granting of credit for previous study are in accordance with the Coursework Rule, except:

   (a) the maximum credit that may be granted to the Bachelor of Engineering degree, Bachelor of Engineering/Combined degrees, Bachelor of Information Technology degree or Bachelor of Information Technology/Combined degrees is 96 credit points; and
   (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% 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.

<table>
<thead>
<tr>
<th>Degree/Stream</th>
<th>Flexible entry program</th>
<th>AAM requirement</th>
</tr>
</thead>
<tbody>
<tr>
<td>BE(Mechatronics)</td>
<td>B</td>
<td>70</td>
</tr>
<tr>
<td>BE(Mechatronics)(Space)</td>
<td>B</td>
<td>75</td>
</tr>
<tr>
<td>BE(Project Mgt)(Civil)</td>
<td>A</td>
<td>65</td>
</tr>
<tr>
<td>BE(Software)</td>
<td>B</td>
<td>65</td>
</tr>
<tr>
<td>BCST</td>
<td>B</td>
<td>always allowed</td>
</tr>
<tr>
<td>BCST(Adv)</td>
<td>B</td>
<td>70</td>
</tr>
<tr>
<td>BIT</td>
<td>B</td>
<td>70</td>
</tr>
</tbody>
</table>
International exchange

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

Part 3: Studying and Assessment

Attendance

1. Students are required to be in attendance at the correct time and place of any formal or informal examinations. Non attendance on any grounds insufficient to claim special consideration will result in the forfeiture of marks associated with the assessment. Participation in a minimum number of assessment items may be a requirement of any unit of study.

2. Students are expected to attend a minimum of 90% of timetabled activities for a unit of study, unless granted exemption by the Dean or Head of School most concerned. The Dean or Head of School most concerned may determine that a student fails a unit of study because of inadequate attendance. Alternatively, at their discretion, they may set additional assessment items where attendance is lower than 90%.

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.

Concessional pass

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

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

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.

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.

Weighted average mark (WAM)

1. WAMS are used by the University as one indicator of performance. For example, WAMS can be used in assessing admission to and award of honours, eligibility for prizes and scholarships, or assessing progression through a course. The University WAM is calculated using the following formula:

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

where \(Wc\) is the unit of study credit points x the unit weighting and \(Mc\) is the mark achieved for the unit. The mark used for units with a grade AF and DF is zero. Pass/fail units and a grade of DNF or credited units from other institutions are not counted.

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

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

1. **Honours Weighted Average Mark (HWAM)**
   a. HWAM is the honours weighted average mark for Bachelor of Engineering undergraduate courses. HWAM is calculated by applying the university WAM formula, with the additional condition that research thesis units of study are given double weighting of 8.
   b. The HWAM is used for honours assessment in Bachelor of Engineering degrees including combined degrees. All units of study attempted in a Bachelor of Engineering single or combined degree are included in the calculation regardless of whether they are core Bachelor of Engineering program units or not.

Part 5: Other

Transitional provisions

1. These resolutions apply to students who commenced their candidature after 1 January, 2011 and students who commenced their candidature prior to 1 January, 2011 who elect to proceed under these resolutions.

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

<table>
<thead>
<tr>
<th>Code</th>
<th>Course title</th>
</tr>
</thead>
<tbody>
<tr>
<td>HG027</td>
<td>Graduate Certificate in Engineering</td>
</tr>
<tr>
<td>HF044</td>
<td>Graduate Diploma in Engineering</td>
</tr>
<tr>
<td>HC087</td>
<td>Master of Engineering</td>
</tr>
</tbody>
</table>

2. Attendance pattern

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

3. Embedded courses in this sequence

(1) The embedded courses in this sequence are:

(a) the Graduate Certificate in Engineering
(b) the Graduate Diploma in Engineering
(c) the Master of Engineering

(2) Providing candidates satisfy the admission requirements for each stage, a candidate may progress to the award of any of the courses in this sequence. Only the longest award completed will be conferred.

4. Admission to candidature

(1) Available places will be offered to qualified applicants in the order in which complete applications are received, according to the following admissions criteria.

(2) Admission to the Graduate Certificate in Engineering requires a bachelor's degree from the University of Sydney or equivalent qualification.

(3) Admission to the Graduate Diploma in Engineering requires:

(a) a bachelor's degree from the University of Sydney or equivalent qualification; or
(b) completion of the embedded graduate certificate.

(4) Admission to the Master of Engineering requires:

(a) a Bachelor of Engineering from the University of Sydney or equivalent with a credit average; or
(b) completion of the embedded graduate diploma or graduate certificate with a minimum credit average; or
(c) an appropriate Bachelor of Science from the University of Sydney or equivalent with a credit average majoring in a discipline that relates to the chosen major in the Master of Engineering and can demonstrate to the satisfaction of the Dean suitable prior learning for the chosen major.

(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.

(e) If a candidate does not have the equivalent qualification with a credit average, they may be admitted to the Graduate Diploma or the Graduate Certificate subject to the discretion of the Dean.

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) 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 minimum GPA of 65 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, 2013 and students who commenced their candidature prior to 1 January, 2013 who elect to proceed under these resolutions.
(2) Candidates who commenced prior to 1 January, 2013 may complete the requirements in accordance with the resolutions in force at the time of their commencement.
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), 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).
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.

<table>
<thead>
<tr>
<th>Unit of study</th>
<th>Credit points</th>
<th>A: Assumed knowledge</th>
<th>P: Prerequisites</th>
<th>C: Corequisites</th>
<th>N: Prohibition</th>
<th>Session</th>
</tr>
</thead>
<tbody>
<tr>
<td>ENGG5102</td>
<td>6</td>
<td>A Some limited industry experience is preferred but not a must.</td>
<td></td>
<td></td>
<td></td>
<td>Semester 1</td>
</tr>
<tr>
<td>ENGG5202</td>
<td>6</td>
<td>A General knowledge in science and calculus and understanding of basic principles of chemistry, physics and mechanics</td>
<td></td>
<td></td>
<td></td>
<td>Semester 1</td>
</tr>
<tr>
<td>ENGG5103</td>
<td>6</td>
<td></td>
<td></td>
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<td></td>
<td>Semester 2</td>
</tr>
<tr>
<td>PMGT5871</td>
<td>6</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Int December \ Int July</td>
</tr>
</tbody>
</table>

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.

<table>
<thead>
<tr>
<th>Unit of study</th>
<th>Credit points</th>
<th>A: Assumed knowledge</th>
<th>P: Prerequisites</th>
<th>C: Corequisites</th>
<th>N: Prohibition</th>
<th>Session</th>
</tr>
</thead>
<tbody>
<tr>
<td>AERO5760</td>
<td>6</td>
<td></td>
<td></td>
<td></td>
<td>Note: Department permission required for enrolment</td>
<td>Semester 2</td>
</tr>
<tr>
<td>AMME5310</td>
<td>6</td>
<td>A (AMME2302 OR AMME5302) AND (AMME2301 OR AMME5301) AND (MECH3261 OR MECH5261)</td>
<td></td>
<td></td>
<td></td>
<td>Semester 1</td>
</tr>
<tr>
<td>AMME5510</td>
<td>6</td>
<td>A (AMME2301 OR AMME5301) AND (AMME2200 OR AMME5200) AND (AMME2500 OR AMME5500); Note: Department permission required for enrolment</td>
<td></td>
<td></td>
<td></td>
<td>Semester 2</td>
</tr>
<tr>
<td>AMME5520</td>
<td>6</td>
<td>P AMME3500 OR AMME5501.</td>
<td></td>
<td></td>
<td></td>
<td>Semester 1</td>
</tr>
<tr>
<td>AMME5602</td>
<td>6</td>
<td>A Some knowledge of product and process design is assumed and a basic understanding of business activity will also be helpful.</td>
<td></td>
<td></td>
<td></td>
<td>Semester 2</td>
</tr>
<tr>
<td>AMME5902</td>
<td>6</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Semester 2</td>
</tr>
<tr>
<td>AMME5912</td>
<td>6</td>
<td>A Computer Aided Drafting, Basic FEA principles and Solid Mechanics</td>
<td></td>
<td></td>
<td></td>
<td>Semester 1</td>
</tr>
<tr>
<td>AMME5951</td>
<td>6</td>
<td>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:</td>
<td></td>
<td></td>
<td></td>
<td>Semester 1</td>
</tr>
<tr>
<td>MECH5416</td>
<td>6</td>
<td>A Eng Mechanics, balance of forces and moments Mechanics of Solids, 2 and 3 dimensional stress and strain Engineering Dynamics - dynamic forces and moments: Mechanical Design, approach to design problems and report writing, and preparation of engineering drawing Mechanical design intermediate, means of applying fatigue analysis to a wide range of machine components</td>
<td></td>
<td></td>
<td></td>
<td>Semester 1</td>
</tr>
<tr>
<td>MECH5720</td>
<td>6</td>
<td>A Strong MATLAB skills</td>
<td>MECH4720</td>
<td></td>
<td></td>
<td>Semester 2</td>
</tr>
<tr>
<td>MTRX5700</td>
<td>6</td>
<td>A Knowledge of statics and dynamics, rotation matrices, programming and some electronic and mechanical design experience is assumed.</td>
<td>MTRX4700</td>
<td></td>
<td></td>
<td>Semester 1</td>
</tr>
</tbody>
</table>
### Unit of study table

**Research units**

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

<table>
<thead>
<tr>
<th>Unit of Study</th>
<th>Credit Points</th>
<th>A: Assumed Knowledge</th>
<th>P: Prerequisites</th>
<th>C: Corequisites</th>
<th>N: Prohibition</th>
<th>Session</th>
</tr>
</thead>
<tbody>
<tr>
<td>AMME5020 Capstone Project A</td>
<td>6</td>
<td>P 48 cp from MPE degree program or 24 cp from the ME program.</td>
<td>Note: Department permission required for enrolment</td>
<td>Semester 1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>AMME5021 Capstone Project B</td>
<td>6</td>
<td>C AMME5020</td>
<td>Note: Department permission required for enrolment</td>
<td>Semester 2</td>
<td></td>
<td></td>
</tr>
<tr>
<td>AMME5022 Capstone Project B Extended</td>
<td>12</td>
<td>P 42 credit points in the Master of Engineering and WAM &gt;70, or 68 credit points in the Master of Professional Engineering and WAM &gt;70 or exemption</td>
<td>Note: Department permission required for enrolment</td>
<td>Semester 2</td>
<td></td>
<td></td>
</tr>
<tr>
<td>AMME5222 Dissertation A</td>
<td>12</td>
<td>N AMME5020, AMME5021, ENGG5220, ENGG5221</td>
<td>Note: Department permission required for enrolment</td>
<td>Semester 1</td>
<td>Semester 2</td>
<td></td>
</tr>
<tr>
<td>AMME5223 Dissertation B</td>
<td>12</td>
<td>N AMME5020, AMME5021, ENGG5220, ENGG5221</td>
<td>Note: Department permission required for enrolment</td>
<td>Semester 1</td>
<td>Semester 2</td>
<td></td>
</tr>
</tbody>
</table>

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.

<table>
<thead>
<tr>
<th>Unit of Study</th>
<th>Credit Points</th>
<th>A: Assumed knowledge</th>
<th>P: Prerequisites</th>
<th>C: Corequisites</th>
<th>N: Prohibition</th>
<th>Session</th>
</tr>
</thead>
<tbody>
<tr>
<td>AERO5010 Optimisation Methods in Engineering</td>
<td>6</td>
<td>A BE in the area of Aerospace or related Engineering field.</td>
<td>Note: Department permission required for enrolment</td>
<td>Semester 2</td>
<td></td>
<td></td>
</tr>
<tr>
<td>AERO5000 Advanced Aerodynamics</td>
<td>6</td>
<td>A BE in the area of Aerospace Engineering or related Engineering field.</td>
<td>Note: Department permission required for enrolment</td>
<td>Semester 1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>AERO5010 Applied Finite Element Analysis</td>
<td>6</td>
<td>A AMME5301 or BE in area of Aerospace Engineering or related Engineering field.</td>
<td>Note: Department permission required for enrolment</td>
<td>Semester 1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>AERO5040 Advanced Aircraft Design Analysis</td>
<td>6</td>
<td>A BE in area of Aerospace Engineering or related Engineering field with familiarity in aircraft design.</td>
<td>Note: Department permission required for enrolment</td>
<td>Semester 2</td>
<td></td>
<td></td>
</tr>
<tr>
<td>AERO5050 Flight Mechanics Test and Evaluation</td>
<td>6</td>
<td>A BE in area of Aerospace Engineering or related Engineering Field.</td>
<td>P AERO5510 OR AERO5560. All MPE and ME students are required to do AERO5510 unless they have already completed an equivalent to AERO5510/AERO5560. This UoS can then be taken as an advanced elective.</td>
<td>Semester 2</td>
<td></td>
<td></td>
</tr>
<tr>
<td>AMME5020 Advanced Computational Fluid Dynamics</td>
<td>6</td>
<td>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.</td>
<td>Note: Department permission required for enrolment</td>
<td>Semester 1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>AMME5021 Computational Nanotechnology</td>
<td>6</td>
<td>A Students are required to have an understanding of basic principles of Newtonian mechanics, physics and chemistry, fluid mechanics and solid mechanics. General knowledge of how to operate a computer and work with different software is also required.</td>
<td>Note: Department permission required for enrolment</td>
<td>Semester 2</td>
<td></td>
<td></td>
</tr>
<tr>
<td>AMME5010 Energy and the Environment</td>
<td>6</td>
<td>A A BE in the area of Aerospace or related Engineering field.</td>
<td>Note: Department permission required for enrolment</td>
<td>Semester 2</td>
<td></td>
<td></td>
</tr>
<tr>
<td>AMME5061 Biomaterials Engineering</td>
<td>6</td>
<td>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 assumed knowledge. Chemistry, biology, materials engineering, and engineering design at least at the Junior level.</td>
<td>Note: Department permission required for enrolment</td>
<td>Semester 1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>AMME5071 Applied Tissue Engineering</td>
<td>6</td>
<td>A 6 credit points of junior biology 6 credit points of junior chemistry and 6 credit points of intermediate physiology or equivalent.</td>
<td>Note: Department permission required for enrolment</td>
<td>Semester 1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>AMME5081 Computational Biomedical Engineering</td>
<td>6</td>
<td>A AMME5301 and AMME5302 and AMME5500 and MECH5361 and MECH53921</td>
<td>Note: Department permission required for enrolment</td>
<td>Semester 1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>AMME5090 Biomedical Engineering Tech 1</td>
<td>6</td>
<td>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.</td>
<td>Note: Department permission required for enrolment</td>
<td>Semester 1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>ELEC503 Computer Control System Design</td>
<td>6</td>
<td>A This unit assumes a basic knowledge of calculus, functions of real variables, Laplace transform, matrix theory and control theory.</td>
<td>Note: Department permission required for enrolment</td>
<td>Semester 1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>ENGG5231 Engineering Graduate Exchange A</td>
<td>6</td>
<td>P Permission from faculty and school.</td>
<td>Note: Department permission required for enrolment</td>
<td>Int January</td>
<td>Int July</td>
<td></td>
</tr>
<tr>
<td>ENGG5232 Engineering Graduate Exchange B</td>
<td>6</td>
<td>P Permission from faculty and school.</td>
<td>Note: Department permission required for enrolment</td>
<td>Int January</td>
<td>Int July</td>
<td></td>
</tr>
<tr>
<td>MECH555 Air Conditioning and Refrigeration (Adv)</td>
<td>6</td>
<td>A Students are expected to be familiar with the basic laws of thermodynamics, fluid mechanics and heat transfer.</td>
<td>P MECH5260 or MECH3262 N MECH4255</td>
<td>Semester 2</td>
<td></td>
<td></td>
</tr>
<tr>
<td>MECH5256 Advanced Combustion</td>
<td>6</td>
<td>P (MECH5262 or MECH3262) and (MECH5261 or MECH3261)</td>
<td>Note: Department permission required for enrolment</td>
<td>Semester 2</td>
<td></td>
<td></td>
</tr>
<tr>
<td>MECH5257 Advanced Renewable Energy</td>
<td>6</td>
<td>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.</td>
<td>P MECH5262 or MECH3260</td>
<td>Semester 2</td>
<td></td>
<td></td>
</tr>
<tr>
<td>MECH5305 Smart Materials</td>
<td>6</td>
<td>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</td>
<td>Note: Department permission required for enrolment</td>
<td>Semester 2</td>
<td></td>
<td></td>
</tr>
<tr>
<td>MECH5310 Advanced Engineering Materials</td>
<td>6</td>
<td>N MECH4310</td>
<td>Note: Department permission required for enrolment</td>
<td>Semester 1</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
For more information on degree program requirements visit CUSP.
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.

ENNG5102
Entrepreneurship for Engineers

Credit points: 6 Session: Semester 1 Classes: 2hr Lectures per week, 2hr Tutorials per week Prohibitions: ELEC5701 Assumed knowledge: Some limited industry experience is preferred but not a must. Assessment: Through semester assessment (100%), Campus: Camperdown/Darlington 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.


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

ENNG5202
Sustainable Design, Eng and Mgt

Credit points: 6 Session: Semester 1 Classes: 2 lectures per week, tutorials 2 hour per week and projects and self assisted learning (4 hours per week) Assumed knowledge: General knowledge in science and calculus and understanding of basic principles of chemistry, physics and mechanics Assessment: Through semester assessment (70%), Final Exam (30%) Campus: Camperdown/Darlington Mode of delivery: Normal (lecture/lab/tutorial) Day

The aim of the 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.

ENNG5103
Safety Systems and Risk Analysis

Credit points: 6 Session: Semester 2 Classes: 2hrs of Lectures per week, 2hrs of Tutorials per week Assessment: Through semester assessment (100%), Campus: Camperdown/Darlington 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: Int December, Int July, Semester 1, Semester 2, Summer Late Classes: Session 1: Evening, Online Session 2: Evening, Online, Block mode July Int and Dec Int : Block mode Assessment: Through session assessment (60%), Final Exam (40%), Campus: Camperdown/Darlington Mode of delivery: Block Mode or On-line or Normal (lecture/lab/tutorial) Evening

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.
The student will learn how to formulate a design in terms of a "cost" function, wherein 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
Engineering and Information Technologies
Credit points: 6 Session: Semester 2 Classes: Project Work in Class: 5 hours per week. Assumed knowledge: Some knowledge of product and process design is assumed and a basic understanding of business activity will also be helpful. Assessment: Through semester assessment (100%) Campus: Camperdown/Darlington Mode of delivery: Normal (lecture/lab/tutorial) Day

This unit covers the following topics: 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
Engineering and Information Technologies
Credit points: 6 Session: Semester 2 Classes: Lectures: 2 hours per week; Tutorials: 2 hours per week; Laboratory: 3 hours per semester. Assessment: Through semester assessment (100%) Campus: Camperdown/Darlington Mode of delivery: Normal (lecture/lab/tutorial) Day

The aim of this course is to enhance the student's manufacturing engineering skills in the CAD/CAM area. The course focuses on CNC milling as a manufacturing automation process applied to a project. The management, planning and marketing of a typical engineering project are also discussed. Objectives: Through integrated project-based learning and hands-on-machine training, you will learn
* How to successfully complete a CAD/CAM and CNC mill based project.
* Manufacturing management and system skills, such as product planning, manufacturing sequence, time and cost;
* The science in designing and selecting a manufacturing method.
* How to effectively present your ideas and outcomes using oral and report based methods.

It is expected that through your hard work in the semester, you will find
* Enhanced learning by real-world problems.
* Improved comprehensive skill in manufacturing design.

AMME5912
Crash Analysis and Design
Engineering and Information Technologies
Credit points: 6 Session: Semester 1 Classes: Lectures 2 hours per week, Tutorials 2 hours per week. Assumed knowledge: Computer Aided Drafting, Basic FEA principles and Solid Mechanics. Assessment: Through semester assessment (100%) Campus: Camperdown/Darlington Mode of delivery: Normal (lecture/lab/tutorial) Day

The objective of the course is to give students skills in the area of highly non-linear finite element analysis. Major topics covered include CAD, Implicit / explicit codes, Wire frame geometry, Elemental Theory, Materials, Pre-processing using ETA-PreSys, Contact, LS-Dyna, using NCAC FEM models, Modeling fasteners, Material covered in lectures and NCAC FEM models, Modeling fasteners. The course involves the design of safety systems by impact analysis 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
Engineering and Information Technologies
Credit points: 6 Session: Semester 1 Classes: 3hrs of lecture/tutorial per 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.

**Assessment:** Through semester assessment (100%)  
**Campus:** Camperdown/Darlington  
**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**  
**Engineering and Information Technologies**  
**Credit points:** 6  
**Session:** Semester 1  
**Classes:** 2 hrs of lectures, 2hrs of tutorial per week.  
**Assumed knowledge:** Engr Mechanics, balance of forces and moments Mechanics of Solids, 2 and 3 dimensional stress and strain  
**Engineering Dynamics** - dynamic forces and moments, Mechanical Design, approach to design problems and report writing, and preparation of engineering drawing Mechanical design intermediate, means of applying fatigue analysis to a wide range of machine components.  
**Assessments:** Through semester assessment (100%)  
**Campus:** Camperdown/Darlington  
**Mode of delivery:** Normal (lecture/lab/tutorial) Day

This UoS utilises assumed theoretical knowledge and skills to elucidate the stresses and strains that exit in the different categories of machine parts. It sets out to make the students familiar with the simplifications that are applied to arrive at the analytic expressions commonly used to analyse each individual categories parts. These simplifications usually begin by assuming that only particular types of loads are carried by teh parts in that category. The resulting analyses provide approximations to the actual stresses. It is possible to have different degrees of simplifications, requiring more or less work, giving better or poorer approximations. Should a part be used to carry loads that were not allowed for in the traditional method then some more appropriate method must be found or developed. An important aspect is to make the student practiced in a range of modern concepts, techniques and tools, and to be made aware of their strengths and limitations.

This UoS teaches the student how to recognise where and how their theoretical skills can be applied to the practical situations that they may encounter in this field of design.

Options may be provided in the choice of design assignments. Biomedical engineering and vehicle design problems may be provided as options to more general machine design problems.

**MECH5720**  
**Sensors and Signals**  
**Engineering and Information Technologies**  
**Credit points:** 6  
**Session:** Semester 2  
**Classes:** 3 hours of lectures and 2 hours tutorials per week.  
**Prohibitions:** MTRX4700  
**Assumed knowledge:** Strong MATLAB skills  
**Assessment:** Through semester assessment (70%), Final Exam (30%)  
**Campus:** Camperdown/Darlington  
**Mode of delivery:** Normal (lecture/lab/tutorial) Day

Syllabus Summary: This course starts by providing a background to the signals and transforms required to understand modern sensors. It goes on to provide an overview of the workings of typical active sensors (Radar, Lidar and Sonar). It provides insight into basic sensing methods as well as aspects of interfacing and signal processing. It includes both background material and a number of case studies.

The course covers the following topics:

a) **SIGNS:** 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  

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**  
**Engineering and Information Technologies**  
**Credit points:** 6  
**Session:** Semester 1  
**Classes:** 2hrs lectures and 3hrs of laboratory work per week.  
**Prohibitions:** MTRX4700  
**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%)  
**Campus:** Camperdown/Darlington  
**Mode of delivery:** Normal (lecture/lab/tutorial) Day

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

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

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

**Research units**

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

**AMME5020**  
**Capstone Project A**
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 thesis itself. The final thesis must be the student’s individual work, although research is sometimes conducted in the framework of a group project shared with others. Students undertaking research on this basis will need to take care in ensuring the individual quality of their own research work and the final thesis submission. The thesis will be judged on the extent and quality of the student’s original work and particularly how critical, perceptive and constructive he or she has been in assessing his/her work and that of others. Students will also be required to present the results of their findings to their peers and supervisors as part of a seminar program.

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

**AMME5021**

**Capstone Project B**

**Engineering and Information Technologies**

**Credit points:** 6  
**Session:** Semester 1, Semester 2  
**Classes:** Independent project work  
**Prerequisites:** 48 cp from MPE degree program or 24 cp from the ME program.  
**Assessment:** Through semester assessment (100%)  
**Campus:** Campervan/Darlington  
**Mode of delivery:** Supervision  
**Note:** Department permission required for enrolment.

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 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 thesis itself. The final thesis must be the student’s individual work, although research is sometimes conducted in the framework of a group project shared with others. Students undertaking research on this basis will need to take care in ensuring the individual quality of their own research work and the final thesis submission. The thesis will be judged on the extent and quality of the student’s original work and particularly how critical, perceptive and constructive he or she has been in assessing his/her work and that of others. Students will also be required to present the results of their findings to their peers and supervisors as part of a seminar program.

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

**AMME5022**

**Capstone Project B Extended**

**Engineering and Information Technologies**

**Credit points:** 12  
**Session:** Semester 1, Semester 2  
**Classes:** Self paced research  
**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%)  
**Campus:** Campervan/Darlington  
**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, whilst 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.

AMM5222
Dissertation A

Engineering and Information Technologies

Credit points: 12
Session: Semester 1, Semester 2
Classes: no formal classwork
Prohibitions: AMM5020, AMM5021, ENGG3220, ENGG5221
Assessment: Through semester assessment (100%)
Campus: Camperdown/Darlington
Mode of delivery: Supervision
Note: Department permission required for enrolment.

Aim: 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.

AMM5223
Dissertation B

Engineering and Information Technologies

Credit points: 12
Session: Semester 1, Semester 2
Classes: no formal classwork
Prohibitions: AMM5020, AMM5021, ENGG3220, ENGG5221
Assessment: Through semester assessment (100%)
Campus: Camperdown/Darlington
Mode of delivery: Supervision
Note: Department permission required for enrolment.

Aim: 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.

With permission from the Head of Department students progressing with distinction (75%) average or higher results may replace AMM5020, AMM5021 and 12 cp of electives with AMM5222 & AMM5223 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.

AEROS200
Advanced Aerodynamics

Engineering and Information Technologies

Credit points: 6
Session: Semester 1
Classes: 2 hours of lectures and 2 hours of tutorials per week
Prerequisites: AEROS210 or AEROS260
Assumed knowledge: BE in the area of Aerospace Engineering or related Engineering field.
Assessment: Through semester assessment (100%)
Campus: Camperdown/Darlington
Mode of delivery: Normal (lecture/lab/tutorial)
Note: Department permission required for enrolment.

Objectives/Expected Outcomes: To develop a specialist knowledge in the fields of computational, non-linear and unsteady aerodynamics.


AEROS301
Applied Finite Element Analysis

Engineering and Information Technologies

Credit points: 6
Session: Semester 1
Classes: 2.5 hours of lectures and 3 hours of workshop session per week
Prerequisites: AEROS310 or MECH5361
Assumed knowledge: AMM5301 or BE in area of Aerospace Engineering or related Engineering field.
Assessment: Through semester assessment (55%), Final Exam (45%)
Campus: Camperdown/Darlington
Mode of delivery: Normal (lecture/lab/tutorial) Day
Note: Department permission required for enrolment.


AEROS400
Advanced Aircraft Design Analysis

Engineering and Information Technologies

Credit points: 6
Session: Semester 2
Classes: 4 hours of lectures per week
Prerequisites: BE in area of Aerospace Engineering or related Engineering field with familiarity in aircraft design.
Assessment: Through semester assessment (100%)
Campus: Camperdown/Darlington
Mode of delivery: Normal (lecture/lab/tutorial) Day
Note: Department permission required for enrolment.

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 covered 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 DARcorps' Advanced Aircraft Analysis (AAA); and introduction to multidisciplinary 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
Engineering and Information Technologies
Credit points: 6
Session: Semester 2 Classes: 3 hours of lectures and 2 hours of tutorials per week, 2hrs of laboratory per semester. Prerequisites: AERO5510 OR AERO3560. Assumed knowledge: BE in area of Aerospace Engineering or related Engineering Field. Assessment: Through semester assessment (100%). Campus: Camperdown/Darlington Mode of delivery: Normal (lecture/lab/tutorial) Day
Note: All MPE and ME students are required to do AERO5510 unless they have already completed an equivalent to AERO5510/AERO3560. This UoS can then be taken as an advanced elective

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
Engineering and Information Technologies
Credit points: 6
Session: Semester 1 Classes: Lectures: 1 hour per week; Tutorials: 1 hour per week; Laboratory Sessions: 2 hours per week. Assumed knowledge: Partial differential equations; Finite difference methods; Taylor series; Basic fluid mechanics including pressure, velocity, boundary layers, separated and recirculating flows. Basic computer programming skills. Assessment: Through semester assessment (100%) Campus: Camperdown/Darlington Mode of delivery: Normal (lecture/lab/tutorial) Day

Objectives: To provide students with the necessary skills to use commercial Computational Fluid Dynamics packages and to carry out research in the area of Computational Fluid Dynamics. Expected outcomes: Students will have a good understanding of the basic theory of Computational Fluid Dynamics, including discretisation, accuracy and stability. They will be capable of writing a simple solver and using a commercial CFD package. A set of laboratory tasks will take the student through a series of increasingly complex flow simulations, requiring an understanding of the basic theory of computational fluid dynamics (CFD). The laboratory tasks will be complemented by a series of lectures in which the basic theory is covered, including: governing equations; finite difference methods accuracy and stability for the advection equation, diffusion equation; direct and iterative solution techniques; solution of the full Navier-Stokes equations; turbulent flow; Cartesian tensors; turbulence models.

AMME5271
Computational Nanotechnology
Engineering and Information Technologies
Credit points: 6
Session: Semester 2 Classes: Lectures: 2 hours per week; Tutorials: 3 hours per week. Assumed knowledge: Students are required to have an understanding of basic principles of Newtonian mechanics, physics and chemistry, fluid mechanics and solid mechanics. General knowledge of how to operate a computer and work with different software is also required. Assessment: Through semester assessment (100%) Campus: Camperdown/Darlington 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
Engineering and Information Technologies
Credit points: 6
Session: Semester 1 Classes: 2 hrs lectures and 2hrs tutorials per week. Assessment: Through semester assessment (100%) Campus: Camperdown/Darlington Mode of delivery: Normal (lecture/lab/tutorial) Day

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

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.

AMME5961
Biomaterials Engineering
Engineering and Information Technologies
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 Assumed Knowledge: Chemistry, biology, materials engineering, and engineering design at least at the junior level. Assessment: Through semester assessment (60%), Final Exam (40%) Campus: Camperdown/Darlington Mode of delivery: Normal (lecture/lab/tutorial) Day

To gain a basic understanding of the major areas of interest in the biomaterials field, learn to apply basic engineering principles to biomedical systems, and understand the challenges and difficulties of biomedical systems. To participate in a project-based-learning approach to the topic of design with Biomaterials.

AMME5971
Applied Tissue Engineering
Engineering and Information Technologies
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%) Campus: Camperdown/Darlington Mode of delivery: Normal (lecture/lab/tutorial) Day

Elective Unit of Study: With the severe worldwide shortage of donor organs and the ubiquitous problem of donor organ rejection, there is a strong need for developing technologies for engineering replacement...
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 System Design

Engineering and Information Technologies

Credit points: 6

Session: Semester 1

Classes: 2 hours of lectures and 2 hours lab/tutorial per 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%)

Campus: Camperdown/Darlington

Mode of delivery: Normal (lecture/lab/tutorial) Day

This unit aims to teach the basics 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.


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 implementations.

**ENGS5231**

Engineering Graduate Exchange A

Engineering and Information Technologies

Credit points: 6

Session: Int. January, Int. July

Classes: overseas short-course.

Prerequisites: Permission from faculty and school.

Assessment: Through semester assessment (100%)

Campus: Camperdown/Darlington

Mode of delivery: Normal (lecture/lab/tutorial) Day

Note: Department permission required for enrolment.

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.
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)

Engineering and Information Technologies

Credit points: 6 Session: Semester 2 Classes: 2 hours of lectures and 1 hour of tutorials per week. Prerequisites: MECH3260 or MECH5262 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%) Campus: Camperdown/Darlington Mode of delivery: Normal (lecture/lab/tutorial) Day

This unit of study develops an advanced knowledge of air conditioning systems and refrigeration applications. At the completion of this unit students will be able to determine thermal loads on structures and design an air conditioning or refrigeration system with attention to comfort, control, air distribution and energy consumption. Course content will include: applied psychrometrics, air conditioning systems, design principles, comfort in the built environment, cooling load calculations, heating load calculations, introduction and use of computer-based load estimation packages software, air distribution, fans, ducts, air conditioning controls, advanced refrigeration cycles, evaporators, condensers, cooling towers, compressors, pumps, throttling devices, piping, refrigerants, control, refrigeration equipment, simulation of refrigeration systems, food refrigeration and industrial applications; Use of CFD packages as tools to simulate flows in building and to optimise air conditioning design, energy estimation methods and software, energy evaluation and management in the built environment. Use of experimental air conditioning systems to test for thermal balances and compare with simulations.

MECH5265
Advanced Combustion

Engineering and Information Technologies

Credit points: 6 Session: Semester 2 Classes: 2 hours of lectures and 1 hour of tutorials per week. Prerequisites: (MECH5262 or MECH3260) and (MECH5265 or MECH3261) Prohibitions: MECH4265 Assessment: Through semester assessment (60%), Final Exam (40%) Campus: Camperdown/Darlington Mode of delivery: Normal (lecture/lab/tutorial) Day

This UoS aims to teach the basic principles of combustion highlighting the role of chemical kinetics, fluid mechanics, and molecular transport in determining the structure of flames. Students will become familiar with laminar and turbulent combustion of gaseous and liquid fuels including the formation of pollutants. They will also be briefly introduced to various applications such as internal combustion engines, gas turbines, furnaces and fires.

This UoS will cover equilibrium compositions, flammability limits, simple chemically reacting systems, detailed chemical kinetics, and the basic theory underlying laminar and turbulent combustion for both premixed and non-premixed cases. There will be an introduction to droplet combustion, the concept of mixture fraction for non-premixed flames, combustion in engines and gas turbines as well as the formation of pollutants. Fire ignition, growth and spread will also be covered with respect to safety in buildings including the hazards related to the formation of smoke and toxic products.

MECH5275
Advanced Renewable Energy

Engineering and Information Technologies

Credit points: 6 Session: Semester 2 Classes: 2 hours of lectures and 3 hours of tutorials per week. Prerequisites: MECH5262 or MECH5260 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 engineering and scientific thermodynamic analysis of energy conversion systems; and perform calculations of radiative, convective and convective heat transfer. Assessment: Through semester assessment (100%) Campus: Camperdown/Darlington Mode of delivery: Normal (lecture/lab/tutorial) Day

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

MECH3035
Smart Materials

Engineering and Information Technologies

Credit points: 6 Session: Semester 2 Classes: 1 hour of lectures, 1 hour of tutorials and 3 hours of laboratory work per week. Assumed knowledge: Critical thinking, data analysis, problem solving, computer programming, physics, engineering, materials science, thermodynamics, electronics, and chemistry Assessment: Through semester assessment (100%) Campus: Camperdown/Darlington Mode of delivery: Normal (lecture/lab/tutorial) Day

Develop an essential understanding of structure-property relationship of smart materials, as well as their applications in practical applications; develop student's capability to design functional structures using smart materials; and provide students an opportunity to learn the new knowledge through project approaches.

MECH3310
Advanced Engineering Materials

Engineering and Information Technologies

Credit points: 6 Session: Semester 1 Classes: 2 hours of lectures and 3 hours of tutorials per week. Prohibitions: MECH4310 Assessment: Through semester assessment (100%) Campus: Camperdown/Darlington Mode of delivery: Normal (lecture/lab/tutorial) Day

To understand (a) how to define the relationship between properties and microstructures of advanced engineering materials, (b) how to improve mechanical design with the knowledge of mechanics and properties of materials, and (c) how to conduct failure diagnosis of engineering materials.

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 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

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</tr>
<tr>
<td>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:</td>
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</tr>
<tr>
<td>(a) 24 credit points of Core units</td>
<td></td>
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<td></td>
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</tr>
<tr>
<td>(b) 24 credit points of Specialist units</td>
<td></td>
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<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>(c) A minimum of 12 credit points of Research units</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>(d) A maximum of 12 credit points of Elective units</td>
<td></td>
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</tr>
<tr>
<td>Candidates who have been granted 24 credit points of Reduced Volume Learning (RVL), must complete 48 credit points including:</td>
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</tr>
<tr>
<td>(a) A minimum of 12 credit points of Core units</td>
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</tr>
<tr>
<td>(b) A minimum of 12 credit points of Specialist units</td>
<td></td>
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<td></td>
<td></td>
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<td></td>
</tr>
<tr>
<td>(c) A minimum of 12 credit points of Research units</td>
<td></td>
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</tr>
<tr>
<td>(d) Elective units are not available for candidates with RVL</td>
<td></td>
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</tr>
</tbody>
</table>

#### 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.

<table>
<thead>
<tr>
<th>Unit of study</th>
<th>Credit points</th>
<th>A: Assumed knowledge</th>
<th>P: Prerequisites</th>
<th>C: Corequisites</th>
<th>N: Prohibition</th>
<th>Session</th>
</tr>
</thead>
<tbody>
<tr>
<td>ENGG5102 Entrepreneurship for Engineers</td>
<td>6</td>
<td>A Some limited industry experience is preferred but not a must.</td>
<td></td>
<td></td>
<td></td>
<td>Semester 1</td>
</tr>
<tr>
<td>ENGG5202 Sustainable Design, Eng and Mgt</td>
<td>6</td>
<td>A General knowledge in science and calculus and understanding of basic principles of chemistry, physics and mechanics</td>
<td></td>
<td></td>
<td></td>
<td>Semester 1</td>
</tr>
<tr>
<td>ENGG5103 Safety Systems and Risk Analysis</td>
<td>6</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Semester 2</td>
</tr>
<tr>
<td>PMGT5971 Project Process Planning and Control</td>
<td>6</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Int December</td>
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<td></td>
<td>Int July</td>
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<td>Semester 1</td>
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<td>Semester 2</td>
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<td></td>
<td>Summer Late</td>
</tr>
</tbody>
</table>

#### 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.

<table>
<thead>
<tr>
<th>Unit of study</th>
<th>Credit points</th>
<th>A: Assumed knowledge</th>
<th>P: Prerequisites</th>
<th>C: Corequisites</th>
<th>N: Prohibition</th>
<th>Session</th>
</tr>
</thead>
<tbody>
<tr>
<td>AMME5921 Biomedical Engineering Tech 2</td>
<td>6</td>
<td>A This is an introductory Masters of Engineering unit. A bachelors degree, ideally in the engineering or science field, is advisory, but not essential.</td>
<td></td>
<td></td>
<td></td>
<td>Semester 2</td>
</tr>
<tr>
<td>AMME5961 Biomaterials Engineering</td>
<td>6</td>
<td>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 Assumed Knowledge: Chemistry, biology, materials engineering, and engineering design at least at the Junior level.</td>
<td></td>
<td></td>
<td></td>
<td>Semester 2</td>
</tr>
<tr>
<td>AMME5971 Applied Tissue Engineering</td>
<td>6</td>
<td>A 6 credit points of junior biology 6 credit points of junior chemistry and 6 credit points of intermediate physiology or equivalent.</td>
<td></td>
<td></td>
<td></td>
<td>Semester 1</td>
</tr>
<tr>
<td>AMME5981 Computational Biomedical Engineering</td>
<td>6</td>
<td>A AMME5301 and AMME5302 and AMME5500 and MECH5361 and MECH3921</td>
<td></td>
<td></td>
<td></td>
<td>Semester 1</td>
</tr>
<tr>
<td>AMME5990 Biomedical Engineering Tech 1</td>
<td>6</td>
<td>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.</td>
<td></td>
<td></td>
<td></td>
<td>Semester 1</td>
</tr>
<tr>
<td>CHNG5002 Cellular Biophysics</td>
<td>6</td>
<td>Note: Department permission required for enrolment</td>
<td></td>
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<td></td>
<td>Semester 1</td>
</tr>
</tbody>
</table>

#### Research units

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

<table>
<thead>
<tr>
<th>Unit of study</th>
<th>Credit points</th>
<th>A: Assumed knowledge</th>
<th>P: Prerequisites</th>
<th>C: Corequisites</th>
<th>N: Prohibition</th>
<th>Session</th>
</tr>
</thead>
<tbody>
<tr>
<td>AMME5020 Capstone Project A</td>
<td>6</td>
<td>P 48 cp from MPE degree program or 24 cp from the ME program. Note: Department permission required for enrolment</td>
<td></td>
<td></td>
<td></td>
<td>Semester 1</td>
</tr>
<tr>
<td>AMME5021 Capstone Project B</td>
<td>6</td>
<td>C AMME5020 Note: Department permission required for enrolment</td>
<td></td>
<td></td>
<td></td>
<td>Semester 1</td>
</tr>
<tr>
<td>AMME5022 Capstone Project B Extended</td>
<td>12</td>
<td>P 42 credit points in the Master of Engineering and WAM &gt;70, or 66 credit points in the Master of Professional Engineering and WAM &gt;70 or exemption Note: Department permission required for enrolment</td>
<td></td>
<td></td>
<td></td>
<td>Semester 1</td>
</tr>
<tr>
<td>AMME5222 Dissertation A</td>
<td>12</td>
<td>N AMME5020, AMME5021, ENGG5220, ENGG5221 Note: Department permission required for enrolment</td>
<td></td>
<td></td>
<td></td>
<td>Semester 1</td>
</tr>
<tr>
<td>AMME5223 Dissertation B</td>
<td>12</td>
<td>N AMME5020, AMME5021, ENGG5220, ENGG5221 Note: Department permission required for enrolment</td>
<td></td>
<td></td>
<td></td>
<td>Semester 1</td>
</tr>
</tbody>
</table>
### 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.

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Credit Points</th>
<th>Assumed Knowledge</th>
<th>Prerequisites</th>
<th>Corequisites</th>
<th>Prohibition</th>
<th>Session</th>
</tr>
</thead>
<tbody>
<tr>
<td>AERO5010</td>
<td>Optimisation Methods in Engineering</td>
<td>6</td>
<td>A BE in the area of Aerospace or related Engineering field.</td>
<td>Note: Department permission required for enrolment</td>
<td>Semester 2</td>
<td></td>
<td></td>
</tr>
<tr>
<td>AEROS501</td>
<td>Applied Finite Element Analysis</td>
<td>6</td>
<td>A AMME5301 or BE in area of Aerospace Engineering or related Engineering field.</td>
<td>P AEROS310 OR MECH5381</td>
<td>Semester 1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>AMME5202</td>
<td>Advanced Computational Fluid Dynamics</td>
<td>6</td>
<td>A Partial differential equations; Finite difference methods; Taylor series; Basic fluid mechanics including pressure, velocity, flow, boundary layers, separated and recirculating flows.</td>
<td>Basic computer programming skills.</td>
<td>Semester 1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>AMME5371</td>
<td>Computational Nanotechnology</td>
<td>6</td>
<td>A Students are required to have an understanding of basic principles of Newtonian mechanics, fluid mechanics and solid mechanics. General knowledge of how to operate a computer and work with different software is also required.</td>
<td>Note: Department permission required for enrolment</td>
<td>Semester 2</td>
<td></td>
<td></td>
</tr>
<tr>
<td>AMME5310</td>
<td>Engineering Tribology</td>
<td>6</td>
<td>A (AMME2302 OR AMME5302) AND (AMME2301 OR AMME5301) AND (MECH3261 OR MECH5526).</td>
<td>Semester 1</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>AMME5220</td>
<td>Advanced Control and Optimisation</td>
<td>6</td>
<td>P AMME3500 OR AMME5501.</td>
<td>Semester 1</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>AMME5602</td>
<td>Product Life Cycle Design</td>
<td>6</td>
<td>A Some knowledge of product and process design is assumed and a basic understanding of business activity will also be helpful.</td>
<td>Semester 2</td>
<td></td>
<td></td>
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</tr>
<tr>
<td>AMME5902</td>
<td>Advanced Computer Aided Manufacturing</td>
<td>6</td>
<td>A Computer Aided Drafting, Basic FEA principles and Solid Mechanics</td>
<td>Semester 1</td>
<td></td>
<td></td>
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</tr>
<tr>
<td>AMME5951</td>
<td>Fundamentals of Neuromodulation</td>
<td>6</td>
<td>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.</td>
<td>Semester 1</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>CHNG5601</td>
<td>Membrane Science</td>
<td>6</td>
<td>A It is assumed that students have a general knowledge of: MATH 1001 Differential Calculus MATH 1003 Integral Calculus and Modeling</td>
<td>Semester 1</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>CHNG5603</td>
<td>Analysis, Modelling, Control: BioPhy Sys</td>
<td>6</td>
<td>A This course is for Master degree students and also is offered as an elective course for fourth year students.</td>
<td>Semester 2</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>CHNG5605</td>
<td>Bio-Products: Laboratory to Marketplace</td>
<td>6</td>
<td>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.</td>
<td>Semester 1</td>
<td></td>
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</tr>
<tr>
<td>ELEC5803</td>
<td>Advanced Bioelectronics</td>
<td>6</td>
<td>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.</td>
<td>Semester 1</td>
<td></td>
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</tr>
<tr>
<td>ENGG5231</td>
<td>Engineering Graduate Exchange A</td>
<td>6</td>
<td>P Permission from faculty and school.</td>
<td>Note: Department permission required for enrolment</td>
<td>Int January</td>
<td></td>
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</tr>
<tr>
<td>ENGG5232</td>
<td>Engineering Graduate Exchange B</td>
<td>6</td>
<td>P Permission from faculty and school.</td>
<td>Note: Department permission required for enrolment</td>
<td>Int January</td>
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</tr>
<tr>
<td>MECH5310</td>
<td>Advanced Engineering Materials</td>
<td>6</td>
<td>N MECH4319</td>
<td>Semester 1</td>
<td></td>
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</tr>
<tr>
<td>MECH5416</td>
<td>Advanced Design and Analysis</td>
<td>6</td>
<td>A Eng Mechanics, balance of forces and moments, Mechanics of Solids, 2 and 3 dimensional mechanics, strain vector method, Engineering Dynamics - dynamic forces and moments. Mechanical Design, approach to design problems and report writing, and preparation of engineering drawing Mechanical design intermediate, means of applying fatigue analysis to a wide range of machine components.</td>
<td>Semester 1</td>
<td></td>
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</tr>
<tr>
<td>MECH5720</td>
<td>Sensors and Signals</td>
<td>6</td>
<td>A Strong MATLAB skills N MECH4720</td>
<td>Semester 2</td>
<td></td>
<td></td>
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</tr>
<tr>
<td>MTRX5700</td>
<td>Experimental Robotics</td>
<td>6</td>
<td>A Knowledge of statics and dynamics, rotation matrices, programming and some electronic and mechanical design experience is assumed.</td>
<td>N MTRX4700</td>
<td>Semester 1</td>
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</tbody>
</table>

For more information on degree program requirements visit CUSP.
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 and (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

Engineering and Information Technologies

Credit points: 6 Session: Semester 1 Classes: 2hrs of Lectures per week, 2hrs of Tutorials per week Prohibitions: ELEC5701 Assumed knowledge: Some limited industry experience is preferred but not a must. Assessment: Through semester assessment (100%) Campus: Camperdown/Darlington 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.


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

ENGG5202 Sustainable Design, Eng and Mgt.

Engineering and Information Technologies

Credit points: 6 Session: Semester 1 Classes: 2 lectures per week, tutorials 2 hour per week and projects and self assisted learning (4 hours per week) Assumed knowledge: General knowledge in science and calculus and 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

Engineering and Information Technologies

Credit points: 6 Session: Semester 1 Classes: 2hrs of Lectures per week, 2hrs of Tutorials per week Assessment: Through semester assessment (100%) Campus: Camperdown/Darlington 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

Engineering and Information Technologies

Credit points: 6 Session: Int December, Int July, Semester 1, Semester 2, Summer Late Classes: Session 1: Evening, Online Session 2: Evening, Online, Block mode Jul Int and Dec Int: Block mode Assessment: Through session assessment (60%), Final Exam (40%), Mode of delivery: Block Mode or On-line or Normal (lecture/lab/tutorial) Evening

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
Engineering and Information Technologies
Credit points: 6  Session: Semester 2  Classes: Lectures: 4 hours per week  Assumed knowledge: This is an introductory Masters of Engineering unit. A bachelor's degree, ideally in the engineering or science field, is advisory, but not essential. Assessment: Through semester assessment (100%)  Campus: Camperdown/Darlington  Mode of delivery: Normal (lecture/lab/tutorial) Day

This unit of study provides an introduction to the field of biomedical engineering, from the point of view of the engineering and the global biomedical industry itself. After completion of this unit, students will have a clear understanding of what biomedical engineering is, both from the engineering perspective and the commercial/industry perspective.

AMME5961  Biomaterials Engineering
Engineering and Information Technologies
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 6 credit points of Chemistry, biology, materials engineering, and engineering design at least at the Junior level. Assessment: Through semester assessment (60%), Final Exam (40%)  Campus: Camperdown/Darlington  Mode of delivery: Normal (lecture/lab/tutorial) Day

To gain a basic understanding of the major areas of interest in the biomaterials field, learn to apply basic engineering principles to biomedical systems, and understand the challenges and difficulties of biomedical systems. To participate in a project-based-learning approach to the topic of design with Biomaterials.

AMME5971  Applied Tissue Engineering
Engineering and Information Technologies
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%)  Campus: Camperdown/Darlington  Mode of delivery: Normal (lecture/lab/tutorial) Day

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

A. To gain a basic understanding of the major areas of interest in tissue engineering
B. To learn to apply basic engineering principles to tissue engineering systems
C. To understand the challenges and difficulties of tissue engineering.
D. To understand the ethical issues of stem cell applications.
E. Practical classes in the preparation and evaluation of scaffolds for tissue regeneration.
F. Enable student to access web-based resources in tissue engineering (for example: Harvard-MIT Principles and Practice of Tissue Engineering).
G. Research basic skills in Tissue Engineering.

AMME5981  Computational Biomedical Engineering
Engineering and Information Technologies
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%)  Campus: Camperdown/Darlington  Mode of delivery: Normal (lecture/lab/tutorial) Day

This UoS will give students a comprehensive understanding of finite element method, material constitutive modelling, CT/MRI based solid modelling, design analysis and optimisation, and their applications in biomedical engineering. The students are expected to expand their research and development skills in relevant topics, and gain experience and skills in finite element software for the solution to sophisticated problems associated with biomedical engineering.

The objectives are:

1. Understanding of the nature of biomedical engineering problems;
2. Exploring CT/MRI image processing, solid modelling etc;
3. Understanding of finite element methods and developing FE models for biomedical engineering analysis;
4. Understanding biomaterials constitutive modelling;
5. Understanding bone remodelling simulation, fracture mechanics;
6. Developing prosthetic design optimisation;

AMME5990  Biomedical Engineering Tech 1
Engineering and Information Technologies
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%)  Campus: Camperdown/Darlington  Mode of delivery: Normal (lecture/lab/tutorial) Day

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

The objectives are:

1. To gain a broad understanding of biomedical product development within the regulatory framework.
2. To understand the challenges and difficulties of Good Manufacturing Practice.
3. Understand the purpose and conduct of preclinical and clinical testing.
4. To understand how each of these components fit together to support regulatory filings.

CHNG5602  Cellular Biophysics
Engineering and Information Technologies
Credit points: 6  Session: Semester 1  Classes: 4 hours of lectures/ project work classes per week. Assessment: Through semester assessment (50%), Final Exam (50%)  Campus: Camperdown/Darlington  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  
Engineering and Information Technologies  
**Credit points:** 6  
**Session:** Semester 1, Semester 2  
**Classes:** Independent project work.  
**Prerequisites:** 48 cp from ME degree program or 24 cp from the ME program.  
**Assessment:** Through semester assessment (100%)  
**Campus:** Camperdown/Darlington  
**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 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 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 these will resolve great intellectual problems. The timeframe available for the thesis is simply too short to permit students to tackle complex or difficult problems. Indeed, a key aim of the thesis is to specify a research topic that arouses sufficient intellectual curiosity, and presents an appropriate range and diversity of technical and conceptual challenges, while remaining manageable and allowing achievable outcomes within the time and resources available. It is important that the topic be of sufficient scope and complexity to allow a student to learn their craft and demonstrate their research skills. Equally imperative is that the task not be so demanding as to elude completion.

**AMME5021**  
Capstone Project B  
Engineering and Information Technologies  
**Credit points:** 12  
**Session:** Semester 1, Semester 2  
**Classes:** Self paced research  
**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%)  
**Campus:** Camperdown/Darlington  
**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 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 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
Unit of study descriptions

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.

AMME5222
Dissertation A
Engineering and Information Technologies
Credit points: 12 Session: Semester 1, Semester 2 Classes: no formal classwork
Prohibitions: AMME5020, AMME5021, ENG5220, ENG5221
Assessment: Through semester assessment (100%) Campus: Camperdown/Darlington
Mode of delivery: Supervision Note: Department permission required for enrolment.

Aim: 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.

AMME5223
Dissertation B
Engineering and Information Technologies
Credit points: 12 Session: Semester 1, Semester 2 Classes: no formal classwork
Prohibitions: AMME5020, AMME5021, ENG5220, ENG5221
Assessment: Through semester assessment (100%) Campus: Camperdown/Darlington
Mode of delivery: Supervision Note: Department permission required for enrolment.

Aim: 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.

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 with the approval of the Program Director.

AMME5301
Applied Finite Element Analysis
Engineering and Information Technologies
Credit points: 6 Session: Semester 1 Classes: 2.5 hours of lectures and 3 hours of group work per week
Prerequisites: AEROS310 OR MEE3101 Assumed knowledge: A credit course in: Aeronautical or Mechanical Engineering or related Engineering field. Assessment: Through semester assessment (100%) Campus: Camperdown/Darlington
Mode of delivery: Normal (lecture/lab/tutorial) Day
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.

AEROS301
Advanced Computational Fluid Dynamics
Engineering and Information Technologies
Credit points: 6 Session: Semester 1 Classes: Lectures: 1 hour per week; Tutorials: 1 hour per week; Laboratory Sessions: 2 hours per week
Assumed knowledge: Partial differential equations; Finite difference methods; Taylor series; Basic fluid mechanics including pressure, velocity, boundary layers, separated and recirculating flows. Basic computer programming skills. Assessment: Through semester assessment (100%) Campus: Camperdown/Darlington
Mode of delivery: Normal (lecture/lab/tutorial) Day

Objectives: To provide students with the necessary skills to use commercial Computational Fluid Dynamics packages and to carry out research in the area of Computational Fluid Dynamics. Expected outcomes: Students will have a good understanding of the basic theory of Computational Fluid Dynamics, including discretisation, accuracy and stability. They will be capable of writing a simple solver and using a sophisticated commercial CFD package. Syllabus summary: A course of lectures, tutorials and laboratories designed to provide the student with the necessary tools for using a sophisticated commercial CFD package. A set of laboratory tasks will take the student through a series of increasingly complex flow simulations, requiring an understanding of the basic theory of computational fluid dynamics (CFD). The laboratory tasks will be complemented by a series of lectures in which the basic theory is covered, including: governing equations; finite difference methods accuracy and stability for the advection equation, diffusion equation; direct and iterative solution techniques; solution of the full Navier-Stokes equations; turbulent flow; Cartesian tensors; turbulence models.

AMME5271
Computational Nanotechnology
Engineering and Information Technologies
Credit points: 6 Session: Semester 2 Classes: Lectures: 2 hours per week; Tutorials: 3 hours per week
Assumed knowledge: Students are required to have an understanding of basic principles of Newtonian mechanics, physics and chemistry, fluid mechanics and solid mechanics. General knowledge of how to operate a computer and work with different software is also required. Assessment: Through semester assessment (100%) Campus: Camperdown/Darlington
Mode of delivery: Normal (lecture/lab/tutorial) Day

Note: Department permission required for enrolment.

The course is concerned with the tools and methods required for nanoscale research and with a detailed understanding of the physical processes involved in real structures. Three dimensional elements. Modelling strategies. Isoparametric elements, accuracy and convergence. Applications of finite element modelling in solid mechanics. Practical modelling of real structures will be done; a 'hands-on' approach will be taken.

AMME5202
Advanced Computational Fluid Dynamics
Engineering and Information Technologies
Credit points: 6 Session: Semester 1 Classes: Lectures: 1 hour per week; Tutorials: 1 hour per week; Laboratory Sessions: 2 hours per week
Assumed knowledge: Partial differential equations; Finite difference methods; Taylor series; Basic fluid mechanics including pressure, velocity, boundary layers, separated and recirculating flows. Basic computer programming skills. Assessment: Through semester assessment (100%) Campus: Camperdown/Darlington
Mode of delivery: Normal (lecture/lab/tutorial) Day

Objectives: To provide students with the necessary skills to use commercial Computational Fluid Dynamics packages and to carry out research in the area of Computational Fluid Dynamics. Expected outcomes: Students will have a good understanding of the basic theory of Computational Fluid Dynamics, including discretisation, accuracy and stability. They will be capable of writing a simple solver and using a sophisticated commercial CFD package. Syllabus summary: A course of lectures, tutorials and laboratories designed to provide the student with the necessary tools for using a sophisticated commercial CFD package. A set of laboratory tasks will take the student through a series of increasingly complex flow simulations, requiring an understanding of the basic theory of computational fluid dynamics (CFD). The laboratory tasks will be complemented by a series of lectures in which the basic theory is covered, including: governing equations; finite difference methods accuracy and stability for the advection equation, diffusion equation; direct and iterative solution techniques; solution of the full Navier-Stokes equations; turbulent flow; Cartesian tensors; turbulence models.

AMME5271
Computational Nanotechnology
Engineering and Information Technologies
Credit points: 6 Session: Semester 2 Classes: Lectures: 2 hours per week; Tutorials: 3 hours per week
Assumed knowledge: Students are required to have an understanding of basic principles of Newtonian mechanics, physics and chemistry, fluid mechanics and solid mechanics. General knowledge of how to operate a computer and work with different software is also required. Assessment: Through semester assessment (100%) Campus: Camperdown/Darlington
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
Engineering and Information Technologies
Credit points: 6
Session: Semester 1
Classes: 2hrs of Lectures per week, 3hr of Tutorials per week, 12 hours of laboratory work per semester
Assumed knowledge: AMME3202 OR AMME5302 AND (AMME2301 OR AMME5301) AND (MECH2561 OR MECH5261)
Assessment: Through semester assessment (100%)
Campus: Camperdown/Darlington
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
Engineering and Information Technologies
Credit points: 6
Session: Semester 1
Classes: 2hrs lectures per week, 2hrs tutorial per week
Prerequisites: AMME3500 OR AMME5501
Assessment: Through semester assessment (50%), Final exam (50%)
Campus: Camperdown/Darlington
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
Engineering and Information Technologies
Credit points: 6
Session: Semester 2
Classes: Project Work in Class: 5 hours per week
Assumed knowledge: Some knowledge of product and process design is assumed and a basic understanding of business activity will also be helpful.
Assessment: Through semester assessment (100%)
Campus: Camperdown/Darlington
Mode of delivery: Normal (lecture/lab/tutorial) Day

This unit cover the following topics: 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
Engineering and Information Technologies
Credit points: 6
Session: Semester 2
Classes: Lectures: 2 hours per week;
Tutorials: 2 hours per week;
Laboratory: 3 hours per semester
Assessment: Through semester assessment (100%)
Campus: Camperdown/Darlington
Mode of delivery: Normal (lecture/lab/tutorial) Day

The aim of this course is to enhance the student's manufacturing engineering skills in the CAD/CAM area. The course focuses on CNC milling as a manufacturing automation process applied to a project. The management, planning and marketing of a typical engineering project are also discussed.

Objectives: Through integrated project-based learning and hands-on-machine training, you will learn
* How to successfully complete a CAD/CAM and CNC mill based project.
* Manufacturing management and system skills, such as product planning, manufacturing sequence, time and cost;
* The science in designing and selecting a manufacturing method.
* How to effectively present your ideas and outcomes using oral and report based methods.

It is expected that through your hard work in the semester, you will find
* Enhanced learning by real-world problems;
* Improved comprehensive skill in manufacturing design.

AMME5912
Crash Analysis Design
Engineering and Information Technologies
Credit points: 6
Session: Semester 1
Classes: Lectures 2 hours per week, Tutorials 2 hours per week
Assumed knowledge: Computer Aided Drafting, Basic FEA principles and Solid Mechanics
Assessment: Through semester assessment (100%)
Campus: Camperdown/Darlington
Mode of delivery: Normal (lecture/lab/tutorial) Day

The objective of the course is to give students skills in the area of highly non-linear finite element analysis. Major topics covered include CAD, Implicit / explicit codes, Wire frame geometry, Elemental Theory, Materials, Pre-processing using ETA-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
Engineering and Information Technologies
Credit points: 6
Session: Semester 1
Classes: 3hrs of lecture/tutorial per 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.
Assessment: Through semester assessment (100%)
Campus: Camperdown/Darlington
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**

**Engineering and Information Technologies**

Credit points: 6  Session: Semester 1  Classes: 4 hours of lectures and laboratory sessions per week. Assessment: Through semester assessment (50%), Final Exam (50%)  Campus: Camperdown/Darlington  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 understanding of:

- Membrane self-assembly and manufacture;
- Membrane separation processes such as filtration, desalination, ion exchange and water-splitting;
- Techniques for membrane characterisation and monitoring.

**CHNG5603**

**Analysis, Modelling, Control: BioPhy Sys**

**Engineering and Information Technologies**

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

This course will give students an insight into the use of computer-based statistical techniques in extracting information from experimental data obtained from real life bio-physical systems. The issues and techniques required for mathematical modelling 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.

**ENNG5231**

**Engineering Graduate Exchange A**

**Engineering and Information Technologies**


Note: Department permission required for enrolment.

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 Engineering and Information Technologies


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 work 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 Engineering and Information Technologies

Credit points: 6 Session: Semester 1 Classes: 2 hours of lectures and 3 hours of tutorials per week. Prerequisites: MEC4310 Assumed knowledge: Through semester assessment (100%) Assessment: Through semester assessment (100%) Campus: Camperdown/Darlington Mode of delivery: Normal (lecture/lab/tutorial) Day

To understand (a) how to define the relationship between properties and microstructures of advanced engineering materials, (b) how to improve mechanical design with the knowledge of mechanics and properties of materials, and (c) how to conduct failure diagnosis of engineering materials.

MECH5416 Advanced Design and Analysis Engineering and Information Technologies

Credit points: 6 Session: Semester 1 Classes: 2 hrs of lectures, 2hrs of tutorial per week. Prerequisites: MEC4310 Assumed knowledge: Eng Mechanics, balance of forces and moments Mechanics of Solids, 2 and 3 dimensional stress and strain Engineering Dynamics - dynamic forces and moments. Mechanical Design, approach to design problems and report writing, and preparation of engineering drawing Mechanical design intermediate, means of applying fatigue analysis to a wide range of machine components Assessment: Through semester assessment (100%) Assessment: Through semester assessment (100%) Campus: Camperdown/Darlington Mode of delivery: Normal (lecture/lab/tutorial) Day

This UoS utilises assumed theoretical knowledge and skills to elucidate the stresses and strains that exit in the different categories of machine parts. It sets out to make the students familiar with the simplifications that are applied to arrive at the analytic expressions commonly used to analyse each individual categories parts. These simplifications usually begin by assuming that only particular types of loads are carried by teh parts in that category. The resulting analyses provide approximations to the actual stresses. It is possible to have different degrees of simplifications, requiring more or less work, giving better or poorer approximations. Should a part be used to carry loads that were not allowed for in the traditional method then some more appropriate method must be found or developed. An important aspect is to make the student practiced in a range of modern concepts, techniques and tools, and to be made aware of their strengths and limitations.

This UoS teaches the student how to recognise where and how their theoretical skills can be applied to the practical situations that they may encounter in this field of design. Options may be provided in the choice of design assignments. Biomedical engineering and vehicle design problems may be provided as options to more general machine design problems.

MECH5720 Sensors and Signals Engineering and Information Technologies

Credit points: 6 Session: Semester 2 Classes: 3 hours of lectures and 2 hours of tutorials per week. Prerequisites: MEC4720 Assumed knowledge: Strong MATLAB skills Assessment: Through semester assessment (70%), Final Exam (30%) Campus: Camperdown/Darlington Mode of delivery: Normal (lecture/lab/tutorial) Day

Syllabus Summary: This course starts by providing a background to the signals and transforms required to understand modern sensors. It goes on to provide an overview of the workings of typical active sensors (Radar, Lidar and Sonar). It provides insight into basic sensing methods as well as aspects of interfacing and signal processing. It includes both background material and a number of case studies.

The course covers the following topics:

a) SIGNALS: 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
d) SENSORS AND THE ENVIRONMENT: Atmospheric Effects, Target Characteristics, Clutter Characteristics, Multipath

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 Engineering and Information Technologies

Credit points: 6 Session: Semester 1 Classes: 2hrs lectures and 3hrs of laboratory work per week. Prerequisites: MTRX4700 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%) Campus: Camperdown/Darlington Mode of delivery: Normal (lecture/lab/tutorial) Day

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

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

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

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<th>Unit of study</th>
<th>Credit points</th>
<th>A: Assumed knowledge</th>
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<tr>
<td>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.</td>
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<tr>
<td>ENGG5102 Entrepreneurship for Engineers</td>
<td>6</td>
<td>A Some limited industry experience is preferred but not a must.</td>
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<td>Semester 1</td>
</tr>
<tr>
<td>ENGG5202 Sustainable Design, Eng and Mgt</td>
<td>6</td>
<td>A General knowledge in science and calculus and understanding of basic principles of chemistry, physics and mechanics</td>
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<td>Semester 1</td>
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<tr>
<td>ENGG5103 Safety Systems and Risk Analysis</td>
<td>6</td>
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<td>Semester 2</td>
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<tr>
<td>PMGT5871 Project Process Planning and Control</td>
<td>6</td>
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<td>Int December</td>
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<tr>
<td>Specialist units</td>
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<tr>
<td>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.</td>
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<tr>
<td>Exchange units may be taken as Specialist units with the approval of the Program Director.</td>
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<tr>
<td>CHNG5001 Process Systems Engineering</td>
<td>6</td>
<td>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/CHNG3802 or similar courses. Students who are unsure about meeting these requirements should contact the unit coordinator for advice.</td>
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<td>Semester 2</td>
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<tr>
<td>CHNG5003 Green Engineering</td>
<td>6</td>
<td>A CHNG3801 AND CHNG3802 AND CHNG3803 AND CHNG3805 AND CHNG3806 AND CHNG3807. All core third year chemical engineering.</td>
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<td>Semester 2</td>
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<tr>
<td>CHNG5004 Particles and Surfaces</td>
<td>6</td>
<td>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</td>
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<td>Semester 1</td>
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<tr>
<td>CHNG5005 Wastewater Eng - Systems and Practice</td>
<td>6</td>
<td>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.</td>
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<td>Semester 1</td>
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<tr>
<td>CHNG5006 Advanced Wastewater Engineering</td>
<td>6</td>
<td>A CHNG5005 OR CHNG3804.</td>
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<td>Semester 2</td>
</tr>
<tr>
<td>CHNG5008 Chemical &amp; Biomolecular Engineering Adv</td>
<td>6</td>
<td>P CHNG5801 OR (CHNG3802 AND CHNG3805 AND CHNG3806)</td>
<td>Department permission required for enrolment</td>
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<td></td>
<td>Semester 2</td>
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<tr>
<td>CHNG5601 Membrane Science</td>
<td>6</td>
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<td>Semester 1</td>
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<tr>
<td>CHNG5602 Cellular Biophysics</td>
<td>6</td>
<td>Note: Department permission required for enrolment</td>
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<td>Semester 1</td>
</tr>
<tr>
<td>CHNG5603 Analysis, Modelling, Control: BioPhy Sys</td>
<td>6</td>
<td>A It is assumed that students have a general knowledge of: MATH 1001 Differential Calculus MATH 1003 Integral Calculus and Modeling</td>
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<td>Semester 1</td>
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</tbody>
</table>
Research units

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

<table>
<thead>
<tr>
<th>Unit of study</th>
<th>Credit points</th>
<th>A: Assumed knowledge</th>
<th>P: Prerequisites</th>
<th>C: Corequisites</th>
<th>N: Prohibition</th>
<th>Session</th>
</tr>
</thead>
<tbody>
<tr>
<td>CHNG5604 Membrane Science Laboratory</td>
<td>6</td>
<td>A CHNG5601</td>
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<td></td>
<td>Semester 2</td>
</tr>
<tr>
<td>CHNG5605 Bio-Products: Laboratory to Marketplace</td>
<td>6</td>
<td>This course is for Master degree students and also is offered as an elective course for fourth year students.</td>
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<td>Semester 2</td>
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</tbody>
</table>

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.

<table>
<thead>
<tr>
<th>Unit of study</th>
<th>Credit points</th>
<th>A: Assumed knowledge</th>
<th>P: Prerequisites</th>
<th>C: Corequisites</th>
<th>N: Prohibition</th>
<th>Session</th>
</tr>
</thead>
<tbody>
<tr>
<td>CIVL5670 Reservoir Stream &amp; Coastal Eng</td>
<td>6</td>
<td>A CIVL3612 AND MATH2061. Students who have previously studied CIVL3613 will only be permitted to enrol in this unit by approval of the Director of Undergraduate Studies.</td>
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<td>Semester 1</td>
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<tr>
<td>ENGG5216 Management of Engineering Innovation</td>
<td>6</td>
<td>A Sound competence in all aspects of engineering, and some understanding of issues of engineering management</td>
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<td>Semester 1</td>
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<tr>
<td>ENGG5231 Engineering Graduate Exchange A</td>
<td>6</td>
<td>P Permission from faculty and school. Note: Department permission required for enrolment</td>
<td></td>
<td></td>
<td>Int January</td>
<td>Int July</td>
</tr>
<tr>
<td>ENGG5232 Engineering Graduate Exchange B</td>
<td>6</td>
<td>P Permission from faculty and school. Note: Department permission required for enrolment</td>
<td></td>
<td></td>
<td>Int January</td>
<td>Int July</td>
</tr>
<tr>
<td>MECH5275 Advanced Renewable Energy</td>
<td>6</td>
<td>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.</td>
<td>P MECH5262 or MECH3260</td>
<td></td>
<td>Semester 2</td>
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</tbody>
</table>

For more information on degree program requirements visit CUSP.
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

Engineering and Information Technologies

Credit points: 6 Session: Semester 1 Classes: 2hr Lectures per week, 2hr Tutorials per week Prohibitions: ELEC5701 Assumed knowledge: Some limited industry experience is preferred but not a must. Campus: Camperdown/Darlington Mode of delivery: Normal (lecture/lab/tutorial) Day

Associated degrees: Grad Cert E, M P E.

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.


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

ENGG5202
Sustainable Design, Eng and Mgt

Engineering and Information Technologies

Credit points: 6 Session: Semester 1 Classes: 2 lectures per week, tutorials 2 hour per week and projects and self assisted learning (4 hours per week) Assumed knowledge: General knowledge in science and calculus and understanding of basic principles of chemistry, physics and mechanics Campus: Camperdown/Darlington Mode of delivery: Normal (lecture/lab/tutorial) Day

Associated degrees: Grad Cert E, M P E.

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

Engineering and Information Technologies

Credit points: 6 Session: Semester 2 Classes: 2hrs of Lectures per week, 2hrs of Tutorials per week Campus: Camperdown/Darlington Mode of delivery: Normal (lecture/lab/tutorial) Day

Associated degrees: Grad Cert E, M P E.

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

Engineering and Information Technologies

Credit points: 6 Session: Int December, Int July, Semester 1, Semester 2, Summer Late Classes: Session 1: Evening, Online Session 2: Evening, Online, Block mode July Int and Dec Int, Block mode Campus: Camperdown/Darlington Mode of delivery: Block mode or On-line or Normal (lecture/lab/tutorial) Evening

Associated degrees: Grad Cert I T, Grad Cert Inf Tech Man, Grad Cert P M, Grad Dip E, M Inf Tech Man, M P E.

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 Special unit 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  
Engineering and Information Technologies  
**Credit points:** 6  
**Session:** Semester 2  
**Classes:** Lectures: 1 hour per week,  
Tutorials: 2 hours per 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/CHNG3802 or similar courses. Students who are unsure about meeting these requirements should contact the unit coordinator for advice.  
**Campus:** Camperdown/Darlington  
**Mode of delivery:** Normal (lecture/lab/tutorial) Day  
**Note:** This unit of study is for Masters students and can be selected as an elective by 4th year students.

**Associated degrees:** B E, Grad Cert E, M P E, UG Study Abroad Program.

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  
Engineering and Information Technologies  
**Credit points:** 6  
**Session:** Semester 2  
**Classes:** 1 hour of lectures, 4 hours of tutorial/project work per week.  
**Assumed knowledge:** CHNG3801 AND CHNG3802 AND CHNG3803 AND CHNG3805 AND CHNG3806 AND CHNG3807. All core third year chemical engineering.  
**Campus:** Camperdown/Darlington  
**Mode of delivery:** Normal (lecture/lab/tutorial) Day  
**Associated degrees:** B E, Grad Cert E, M P E, UG Study Abroad Program.

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  
Engineering and Information Technologies  
**Credit points:** 6  
**Session:** Semester 1  
**Classes:** 2 hours of lectures and 2 hours of tutorials per week.  
**Assumed knowledge:** Enrolment in this unit of study assumes that all (six) core chemical engineering UOs in third year or their equivalent have been successfully completed.  
**Campus:** Camperdown/Darlington  
**Mode of delivery:** Normal (lecture/lab/tutorial) Day  
**Note:** Department permission required for enrolment.

**Associated degrees:** B E, Grad Cert E, M P E, UG Study Abroad Program.

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 Eng - Systems and Practice  
Engineering and Information Technologies  
**Credit points:** 6  
**Session:** Semester 1  
**Classes:** 4 hours of lectures and tutorials per week.  
**Assumed knowledge:** Ability to conduct mass and energy balances, and the integration of these concepts to solve `real` chemical engineering problems; Ability to understand basic principles of physical chemistry, physics and mechanics. Ability to use basic calculus and linear algebra, and carry out such computations using Matlab and MS Excel. Ability to read widely outside of the technical literature and to synthesise arguments based on such literature. Ability to write coherent reports and essays based on information from diverse sources.  
**Campus:** Camperdown/Darlington  
**Mode of delivery:** Normal (lecture/lab/tutorial) Day  
**Associated degrees:** B E, M E, M P E.

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  
Engineering and Information Technologies  
**Credit points:** 6  
**Session:** Semester 2  
**Classes:** 2hr lectures per week; 1 hr tutorial per week; 1 hr laboratory per week.  
**Assumed knowledge:** CHNG5005 OR CHNG3804.  
**Campus:** Camperdown/Darlington  
**Mode of delivery:** Normal (lecture/lab/tutorial) Day  
**Associated degrees:** B E, M E, M P E.

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**  
Chemical & Biomolecular Engineering Adv  
Engineering and Information Technologies  
Credit points: 6  
Session: Semester 2  
Classes: Project Work - own time.  
Lectures 4hrs per week.  
Prerequisites: CHNG5801 OR (CHNG3802 AND CHNG3805 AND CHNG3806)  
Campus: Camperdown/Darlington  
Mode of delivery: Normal (lecture/lab/tutorial) Day  
Note: Department permission required for enrolment.  
Associated degrees: B E, M P E.

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  
Engineering and Information Technologies  
Credit points: 6  
Session: Semester 1  
Classes: 4 hours of lectures and laboratory sessions per week.  
Campus: Camperdown/Darlington  
Mode of delivery: Normal (lecture/lab/tutorial) Day  
Associated degrees: B E, Grad Cert E, M P E.

"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 understanding 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  
Engineering and Information Technologies  
Credit points: 6  
Session: Semester 1  
Classes: 4 hours of lectures per week.  
Campus: Camperdown/Darlington  
Mode of delivery: Normal (lecture/lab/tutorial) Day  
Note: Department permission required for enrolment.  
Associated degrees: B E, Grad Cert E, M P E.

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  
Engineering and Information Technologies  
Credit points: 6  
Session: Semester 1  
Classes: Lectures 2hrs per week, Tutorials 1hr per week.  
Project Work - own time.  
Assumed knowledge: It is assumed that students have a general knowledge of: MATH 1001 Differential Calculus MATH 1003 Integral Calculus and Modeling  
Campus: Camperdown/Darlington  
Mode of delivery: Normal (lecture/lab/tutorial) Day  
Associated degrees: B E, Grad Cert E, M P E.

This course will give students an insight into the use of (computer-based) statistical techniques in extracting information from experimental data obtained from real life bio-physical systems. The issues and techniques required for mathematical modeling as well as monitoring and/or control scheme for bio-physical systems will be discussed and implemented in diverse range of bioprocesses, including biomaterials and fermentation products. We will review statistical distribution; tests based on z, t, F variables; calculation of confidence intervals; hypothesis testing; linear and nonlinear regression; analysis of variance; principal component analysis; and use of computer-based statistical tools. The issues associated with dynamic response of bio-physical processes; inferred or estimated variables; control system design and implementation; introduction to model-based control; use of computer-based control system design and analysis tools will be elaborated.

When this course is successfully completed you will acquire knowledge to choose the appropriate statistical techniques within a computer based environment, such as Excel or MATLAB, for a given situation. The students will also obtain potential for monitoring/control scheme based on the key dynamic features of the process. Such information would be beneficial for any future career in Bio-manufacturing companies. Students are encouraged to promote an interactive environment for exchange of information.

**CHNG5604**  
Membrane Science Laboratory  
Engineering and Information Technologies  
Credit points: 6  
Session: Semester 2  
Classes: 2 hours of lectures or tutorials per week.  
4 hours of laboratory sessions per week.  
Assumed knowledge: CHNG5601  
Campus: Camperdown/Darlington  
Mode of delivery: Normal (lecture/lab/tutorial) Day  
Associated degrees: B E, Grad Cert E, M P E.

Students will explore experimentally the theoretical concepts learned in the other modules of the MES course in Biophysical Processes. They will gain practical insights into electrodiffusion and other mass transport processes through membranes. Students will understand the construction and functional properties of synthetic separation membranes. Students will explore experimentally the various factors affecting the performance of synthetic separation membranes.

**CHNG5605**  
Bio-Products: Laboratory to Marketplace  
Engineering and Information Technologies  
Credit points: 6  
Session: Semester 2  
Classes: 2 hours of lectures per week, Project Work - own time.  
Campus: Camperdown/Darlington  
Mode of delivery: Normal (lecture/lab/tutorial) Day  
Note: This course is for Master degree students and also is offered as an elective course for fourth year students.  
Associated degrees: B E, Grad Cert E, M P E.

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**

**Engineering and Information Technologies**

**Credit points:** 6  
**Session:** Semester 1, Semester 2  
**Class:** Independent project work.  
**Prerequisites:** Completion of 24 credits of ME or exemption, or 42 credits of MPE.  
**Assumed knowledge:** CHNG5801 AND CHNG5802 AND CHNG5803 AND CHNG5805 AND CHNG5806.  
**Campus:** Camperdown/Darlington  
**Mode of delivery:** Supervision  
**Note:** Department permission required for enrolment.  
**Associated degrees:** M E, M P E.

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

**CHNG5021**

**Capstone Project B**

**Engineering and Information Technologies**

**Credit points:** 6  
**Session:** Semester 1, Semester 2  
**Class:** Independent project work.  
**Prerequisites:** CHNG5020  
**Assumed knowledge:** Enrolment in this unit of study assumes that Capstone Project A has been successfully completed.  
**Campus:** Camperdown/Darlington  
**Mode of delivery:** Supervision  
**Note:** Department permission required for enrolment in the following sessions: Semester 1.

**Associated degrees:** M E, M P E.  

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**

**Engineering and Information Technologies**

**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  
**Campus:** Camperdown/Darlington  
**Mode of delivery:** Supervision  
**Note:** Department permission required for enrolment.  
**Associated degrees:** M E, M P E.

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**

**Engineering and Information Technologies**

**Credit points:** 12  
**Session:** Semester 1, Semester 2  
**Prohibitions:** ENGG5220, ENGG5221  
**Campus:** Camperdown/Darlington  
**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.  
**Associated degrees:** M E, M P E.

To complete a substantial research project and successfully analyse a problem, devise appropriate experiments, analyse the results and produce a well-argued, in-depth thesis. Department permission required for enrolment in the following session(s); 1.2

**CHNG5223**

**Dissertation B**

**Engineering and Information Technologies**

**Credit points:** 12  
**Session:** Semester 1, Semester 2  
**Prohibitions:** ENGG5220, ENGG5221  
**Campus:** Camperdown/Darlington  
**Mode of delivery:** Supervision  
**Note:** Department permission required for enrolment.  
**Associated degrees:** M E, M P E.
To complete a substantial research project and successfully analyse a problem, devise appropriate experiments, analyse the results and produce a well-argued, in-depth thesis.

Department permission required for enrolment in the following session(s): 1, 2.

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
Engineering and Information Technologies

Credit points: 6 Session: Semester 1 Classes: Lectures 2 hours per week, Tutorials 2 hours per week. Assumed knowledge: CIVL3612 AND MATH2061.
Campus: Camperdown/Darlington Mode of delivery: Normal (lecture/lab/tutorial) Day
Note: Students who have previously studied CIVL3613 will only be permitted to enrol in this unit by approval of the Director of Undergraduate Studies.

Associated degrees: B E, Grad Cert E, M P E, PG Coursework Exchange.

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
Engineering and Information Technologies

Credit points: 6 Session: Semester 1 Classes: 1hr Lecture per week, 1 hr Tutorials per week, 2 hr Project work in class per week for first half of semester. Assumed knowledge: Sound competence in all aspects of engineering, and some understanding of issues of engineering management.
Campus: Camperdown/Darlington Mode of delivery: Normal (lecture/lab/tutorial) Day

Associated degrees: Grad Dip E, M P E.

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 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

Engineering and Information Technologies

Prerequisites: Permission from faculty and school. Campus: Camperdown/Darlington Mode of delivery: Normal (lecture/lab/tutorial) Day
Note: Department permission required for enrolment.

Associated degrees: M E, M Inf Tech, M Inf Tech Man, M P E, M P L, M P M.

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
Engineering and Information Technologies

Prerequisites: Permission from faculty and school. Campus: Camperdown/Darlington Mode of delivery: Normal (lecture/lab/tutorial) Day
Note: Department permission required for enrolment.

Associated degrees: M E, M Inf Tech, M Inf Tech Man, M P E, M P L, M P M.

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
Engineering and Information Technologies

Credit points: 6 Session: Semester 2 Classes: 2 hours of lectures and 3 hours of tutorials per week. Prerequisites: MECH5265 or MECH5260.
Assumed knowledge: The students will require an understanding of the basic principles of fluid mechanics, thermodynamics and heat transfer, and the application of these principles to energy conversion systems. In particular, students should be able to analyse fluid flow in turbomachinery; perform first and second law thermodynamic analysis of energy conversion systems; and perform calculations of radiative, conductive and convective heat transfer.
Campus: Camperdown/Darlington Mode of delivery: Normal (lecture/lab/tutorial) Day

Associated degrees: B E, Grad Cert E, M P E.

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.
Course overview
A postgraduate major in Civil Engineering is concerned with 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).
## 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.

<table>
<thead>
<tr>
<th>Unit of study</th>
<th>Credit points</th>
<th>A: Assumed knowledge</th>
<th>P: Prerequisites</th>
<th>C: Corequisites</th>
<th>N: Prohibition</th>
<th>Session</th>
</tr>
</thead>
<tbody>
<tr>
<td>ENNGS102 Entrepreneurship for Engineers</td>
<td>6</td>
<td>Some limited industry experience is preferred but not a must.</td>
<td>N ELEC5701</td>
<td></td>
<td></td>
<td>Semester 1</td>
</tr>
<tr>
<td>ENNGS502 Sustainable Design, Eng and Mgt</td>
<td>6</td>
<td>General knowledge in science and calculus and understanding of basic principles of chemistry, physics and mechanics</td>
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<td></td>
<td>Semester 1</td>
</tr>
<tr>
<td>ENGGS103 Safety Systems and Risk Analysis</td>
<td>6</td>
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<td></td>
<td>Semester 2</td>
</tr>
<tr>
<td>PMGT5871 Project Process Planning and Control</td>
<td>6</td>
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<td>Int December</td>
</tr>
</tbody>
</table>

### 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.

<table>
<thead>
<tr>
<th>Unit of study</th>
<th>Credit points</th>
<th>A: Assumed knowledge</th>
<th>P: Prerequisites</th>
<th>C: Corequisites</th>
<th>N: Prohibition</th>
<th>Session</th>
</tr>
</thead>
<tbody>
<tr>
<td>CIVL5257 Concrete Structures: Prestressed</td>
<td>6</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Semester 1</td>
</tr>
<tr>
<td>CIVL5264 Composite Steel-Concrete Structures</td>
<td>6</td>
<td></td>
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<td></td>
<td>Semester 2</td>
</tr>
<tr>
<td>CIVL5267 Steel Structures - Advanced Design</td>
<td>6</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Semester 1</td>
</tr>
<tr>
<td>CIVL5268 Structural Dynamics</td>
<td>6</td>
<td>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.</td>
<td></td>
<td></td>
<td></td>
<td>Semester 2</td>
</tr>
<tr>
<td>CIVL5450 Analysis and Design of Pile Foundations</td>
<td>6</td>
<td></td>
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<td></td>
<td>Semester 1</td>
</tr>
<tr>
<td>CIVL5451 Computer Methods in Geotechnical Eng</td>
<td>6</td>
<td></td>
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<td></td>
<td>Semester 1</td>
</tr>
<tr>
<td>CIVL5454 Rock Engineering</td>
<td>6</td>
<td>Undergraduate geology and soil mechanics.</td>
<td></td>
<td></td>
<td></td>
<td>Semester 2</td>
</tr>
<tr>
<td>CIVL5455 Engineering Behaviour of Soils</td>
<td>6</td>
<td>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.</td>
<td></td>
<td></td>
<td></td>
<td>Semester 2</td>
</tr>
<tr>
<td>CIVL5666 Open Channel Flow &amp; Hydraulic Structures</td>
<td>6</td>
<td>CIVL3612</td>
<td></td>
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<td></td>
<td>Semester 1</td>
</tr>
<tr>
<td>CIVL5668 Wind Engineering for Design-Fundamentals</td>
<td>6</td>
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<td></td>
<td>Semester 1</td>
</tr>
<tr>
<td>CIVL5669 Applied Fluid Engineering Computing</td>
<td>6</td>
<td>CIVL5511. 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.</td>
<td></td>
<td></td>
<td></td>
<td>Semester 2</td>
</tr>
</tbody>
</table>
For more information on degree program requirements visit CUSP.

**Unit of study table**

<table>
<thead>
<tr>
<th>Unit of study</th>
<th>Credit points</th>
<th>A: Assumed knowledge</th>
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<th>C: Corequisites</th>
<th>N: Prohibition</th>
<th>Session</th>
</tr>
</thead>
<tbody>
<tr>
<td>CHNG5005 Wastewater Eng - Systems and Practice</td>
<td>6</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Semester 2</td>
</tr>
<tr>
<td>CIVL5020 Capstone Project A</td>
<td>6</td>
<td>P 48 credits from MPE degree program</td>
<td></td>
<td></td>
<td></td>
<td>Semester 1</td>
</tr>
<tr>
<td>CIVL5021 Capstone Project B</td>
<td>6</td>
<td>C CIVL5020</td>
<td></td>
<td>Note: Department permission required for enrolment</td>
<td></td>
<td>Semester 1</td>
</tr>
<tr>
<td>CIVL5022 Capstone Project B Extended</td>
<td>12</td>
<td>P 42 credit points in the Master of Engineering and WAM &gt;70, or 66 credit points in the Master of Professional Engineering and WAM &gt;70 or exemption</td>
<td></td>
<td>Note: Department permission required for enrolment</td>
<td></td>
<td>Semester 1</td>
</tr>
</tbody>
</table>

**Research units**

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

<table>
<thead>
<tr>
<th>Unit of study</th>
<th>Credit points</th>
<th>A: Assumed knowledge</th>
<th>P: Prerequisites</th>
<th>C: Corequisites</th>
<th>N: Prohibition</th>
<th>Session</th>
</tr>
</thead>
<tbody>
<tr>
<td>AMME5202 Advanced Computational Fluid Dynamics</td>
<td>6</td>
<td>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.</td>
<td></td>
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<td></td>
<td>Semester 1</td>
</tr>
<tr>
<td>CHNG5006 Advanced Wastewater Engineering</td>
<td>6</td>
<td>A CHNG5005 OR CHNG3804.</td>
<td></td>
<td></td>
<td></td>
<td>Semester 2</td>
</tr>
<tr>
<td>CIVL5266 Steel Structures - Stability</td>
<td>6</td>
<td>A Knowledge: CIVL2201 AND CIVL3206 AND CIVL3235. There are no prerequisites for this unit of study but it is assumed that students are competent in the content covered in CIVL2201 Structural Mechanics, CIVL3206 Steel Structures 1, and CIVL3235 Structural Analysis. Students who have failed previous units of study should note that no special consideration will be given to them if they do choose to enrol in this unit of study (on the basis of timetable clashes or lack of knowledge of basics), and they are discouraged from enrolling in this unit of study Students who have not yet passed first, second or third year units of study must enrol in those units of study in precedence to any later year units of study.</td>
<td></td>
<td></td>
<td></td>
<td>Semester 1</td>
</tr>
<tr>
<td>CIVL5269 Concrete Structures - Strength &amp; Service</td>
<td>6</td>
<td>P CIVL3205 OR CIVL5507</td>
<td></td>
<td></td>
<td></td>
<td>Semester 2</td>
</tr>
<tr>
<td>CIVL5351 Geoenvironmental Engineering</td>
<td>6</td>
<td></td>
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<td></td>
<td>Semester 1</td>
</tr>
<tr>
<td>CIVL5452 Foundation Engineering</td>
<td>6</td>
<td>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)</td>
<td></td>
<td></td>
<td></td>
<td>Semester 2</td>
</tr>
<tr>
<td>CIVL5458 Numerical Methods in Civil Engineering</td>
<td>6</td>
<td></td>
<td></td>
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<td></td>
<td>Semester 1</td>
</tr>
<tr>
<td>CIVL5665 Advanced Water Resources Management</td>
<td>6</td>
<td>A CIVL3612.</td>
<td></td>
<td></td>
<td></td>
<td>Semester 2</td>
</tr>
<tr>
<td>CIVL5670 Reservoir Stream &amp; Coastal Eng</td>
<td>6</td>
<td>A CIVL3612 AND MATH2061. Students who have previously studied CIVL3613 will only be permitted to enrol in this unit by approval of the Director of Undergraduate Studies.)</td>
<td></td>
<td></td>
<td></td>
<td>Semester 1</td>
</tr>
<tr>
<td>ENGG5231 Engineering Graduate Exchange A</td>
<td>6</td>
<td>P Permission from faculty and school. Note: Department permission required for enrolment</td>
<td></td>
<td></td>
<td></td>
<td>Int January</td>
</tr>
<tr>
<td>ENGG5232 Engineering Graduate Exchange B</td>
<td>6</td>
<td>P Permission from faculty and school. Note: Department permission required for enrolment</td>
<td></td>
<td></td>
<td></td>
<td>Int January</td>
</tr>
</tbody>
</table>

**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.

<table>
<thead>
<tr>
<th>Unit of study</th>
<th>Credit points</th>
<th>A: Assumed knowledge</th>
<th>P: Prerequisites</th>
<th>C: Corequisites</th>
<th>N: Prohibition</th>
<th>Session</th>
</tr>
</thead>
<tbody>
<tr>
<td>CHNG5005 Wastewater Eng - Systems and Practice</td>
<td>6</td>
<td>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.</td>
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<td></td>
<td></td>
<td>Semester 1</td>
</tr>
<tr>
<td>CIVL5020 Capstone Project A</td>
<td>6</td>
<td>P 48 credits from MPE degree program</td>
<td></td>
<td></td>
<td></td>
<td>Semester 1</td>
</tr>
<tr>
<td>CIVL5021 Capstone Project B</td>
<td>6</td>
<td>C CIVL5020</td>
<td></td>
<td>Note: Department permission required for enrolment</td>
<td></td>
<td>Semester 1</td>
</tr>
<tr>
<td>CIVL5022 Capstone Project B Extended</td>
<td>12</td>
<td>P 42 credit points in the Master of Engineering and WAM &gt;70, or 66 credit points in the Master of Professional Engineering and WAM &gt;70 or exemption</td>
<td></td>
<td>Note: Department permission required for enrolment</td>
<td></td>
<td>Semester 1</td>
</tr>
</tbody>
</table>

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.

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

Engineering and Information Technologies

Credit points: 6 Session: Semester 1 Classes: 2hrs of Lectures per week, 2hrs Tutorials per week Prohibitions: ELEC5701 Assumed knowledge: Some limited industry experience is preferred but not a must. Assessment: Through semester assessment (100%) Campus: Camperdown/Darlington Mode of delivery: Normal (lecture/lab/tutorial) Day

Associated degrees: Grad Cert E.

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

Engineering and Information Technologies

Credit points: 6 Session: Semester 1 Classes: 2 lectures per week, tutorials 2 hour per week and projects and self assisted learning (4 hours per week) Assumed knowledge: General knowledge in science and calculus and understanding of basic principles of chemistry, physics and mechanics Assessment: Through semester assessment (70%), Final Exam (30%) Campus: Camperdown/Darlington Mode of delivery: Normal (lecture/lab/tutorial) Day

Associated degrees: Grad Cert E, M P E.

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

Engineering and Information Technologies

Credit points: 6 Session: Semester 2 Classes: 2hrs of Lectures per week, 2hrs of Tutorials per week Assessment: Through semester assessment (100%) Campus: Camperdown/Darlington Mode of delivery: Normal (lecture/lab/tutorial) Day

Associated degrees: Grad Cert E, M P E.

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

Engineering and Information Technologies

Credit points: 6 Session: Int December, Int July, Semester 1, Semester 2, Summer Late Classes: Session 1: Evening, Online Session 2: Evening, Online, Block mode July Int and Dec Int : Block mode Assessment: Through session assessment (60%) , Final Exam (40%). Campus: Camperdown/Darlington Mode of delivery: Block Mode or On-line or Normal (lecture/lab/tutorial) Evening

Associated degrees: Grad Cert I T, Grad Cert Inf Tech Man, Grad Cert P M, Grad Dip E, M Inf Tech Man, M P E.

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 Engineering and Information Technologies

**Credit points:** 6  
**Session:** Semester 1  
**Classes:** Lectures 2hrs per week, Project Work - in class 1hr per week.  
**Assessment:** Through semester assessment (60%), Final Exam (40%)  
**Campus:** Camperdown/Darlington  
**Mode of delivery:** Normal (lecture/lab/tutorial) Day

**Associated degrees:** B E, Grad Cert E, M P E.

**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 Engineering and Information Technologies

**Credit points:** 6  
**Teacher/Coordinator:** Dr G Ranzi  
**Session:** Semester 2  
**Classes:** Lectures 2hrs per week, Tutorial 1hr per week.  
**Assessment:** Through semester assessment (100%)  
**Campus:** Camperdown/Darlington  
**Mode of delivery:** Normal (lecture/lab/tutorial) Day

**Associated degrees:** B E, Grad Cert E, M P E, PG Coursework Exchange.

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

**CIVL5267**
Steel Structures - Advanced Design Engineering and Information Technologies

**Credit points:** 6  
**Session:** Semester 1  
**Classes:** Lectures 2hrs per week, Tutorial 1hr per week.  
**Assessment:** Through semester assessment (50%), Final Exam (50%)  
**Campus:** Camperdown/Darlington  
**Mode of delivery:** Normal (lecture/lab/tutorial) Day

**Associated degrees:** B E, Grad Cert E, M P E, PG Coursework Exchange.

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.

**CIVL5268**
Structural Dynamics Engineering and Information Technologies

**Credit points:** 6  
**Session:** Semester 2  
**Classes:** 3-hr combined lecture and tutorial per 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%)  
**Campus:** Camperdown/Darlington  
**Mode of delivery:** Normal (lecture/lab/tutorial) Day

**Associated degrees:** B E, Grad Cert E, M P E, PG Coursework Exchange.

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 Parts 4 of the Australian loading standard AS1170 for determining earthquake loads.

**Outcomes:** This Unit will provide students with the following knowledge and skills:

* Understanding of the fundamental concepts and definitions used in structural dynamics
* Ability to calculate the natural frequency of a system using equilibrium or energy methods
* Ability to determine the effect of viscous damping on the response of a freely vibrating system
* Ability to determine the response of a system to a harmonic excitation
* 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 Engineering and Information Technologies

**Credit points:** 6  
**Session:** Semester 1  
**Classes:** 3 hours of lecture/project work in class per week.  
**Assessment:** Through semester assessment (65%), Final Exam (35%)  
**Campus:** Camperdown/Darlington  
**Mode of delivery:** Normal (lecture/lab/tutorial) Day

**Associated degrees:** B E, Grad Cert E, M P E.

**Objectives:** To develop an understanding of the modern principles of design of pile foundations and the application of those principles to practice.

**Expected outcomes:** Students should gain an advanced understanding of the types of pile foundations used in practice, and the procedures for analysis of pile foundations under various types of loading, and gain experience in carrying out pile design for real geotechnical profiles.

**Syllabus summary:** Types of piles and their uses, effects of pile installation, axial capacity of piles and pile groups, settlement of pile foundations, ultimate lateral capacity, lateral deformations, analysis of pile groups subjected to general loading conditions, piled raft foundations, piles subjected to ground movements, pile load testing, code provisions for pile design.

**CIVL5451**
Computer Methods in Geotechnical Eng Engineering and Information Technologies

**Credit points:** 6  
**Session:** Semester 1  
**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 (100%)
Objective 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 develop students' ability at critically assessing assumptions behind computer models and critically evaluating the quality of numerical results.

CIVL5454
Rock Engineering
Engineering and Information Technologies

Credit points: 6 Session: Semester 2 Classes: 3 hours of project work in class per week. Assumed knowledge: Undergraduate geology and soil mechanics. Assessment: Through semester assessment (100%). Campus: Camperdown/Darlington Mode of delivery: Normal (lecture/lab/tutorial) Day

Associated degrees: B E, Grad Cert E, M P E.

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

Expected outcomes: Students will have learnt how to classify and characterise rocks and rock masses for engineering purposes and developed an understanding of basic rock mechanics etc.


CIVL5455
Engineering Behaviour of Soils
Engineering and Information Technologies

Credit points: 6 Session: Semester 2 Classes: Independent Study 4 hrs per week. Lectures 2hrs per week 12 weeks of semester. Tutorials 1hr per week. Assumed knowledge: 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 (80%), Final Exam (20%) Campus: Camperdown/Darlington Mode of delivery: Normal (lecture/lab/tutorial) Day

Associated degrees: B E, Grad Cert E, M P E.

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.

CIVL5566
Open Channel Flow & Hydraulic Structures
Engineering and Information Technologies

Credit points: 6 Session: Semester 1 Classes: 3-hr combined lecture and tutorial per week. Assumed knowledge: CIVL3612 Assessment: Through semester assessment (50%), Final Exam (50%) Campus: Camperdown/Darlington Mode of delivery: Normal (lecture/lab/tutorial) Day

Associated degrees: B E, Grad Cert E, M P E, PG Coursework Exchange.

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
Engineering and Information Technologies

Credit points: 6 Session: Semester 1 Classes: 3-hr combined lecture and tutorial per week. Assessment: Through semester assessment (60%), Final Exam (40%) Campus: Camperdown/Darlington Mode of delivery: Normal (lecture/lab/tutorial) Day

Associated degrees: B E, Grad Cert E, M P E, PG Coursework Exchange.

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
Engineering and Information Technologies

Credit points: 6 Session: Semester 2 Classes: Lecture 1 hr per week, Tutorial 1hr per week, Laboratory 2hrs per week. Assumed knowledge: CIVL5511. 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%) Campus: Camperdown/Darlington Mode of delivery: Normal (lecture/lab/tutorial) Day

Associated degrees: B E, Grad Cert E, M P E, PG Coursework Exchange.

The objective of this unit is to provide students with advanced knowledge of Computational Fluid Dynamics (CFD) techniques and skills in solving fluid and thermal flow problems relevant to Civil and Environmental Engineering applications. Students will also gain experience in using a state-of-the-art commercial CFD package and advanced understanding of a range of engineering problems through working on projects.

CHNG5005
Wastewater Eng - Systems and Practice
Engineering and Information Technologies

Credit points: 6 Session: Semester 1 Classes: 4 hours of lectures and tutorials per week. Assumed knowledge: Ability to conduct mass and energy balances, and the integration of these concepts to solve `real' chemical engineering problems. Ability to understand basic principles of physical chemistry, physics and mechanics. Ability to use basic calculus and linear algebra, and carry out such computations using Matlab and MS Excel. Ability to read widely outside of the technical literature and to synthesise arguments based on such literature. Ability to write coherent reports and essays based on information from diverse sources. Assessment: Through semester assessment (50%), Final Exam (50%) Campus: Camperdown/Darlington Mode of delivery: Normal (lecture/lab/tutorial) Day

Associated degrees: B E, M E, M P E.

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.

Research units

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

CIVL5020
Capstone Project A
Engineering and Information Technologies
Credit points: 6  Session: Semester 1, Semester 2 Classes: Independent project work. Prerequisites: 48 credits from MPE degree program. Assessment: Through semester assessment (100%)  Campus: Camperdown/Darlington Mode of delivery: Supervision

Note: Department permission required for enrolment.

Associated degrees: M E, M P E.

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
Engineering and Information Technologies
Credit points: 6  Session: Semester 1, Semester 2 Classes: Independent project work. Corequisites: CIVL5020 Assessment: Through semester assessment (100%)  Campus: Camperdown/Darlington Mode of delivery: Supervision

Note: Department permission required for enrolment.

Associated degrees: M E, M P E.

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 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
Dissertation A
Engineering and Information Technologies
Credit points: 12  Session: Semester 1, Semester 2 Classes: no formal classes. Prohibitions: ENGG5220, ENGG5221 Assessment: Through semester assessment (100%)  Campus: Camperdown/Darlington 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.

Associated degrees: M E, M P E.

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.

CIVL5023
Dissertation B
Engineering and Information Technologies
Credit points: 12  Session: Semester 1, Semester 2 Classes: no formal classes. Prohibitions: ENGG5220, ENGG5221 Assessment: Through semester assessment (100%)  Campus: Camperdown/Darlington 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.

Associated degrees: M E, M P E.

To complete a substantial research project and successfully analyse a problem, devise appropriate experiments, analyse the results and produce a well-argued, in-depth thesis.

Department permission required for enrolment in the following session(s): 1, 2

With permission from the Program Director candidates progressing with distinction (75%) average or higher results may replace CIVL5020, CIVL5021 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
Engineering and Information Technologies
Credit points: 6  Session: Semester 1 Classes: Lectures: 1 hour per week; Tutorials: 1 hour per week; Laboratory Sessions: 2 hours per week Assumed knowledge: Partial differential equations; Finite difference methods; Taylor series; Basic fluid mechanics including pressure, velocity, boundary layers,
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 Engineering and Information Technologies
Credit points: 6 Session: Semester 2 Classes: 4-hr combined lecture and tutorial per week. Prerequisites: CIVL3205 OR CIVL5507 Assessment: Through semester assessment (50%), Final Exam (50%) Campus: Camperdown/Darlington Mode of delivery: Normal (lecture/lab/tutorial) Day
Associated degrees: B E, Grad Cert E, M P E, PG Coursework Exchange.
Objectives: This Unit reviews the fundamental concepts of ‘elastic' behaviour of reinforced concrete structures and introduces models of behaviour and methods of analysis related to the time-dependent effects of creep and shrinkage (at service loads). This Unit also examines the non-linear (strain-softening) behaviour of reinforced concrete and the related effects concerning the strength of statically-indeterminate reinforced concrete structures. In particular, this Unit examines the concepts of ductility, moment-redistribution and plastic design (for beams and slabs), Strut-and-tie modelling of reinforced concrete members is also described.
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
Engineering and Information Technologies
Credit points: 6 Session: Semester 1 Classes: 4 hours of lectures/project work per week. Assessment: Through semester assessment (100%) Campus: Camperdown/Darlington Mode of delivery: Normal (lecture/lab/tutorial) Day
Associated degrees: B E, Grad Cert E, M P E.
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 Engineering and Information Technologies
Credit points: 6 Session: Semester 2 Classes: Lectures 3 hrs per week, presented in 2 sessions per week for 11 weeks of semester. Tutorials 1hr per week. Assumed knowledge: 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, slope stability, retaining walls, foundation capacity). Assessment: Through semester assessment (100%). Campus: Camperdown/Darlington Mode of delivery: Normal (lecture/lab/tutorial) Day
Associated degrees: B E, Grad Cert E, M P E.

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 Engineering and Information Technologies
Credit points: 6 Session: Semester 1 Classes: 2 hrs lecture, 2hr. tutorial and laboratory per week. Assessment: Through semester assessment (100%). Campus: Camperdown/Darlington Mode of delivery: Normal (lecture/lab/tutorial) Day
Associated degrees: B E, Grad Cert E, M P E.

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 assemblies 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.
5. Extended knowledge of the application of FE to solve civil engineering problems.

CIVL5665
Advanced Water Resources Management Engineering and Information Technologies
Credit points: 6 Session: Semester 2 Classes: 2 hours of lectures and 1 hour of tutorials per week. Assumed knowledge: CIVL3612. Assessment: Through semester assessment (50%), Final Exam (50%). Campus: Camperdown/Darlington Mode of delivery: Normal (lecture/lab/tutorial) Day
Associated degrees: B E, Grad Cert App Sc (Enviro Sci), Grad Cert E, M Appl Sc (Env Sc), M P E.

The objective of this unit of study is to introduce students and professional 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.

CIVL5670
Reservoir Stream & Coastal Eng Engineering and Information Technologies
Credit points: 6 Session: Semester 1 Classes: Lectures 2 hours per week, Tutorials 2 hours per week. Assumed knowledge: CIVL3612 AND MATH2061. Assessment: Through semester assessment (40%), Final Exam (60%). Campus: Camperdown/Darlington Mode of delivery: Normal (lecture/lab/tutorial) Day
Note: Students who have previously studied CIVL3613 will only be permitted to enrol in this unit by approval of the Director of Undergraduate Studies.
Associated degrees: B E, Grad Cert E, M P E, PG Coursework Exchange.

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 Engineering and Information Technologies
Note: Department permission required for enrolment.
Associated degrees: M E, M Inf Tech, M Inf Tech Man, M P E, M P L, M P M.

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
Engineering and Information Technologies

Credit points: 6  
Session: Int January, Int July  
Classes: overseas short-course  
Prerequisites: Permission from faculty and school.  
Assessment: Through semester assessment (100%)  
Campus: Camperdown/Darlington  
Mode of delivery: Normal (lecture/lab/tutorial) Day  

Note: Department permission required for enrolment.

Associated degrees: M E, M Inf Tech, M Inf Tech Man, M P E, M P L, M P M.

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.
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

## 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.

<table>
<thead>
<tr>
<th>Unit of study</th>
<th>Credit points</th>
<th>A: Assumed knowledge</th>
<th>P: Prerequisites</th>
<th>C: Corequisites</th>
<th>N: Prohibition</th>
<th>Session</th>
</tr>
</thead>
<tbody>
<tr>
<td>ENGG5102 Entrepreneurship for Engineers</td>
<td>6</td>
<td>A Some limited industry experience is preferred but not a must.</td>
<td>N ELEC5701</td>
<td></td>
<td></td>
<td>Semester 1</td>
</tr>
<tr>
<td>ENGG5202 Sustainable Design, Eng and Mgt</td>
<td>6</td>
<td>A General knowledge in science and calculus and understanding of basic principles of chemistry, physics and mechanics</td>
<td></td>
<td></td>
<td></td>
<td>Semester 1</td>
</tr>
<tr>
<td>ENGG5103 Safety Systems and Risk Analysis</td>
<td>6</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Semester 2</td>
</tr>
<tr>
<td>FMGT5871 Project Process Planning and Control</td>
<td>6</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Int December Int July Semester 1 Semester 2 Summer Late</td>
</tr>
</tbody>
</table>

### 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.

<table>
<thead>
<tr>
<th>Unit of study</th>
<th>Credit points</th>
<th>A: Assumed knowledge</th>
<th>P: Prerequisites</th>
<th>C: Corequisites</th>
<th>N: Prohibition</th>
<th>Session</th>
</tr>
</thead>
<tbody>
<tr>
<td>ELEC5101 Antennas and Propagation</td>
<td>6</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Semester 2</td>
</tr>
<tr>
<td>ELEC5203 Topics in Power Engineering</td>
<td>6</td>
<td>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.</td>
<td></td>
<td></td>
<td></td>
<td>Semester 2</td>
</tr>
<tr>
<td>ELEC5204 Power Systems Analysis and Protection</td>
<td>6</td>
<td>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.</td>
<td></td>
<td></td>
<td></td>
<td>Semester 1</td>
</tr>
<tr>
<td>ELEC5205 High Voltage Engineering</td>
<td>6</td>
<td>P ELEC3203. The following previous knowledge is assumed for this unit. Circuit analysis techniques, electricity networks, power system fundamentals</td>
<td></td>
<td></td>
<td></td>
<td>Semester 2</td>
</tr>
<tr>
<td>ELEC5206 Sustainable Energy Systems</td>
<td>6</td>
<td>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.</td>
<td></td>
<td></td>
<td></td>
<td>Semester 2</td>
</tr>
<tr>
<td>ELEC5207 Advanced Power Conversion Technologies</td>
<td>6</td>
<td>A Fundamentals of Power Electronics and Applications</td>
<td></td>
<td></td>
<td></td>
<td>Semester 2</td>
</tr>
<tr>
<td>ELEC5208 Intelligent Electricity Networks</td>
<td>6</td>
<td>A Fundamentals of Electricity Networks, Control Systems and Telecommunications. Note: Department permission required for enrolment</td>
<td></td>
<td></td>
<td></td>
<td>Semester 1</td>
</tr>
<tr>
<td>ELEC5211 Power Systems Dynamics and Control</td>
<td>6</td>
<td>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. Note: Department permission required for enrolment</td>
<td></td>
<td></td>
<td></td>
<td>Semester 1</td>
</tr>
<tr>
<td>ELEC5212 Power Systems Planning and Markets</td>
<td>6</td>
<td>P ELEC3203 or ELEC5732 or equivalent</td>
<td></td>
<td></td>
<td></td>
<td>Semester 2</td>
</tr>
<tr>
<td>ELEC5303 Computer Control System Design</td>
<td>6</td>
<td>A This unit assumes a basic knowledge of calculus, functions of real variables, Laplace transform, matrix theory and control theory.</td>
<td></td>
<td></td>
<td></td>
<td>Semester 1</td>
</tr>
<tr>
<td>ELEC5403 Radio Frequency Engineering</td>
<td>6</td>
<td>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.</td>
<td></td>
<td></td>
<td></td>
<td>Semester 1</td>
</tr>
</tbody>
</table>
## Unit of study table

<table>
<thead>
<tr>
<th>Unit of study</th>
<th>Credit points</th>
<th>A: Assumed knowledge P: Prerequisites C: Corequisites N: Prohibition</th>
<th>Session</th>
</tr>
</thead>
<tbody>
<tr>
<td>ELEC5507 Error Control Coding</td>
<td>6</td>
<td>A Basic knowledge on digital communications. Fundamental mathematics including probability theory and linear algebra.</td>
<td>Semester 1</td>
</tr>
<tr>
<td>ELEC5508 Wireless Engineering</td>
<td>6</td>
<td>A Basic knowledge in probability and statistics, analog and digital communications, error probability calculation in communications channels, and telecommunications network.</td>
<td>Semester 2</td>
</tr>
<tr>
<td>ELEC5509 Mobile Networks</td>
<td>6</td>
<td>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.</td>
<td>Semester 1</td>
</tr>
<tr>
<td>ELEC5510 Satellite Communication Systems</td>
<td>6</td>
<td>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.</td>
<td>Semester 2</td>
</tr>
<tr>
<td>ELEC5511 Optical Communication Systems</td>
<td>6</td>
<td>A [ELEC3505 Communications] and [ELEC3405 Communications Electronics and Photonics] or equivalent</td>
<td>Semester 1</td>
</tr>
<tr>
<td>ELEC5512 Optical Networks</td>
<td>6</td>
<td>A Knowledge of digital communications, wave propagation, and fundamental optics</td>
<td>Semester 2</td>
</tr>
<tr>
<td>ELEC5514 Networked Embedded Systems</td>
<td>6</td>
<td>A ELEC3305, ELEC3506, ELEC3607 and ELEC5508 or equivalent</td>
<td>Semester 2</td>
</tr>
<tr>
<td>ELEC5701 Technology Venture Creation</td>
<td>6</td>
<td>N ENGG5102</td>
<td>Semester 2</td>
</tr>
</tbody>
</table>

### Research units

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

<table>
<thead>
<tr>
<th>Unit of study</th>
<th>Credit points</th>
<th>A: Assumed knowledge P: Prerequisites C: Corequisites N: Prohibition</th>
<th>Session</th>
</tr>
</thead>
<tbody>
<tr>
<td>ELEC5020 Capstone Project A</td>
<td>6</td>
<td>P 48 credits from MPE degree program Note: Department permission required for enrolment</td>
<td>Semester 1</td>
</tr>
<tr>
<td>ELEC5021 Capstone Project B</td>
<td>6</td>
<td>C ELEC5020 Note: Department permission required for enrolment</td>
<td>Semester 1</td>
</tr>
<tr>
<td>ELEC5022 Capstone Project B Extended</td>
<td>12</td>
<td>P 42 credit points in the Master of Engineering and WAM &gt;70, or 66 credit points in the Master of Professional Engineering and WAM &gt;70 or exemption Note: Department permission required for enrolment</td>
<td>Semester 1</td>
</tr>
<tr>
<td>ELEC5222 Dissertation A</td>
<td>12</td>
<td>N ELEC8901, ELEC8902, ENGG5222, ENGG5223 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.</td>
<td>Semester 1</td>
</tr>
<tr>
<td>ELEC5223 Dissertation B</td>
<td>12</td>
<td>N ELEC8901, ELEC8902, ENGG5222, ENGG5223</td>
<td>Semester 2</td>
</tr>
</tbody>
</table>

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.

<table>
<thead>
<tr>
<th>Unit of study</th>
<th>Credit points</th>
<th>A: Assumed knowledge P: Prerequisites C: Corequisites N: Prohibition</th>
<th>Session</th>
</tr>
</thead>
<tbody>
<tr>
<td>COMP5047 Pervasive Computing</td>
<td>6</td>
<td>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. N NETS4047</td>
<td>Semester 2</td>
</tr>
<tr>
<td>COMP5416 Advanced Network Technologies</td>
<td>6</td>
<td>A COMP5116 OR ELEC3506</td>
<td>Semester 2</td>
</tr>
<tr>
<td>COMP5426 Parallel and Distributed Computing</td>
<td>6</td>
<td>A COMP5116</td>
<td>Semester 1</td>
</tr>
<tr>
<td>ELEC5614 Real Time Computing</td>
<td>6</td>
<td>A SOFT2130 Software Construction (or SOFT2004 Software Development Methods 1) and ELEC3607 Embedded Computing (or ELEC2601 Microprocessor Systems) N MECH5701</td>
<td>Semester 1</td>
</tr>
<tr>
<td>ELEC5616 Computer and Network Security</td>
<td>6</td>
<td>A A programming language, basic maths.</td>
<td>Semester 1</td>
</tr>
<tr>
<td>ELEC5618 Software Quality Engineering</td>
<td>6</td>
<td>A You are capable of writing programs with multiple functions or methods in multiple files. You are capable of design complex data structures and combine them in non trivial algorithms. You know how to use an integrated development environment. You are familiar and have worked previously with software version control systems. You know how to distribute the workload derived from the unit of study effectively throughout the week and make sure that time is truly productive.</td>
<td>Semester 1</td>
</tr>
<tr>
<td>ELEC5619 Object Oriented Application Frameworks</td>
<td>6</td>
<td>A Java programming, and some web development experience are essential. Databases strongly recommended</td>
<td>Semester 2</td>
</tr>
<tr>
<td>ELEC5620 Model Based Software Engineering</td>
<td>6</td>
<td>A A programming language, basic maths Note: Department permission required for enrolment</td>
<td>Semester 2</td>
</tr>
<tr>
<td>ELEC5622 Signals, Software and Health</td>
<td>6</td>
<td></td>
<td>Semester 2</td>
</tr>
</tbody>
</table>
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 AND ELEC2602. Familiarity with transistor operations, basic electrical circuits, embedded programming is required.

Note: Department permission required for enrolment

<table>
<thead>
<tr>
<th>Unit of study</th>
<th>Credit points</th>
<th>A: Assumed knowledge</th>
<th>P: Prerequisites</th>
<th>C: Corequisites</th>
<th>N: Prohibition</th>
<th>Session</th>
</tr>
</thead>
<tbody>
<tr>
<td>ELEC5803 Advanced Bioelectronics</td>
<td>6</td>
<td>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.</td>
<td>P ELEC2104 AND ELEC2602. Familiarity with transistor operations, basic electrical circuits, embedded programming is required.</td>
<td>Note: Department permission required for enrolment</td>
<td>Semester 1</td>
<td></td>
</tr>
<tr>
<td>ENGG5231 Engineering Graduate Exchange A</td>
<td>6</td>
<td>P Permission from faculty and school.</td>
<td>Note: Department permission required for enrolment</td>
<td></td>
<td>Int January  Int July</td>
<td></td>
</tr>
<tr>
<td>ENGG5232 Engineering Graduate Exchange B</td>
<td>6</td>
<td>P Permission from faculty and school.</td>
<td>Note: Department permission required for enrolment</td>
<td></td>
<td>Int January  Int July</td>
<td></td>
</tr>
</tbody>
</table>

For more information on degree program requirements visit CUSP.
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: 2hr Lectures per week, 2hr Tutorials per week Prohibitions: ELEC5701 Assumed knowledge: Some limited industry experience is preferred but not a must. Assessment: Through semester assessment (100%) Campus: Camperdown/Darlington Mode of delivery: Normal (lecture/lab/tutorial) Day

Associated degrees: Grad Cert E, M P E.

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.


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

ENGG5202
Sustainable Design, Eng and Mgt

Engineering and Information Technologies

Credit points: 6 Session: Semester 1 Classes: 2 lectures per week, tutorials 2 hour per week and projects and self assisted learning (4 hours per week) Assumed knowledge: General knowledge in science and calculus and understanding of basic principles of chemistry, physics and mechanics Assessment: Through semester assessment (70%), Final Exam (30%) Campus: Camperdown/Darlington Mode of delivery: Normal (lecture/lab/tutorial) Day

Associated degrees: Grad Cert E, M P E.

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

Engineering and Information Technologies

Credit points: 6 Session: Semester 2 Classes: 2hrs of Lectures per week, 2hrs of Tutorials per week Assessment: Through semester assessment (100%) Campus: Camperdown/Darlington Mode of delivery: Normal (lecture/lab/tutorial) Day

Associated degrees: Grad Cert E, M P E.

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

Engineering and Information Technologies

Credit points: 6 Session: Int December, Int July, Semester 1, Semester 2, Summer Late Classes: Session 1: Evening, Online Session 2: Evening, Online, Block mode Int July Int and Dec Int : Block mode Assessment: Through session assessment (60%) , Final Exam (40%). Campus: Camperdown/Darlington Mode of delivery: Block Mode or On-line or Normal (lecture/lab/tutorial) Evening

Associated degrees: Grad Cert I T, Grad Cert Inf Tech Man, Grad Cert P M, Grad Dip E, M Inf Tech Man, M P E.

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.
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
Engineering and Information Technologies
Credit points: 6 Semester 2 Classes: 2 hours of lectures and a 3 hours laboratory each week. Assessment: Through semester assessment (40%), Final Exam (60%), Final Exam (40%), Final Exam (60%). Campus: Camperdown/Darlington Mode of delivery: Normal (lecture/lab/tutorial) Day

Associated degrees: B E, Grad Cert E, M P E, PG Coursework Exchange.

The basics of antenna radiation are introduced with emphasis on the significant 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 reception efficiency of receiving antennas which allows comparison 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 through and are reinforced by the hands on laboratory program which includes design projects.

ELEC5203
Topics in Power Engineering
Engineering and Information Technologies
Credit points: 6 Session: Semester 2 Classes: 2 hours of lectures and 2 hour tutorial/laboratory per 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%). Campus: Camperdown/Darlington Mode of delivery: Normal (lecture/lab/tutorial) Day

Associated degrees: B E, Grad Cert E, M P E, UG Study Abroad Program.

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
Engineering and Information Technologies
Credit points: 6 Session: Semester 1 Classes: 2 hours of lectures and a 1 hour tutorial per week, 2 hours laboratory per 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 (40%), Final Exam (60%). Campus: Camperdown/Darlington Mode of delivery: Normal (lecture/lab/tutorial) Day

Associated degrees: B E, Grad Cert E, M P E, UG Study Abroad Program.

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: Types and causes of power system faults; balanced faults and short circuit levels; an introduction to fault current transients in machines; symmetrical 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
Engineering and Information Technologies
Credit points: 6 Session: Semester 2 Classes: 2 hours lecture and 2 hours tutorial/lab per week. Prerequisites: ELEC3203. 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%). Campus: Camperdown/Darlington Mode of delivery: Normal (lecture/lab/tutorial) Day

Associated degrees: B E, Grad Cert E, M P E, UG Study Abroad Program.

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
Engineering and Information Technologies
Credit points: 6 Session: Semester 2 Classes: 2 hours lectures per week and 2 hours of labs and 2 hours of tutorials per fortnight. Assumed knowledge: Following concepts are assumed knowledge for this unit of study; familiarity with transformers, ac power, capacitors and inductors, electronic circuits such as three-phase circuits and circuits with switches, and basic electronic circuit theory. Assessment: Through semester assessment (50%), Final Exam (50%).Campus: Camperdown/Darlington Mode of delivery: Normal (lecture/lab/tutorial) Day

Associated degrees: B E, B E, B A, B E, B Com, B E, B Sc, B E, LL B, Grad Cert E, M P E.

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 electrical and electronic (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

Engineering and Information Technologies

**Credit points:** 6 **Session:** Semester 2 Classes: 2hr Lecture per week, 2-3hrs of tutorial/labouratory per week. **Assumed knowledge:** Fundamentals of Power Electronics and Applications. **Assessment:** Through semester assessment (45%), Final Exam (55%) **Campus:** Camperdown/Darlington **Mode of delivery:** Normal (lecture/lab/tutorial) Day

**Associated degrees:** B E, Grad Cert E, M P E, PG Coursework Exchange.

The unit aims to cover advanced topics in power electronics and its 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

Engineering and Information Technologies

**Credit points:** 6 **Session:** Semester 1 Classes: 2hr lectures per week, 1 hr of tutorial per week. **Assumed knowledge:** Fundamentals of Electricity Networks, Control Systems and Telecommunications. **Assessment:** Through semester assessment (40%), Final Exam (60%) **Campus:** Camperdown/Darlington **Mode of delivery:** Normal (lecture/lab/tutorial) Day

**Note:** Department permission required for enrolment.

**Associated degrees:** B E, Grad Cert E, M P E.

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

Engineering and Information Technologies

**Credit points:** 6 **Session:** Semester 1 Classes: 2hr lectures per week; 2hr tutorial per week; 2hr Laboratory per fortnight. **Prerequisites:** ELEC3203 or ELEC5732 or equivalent. **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 (40%), Final Exam (60%) **Campus:** Camperdown/Darlington **Mode of delivery:** Normal (lecture/lab/tutorial) Day

**Note:** Department permission required for enrolment.

**Associated degrees:** B E, Grad Cert E, M P E.

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

- 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; Voltage stability; Frequency stability; Small signal stability.
- Power system control: Voltage control; Frequency control; Power system stabilizers; 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

Engineering and Information Technologies

**Credit points:** 6 **Session:** Semester 1 Classes: 2hr lecture per week; 2hr tutorial per week; 2hr Laboratory per fortnight. **Prerequisites:** ELEC3203 or ELEC5732 or equivalent. **Assessment:** Through semester assessment (45%), Final Exam (45%) **Campus:** Camperdown/Darlington **Mode of delivery:** Normal (lecture/lab/tutorial) Day

**Note:** Department permission required for enrolment.

**Associated degrees:** B E, Grad Cert E, M P E.

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. The increasing penetration of intermittent renewable energy sources has further increased the complexity. To equip the student with the 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 and unit commitment; Power system reliability.
- Drivers for the restructuring of the electricity industry.
- Electricity market design: Market structures (spot, bilateral, hybrid); Energy market; Ancillary services market.
- Electricity industry in Australia and the National Electricity Market.
- Power system expansion planning; Transmission planning; Generation planning; Power system adequacy assessment.
- Distribution systems: Modern developments (distributed generation, demand management).

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).

**ELEC5303**

Computer Control System Design
Engineering and Information Technologies

Credit points: 6  Session: Semester 1  Classes: 2 hours of lectures and a 2 hours lab/tutorial per 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%)  Campus: Camperdown/Darlington  Mode of delivery: Normal (lecture/lab/tutorial) Day

Associated degrees: B E, Grad Cert E, Grad Cert I T, M P E, PG Coursework Exchange.

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.


ELEC5403  
Radio Frequency Engineering  
Engineering and Information Technologies  

Credit points: 6  Session: Semester 1  Classes: 2 hours of lectures and 2 hours lab/tutorial per week.  Assumed knowledge: Students will be expected to be familiar with ELEC5404: 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%)  Campus: Camperdown/Darlington  Mode of delivery: Normal (lecture/lab/tutorial) Day

Associated degrees: B E, Grad Cert E, M P E, PG Coursework Exchange.

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  
Engineering and Information Technologies  

Credit points: 6  Session: Semester 1  Classes: 2 hours of lectures and 1 hour tutorial per week.  Assumed knowledge: Basic knowledge on digital communications. Fundamental mathematics including probability theory and linear algebra.  Assessment: Through semester assessment (50%), Final Exam (50%)  Campus: Camperdown/Darlington  Mode of delivery: Normal (lecture/lab/tutorial) Day

Associated degrees: B E, Grad Cert E, Grad Cert I T, M P E, PG Coursework Exchange.

This unit deals with the principles of error control coding techniques and their applications in various communication and data storage systems. Its aim is to present the fundamentals of error control coding techniques and develop theoretical and practical skills in the design of error control encoders/decoders. Successful completion of this unit will facilitate progression to advanced study or to work in the fields of telecommunications and computer engineering. It is assumed that the students have some background in communications principles and probability theory.

The following topics are covered. Introduction to error control coding, linear algebra. Linear block codes, cyclic codes, BCH codes, Reed-Solomon codes, burst-error correcting codes, design of codes for block codes, applications of block codes in communications and digital recording. Convolutional codes, Viterbi algorithm, design of codes for convolutional codes, applications of convolutional codes in communications, soft decision decoding of block and convolutional codes, trellis coded modulation, block coded modulation, design of codes for trellis codes, applications of trellis codes in data transmission. Turbo codes and applications to space and mobile communications.

ELEC5508  
Wireless Engineering  
Engineering and Information Technologies  

Credit points: 6  Session: Semester 2  Classes: 2 hours of lectures and 1 hour tutorial per week.  Assumed knowledge: Basic knowledge on probability and statistics, analog and digital communications, error probability calculation in communications channels, and telecommunications network.  Assessment: Through semester assessment (30%), Final Exam (70%)  Campus: Camperdown/Darlington  Mode of delivery: Normal (lecture/lab/tutorial) Day

Associated degrees: B C S T (Hons), B E, B I T (Hons), Grad Cert E, Grad Cert I T, M P E, PG Coursework Exchange.

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.


ELEC5509  
Mobile Networks  
Engineering and Information Technologies  

Credit points: 6  Session: Semester 1  Classes: 2 hours of lecture and 2 hours tutorial/project meeting per 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: ELEC5305 Communications, ELEC5306 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%)  Campus: Camperdown/Darlington  Mode of delivery: Normal (lecture/lab/tutorial) Day

Associated degrees: B C S T (Hons), B E, B I T (Hons), Grad Cert E, Grad Cert I T, M P E, PG Coursework Exchange.

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...

ELEC5510
Satellite Communication Systems
Engineering and Information Technologies

Credit points: 6
Session: Semester 2
Classes: 2 hours of lectures, 1 hour tutorial per week, 3 hour site visit during semester.
Assumed knowledge: Knowledge of error probabilities, analog and digital modulation techniques and error performance evaluation studied in ELEC3305 Communications and ELEC4505 Digital Communication Systems, is assumed.
Assessment: Through semester assessment (30%), Final Exam (70%)
Campus: Camperdown/Darlington
Mode of delivery: Normal (lecture/lab/tutorial) Day

Associated degrees: B E, Grad Cert E, Grad Cert IT, M P E, PG Coursework Exchange.

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
Engineering and Information Technologies

Credit points: 6
Session: Semester 1
Classes: 2 hours of lectures and 2 hours lab per week.
Assumed knowledge: (ELEC3505 Communications) and (ELEC3405 Communications Electronics and Photonics) or equivalent.
Assessment: Through semester assessment (25%), Final Exam (75%)
Campus: Camperdown/Darlington
Mode of delivery: Normal (lecture/lab/tutorial) Day

Associated degrees: B E, Grad Cert E, Grad Cert IT, M P E, PG Coursework Exchange.

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
Engineering and Information Technologies

Credit points: 6
Session: Semester 2
Classes: 2 hours of lectures and 1 hour laboratory/tutorial per week.
Assumed knowledge: Knowledge of digital communications, wave propagation, and fundamental optics.
Assessment: Through semester assessment (25%), Final Exam (75%)
Campus: Camperdown/Darlington
Mode of delivery: Normal (lecture/lab/tutorial) Day

Associated degrees: B E, Grad Cert E, Grad Cert IT, M P E, PG Coursework Exchange.

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 networks.

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 lightweight 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
Engineering and Information Technologies

Credit points: 6
Session: Semester 2
Classes: 2 hours lecture and 2 hours lab per week.
Assumed knowledge: ELEC3305, ELEC3506, ELEC3607 and ELEC5505 or equivalent.
Assessment: Through semester assessment (60%), Final Exam (40%)
Campus: Camperdown/Darlington
Mode of delivery: Normal (lecture/lab/tutorial) Day

Associated degrees: B C S T (Hons), B E, B I T (Hons), Grad Cert E, Grad Cert IT, M P E, PG Coursework Exchange.

This unit aims to teach the fundamental concepts associated with:
*Networked Embedded Systems, wireless sensor networks
*Wireless channel propagation and radio power consumption
*Wireless networks, ZigBee, Bluetooth, etc.
*Sensor principle, data fusion, source detection and identification
*Multiple source detection, multiple access communications.
*Network topology, routing, network information theory
*Distributed source channel coding for sensor networks
*Power-aware and energy-aware communication protocols.
*Distributed 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.

*Ability to identify the main issues and trade-offs in networked embedded systems.
*Understanding of the state-of-the-art solutions in the area
*Based on the above understanding, ability to analyze requirements and devise first-order solutions for particular networked embedded systems problems.
*Familiarization with a simulator platform and real hardware platforms for network embedded systems through the Students involvement in projects.

ELEC5701
Technology Venture Creation
Engineering and Information Technologies

Credit points: 6
Session: Semester 2
Classes: 2 hours of lectures and 1 hour visiting professional or team-based interaction exercise per week.
Prohibitions: ENGG5102
Assessment: Through semester assessment (40%), Final Exam (60%)
Campus: Camperdown/Darlington
Mode of delivery: Normal (lecture/lab/tutorial) Day

Associated degrees: B E, Grad Cert E, M P E, PG Coursework Exchange.

This course introduces students to the broad spectrum of technology-based venture creation, from technology venture creation, to the broad spectrum of technology-based venture creation, from technology venture creation, to the broad spectrum of technology-based venture creation,
This unit of study prepares graduating students with insight and skills in how to turn a concept into a high technology startup company. The class will provide students with knowledge, practical experience and frameworks to assist in evaluating the market for a technology product or service, the design & viability of business models around it, the formulation of a funding-reading business plan & financials, capital raising options & process, venture capital, building distribution channels, intellectual property protection, putting together an A-grade management team, term sheets & funding documentation, technology sales models and going global. We will look at real world case studies of successful technology companies (and flame outs). Does Twitter have a viable business model? Will Facebook eat its lunch? Is YouTube just burning cash? Will Google rule the world? During the period of the course, students will form teams and write a business plan around a concept they propose. Each student will assume a role in the team (CEO, CTO, CFO, VP Sales & Marketing). The plan will be judged by a panel of real world venture capitalists, entrepreneurs and angel investors to determine the final grade for the course. The course is limited to 40 students (10 teams of 4) in addition to a waiting list of 8. Be warned that a serious commitment will be required in developing the concept into a viable business plan. The outcome, however, will be very rewarding to those students interested in starting the next Google. Prospective students should send an email in 400 words or less on why they want to enrol prior to acceptance, to the course email address. This course is taught by instructors experienced in technology startups & venture capital. The course will include a number of guest lectures by industry.

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

**ELEC5020**
Capstone Project A
Engineering and Information Technologies
Credit points: 6  
Session: Semester 1, Semester 2  
Prerequisites: 48 credits from MPE degree program  
Assessment: Through semester assessment (100%)  
Mode of delivery: Supervision  
Note: Department permission required for enrolment.

**ELEC5021**
Capstone Project B
Engineering and Information Technologies
Credit points: 6  
Session: Semester 1, Semester 2  
Prerequisites: ELEC5020  
Assessment: Through semester assessment (100%)  
Mode of delivery: Supervision  
Note: Department permission required for enrolment.

Students will work individually or in groups on an assigned project for the Semester. The concepts covered depend on the nature of the project, but broadly cover research and inquiry, and information literacy.

**ELEC5022**
Capstone Project B Extended
Engineering and Information Technologies
Credit points: 12  
Session: Semester 1, Semester 2  
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.

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.

**ELEC5222**
Dissertation A
Engineering and Information Technologies
Credit points: 12  
Session: Semester 1, Semester 2  
Assessment: Through semester assessment (100%)  
Campus: Camperdown/Darlington  
Mode of delivery: Supervision  
Note: Department permission required for enrolment.

**ELEC5223**
Dissertation B
Engineering and Information Technologies
Credit points: 12  
Session: Semester 1, Semester 2  
Assessment: Through semester assessment (100%)  
Campus: Camperdown/Darlington  
Mode of delivery: Supervision  
Note: Department permission required for enrolment.

**ELEC8901**
Integrated Elective A
Engineering and Information Technologies
Credit points: 12  
Mode of delivery: Supervision  
Note: Department permission required for enrolment.

**ELEC8902**
Integrated Elective B
Engineering and Information Technologies
Credit points: 12  
Mode of delivery: Supervision  
Note: Department permission required for enrolment.

Elective units
Candidates may complete a maximum of 12 credit points from the following units: Specialised 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
Engineering and Information Technologies
Credit points: 6  
Session: Semester 2  
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%)  
Campus: Camperdown/Darlington  
Mode of delivery: Normal (lecture/lab/tutorial) Day  
Associated degrees: B C S T (Hons), B E, B I T (Hons), B Sc (Hons), Grad Cert I, M P E.

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
Engineering and Information Technologies
Credit points: 6 Session: Semester 2 Classes: (Lec 2hrs & Prac 1hr) per week Assumed knowledge: COMP5116 OR ELEC3506 Assessment: Through semester assessment (40%), Final Exam (60%) Campus: Camperdown/Darlington Mode of delivery: Normal (lecture/lab/tutorial) Day
Associated degrees: B C S T (Hons), B E, B I T (Hons), B Psych (Hons), B Sc (Hons), Grad Cert I T, Grad Dip E.

The unit introduces networking concepts beyond the basic 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
Engineering and Information Technologies
Credit points: 6 Session: Semester 1 Classes: (Lec 2hrs & Prac 1hr) per week Assumed knowledge: COMP5116 Assessment: Through semester assessment (40%), Final Exam (60%) Campus: Camperdown/Darlington Mode of delivery: Normal (lecture/lab/tutorial) Day
Associated degrees: B C S T (Hons), B E, B I T (Hons), B Psych (Hons), B Sc (Hons), Grad Cert E, Grad Cert I T, M P E.

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
Engineering and Information Technologies
Credit points: 6 Session: Semester 1 Classes: 2 hours of lectures, 1 hour tutorial per week, 2 hours labs per week. 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%) Campus: Camperdown/Darlington Mode of delivery: Normal (lecture/lab/tutorial) Day
Associated degrees: B C S T (Hons), B E, B I T (Hons), Grad Cert E, Grad Cert I T, M P E, PG Coursework Exchange.

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 is to study and 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
Engineering and Information Technologies
Credit points: 6 Session: Semester 1 Classes: 2 hours of lectures, 1 hour of tutorial and 2 hours labs per week. Assumed knowledge: A programming language, basic maths. Assessment: Through semester assessment (50%), Final Exam (50%) Campus: Camperdown/Darlington Mode of delivery: Normal (lecture/lab/tutorial) Day
Associated degrees: B C S T (Hons), B E, B I T (Hons), Grad Cert E, Grad Cert I T, M P E, PG Coursework Exchange.

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
Engineering and Information Technologies
Credit points: 6 Session: Semester 1 Classes: 2 hours lecture and 2 hours tutorials per 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 throughout the week and make sure that time is truly productive. Assessment: Through semester assessment (30%), Final Exam (70%) Campus: Camperdown/Darlington Mode of delivery: Normal (lecture/lab/tutorial) Day
Associated degrees: B C S T (Hons), B E, B I T (Hons), Grad Cert I T, Grad Dip E, M P E, UG Study Abroad Program.

This unit will cover software quality planning, validation and verification methods and techniques, risk analysis, software review techniques, software standards and software process improvement and software reliability. The unit covers testing and quality assurance from a unit testing/developer-based focus up to an overall quality process overview of the software development life cycle. Students who successfully complete this unit will: understand the fundamental concepts of software quality, be able to assess the quality of a software design, be acquainted with methods of building for quality and be able to verify and test a unit of code through familiarity with unit testing strategies and understanding software quality assurance as a rigorous and structured formal process.

ELEC5619
Object Oriented Application Frameworks
Engineering and Information Technologies
Credit points: 6 Session: Semester 2 Classes: 3 hours project work in class per week. Assumed knowledge: Java programming, and some web development experience are essential. Databases strongly recommended Assessment: Through semester assessment (100%) Campus: Camperdown/Darlington Mode of delivery: Normal (lecture/lab/tutorial) Day
Associated degrees: B E, Grad Cert I T, Grad Dip E, M P E, UG Study Abroad Program.

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

Engineering and Information Technologies

Credit points: 6 Session: Semester 2 Classes: 2 hours lectures, 1 hour of tutorial and 2 hours of lab/project work in class per week. Assumed knowledge: A programming language, basic maths Assessment: Through semester assessment (50%), Final Exam (50%) Campus: Camperdown/Darlington Mode of delivery: Normal (lecture/lab/tutorial) Day

Note: Department permission required for enrolment.

Associated degrees: B E, B IT, Grad Cert E, M P E.

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 SGE and strengthens a key area in the program.

ELEC5622 Signals, Software and Health

Engineering and Information Technologies

Credit points: 6 Session: Semester 2 Classes: 3 hr project work session per week, 3hr tutorials/labs per week. Assessment: Through semester assessment (100%) Campus: Camperdown/Darlington Mode of delivery: Normal (lecture/lab/tutorial) Day

Associated degrees: B E, Grad Cert E, M P E.

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 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

Engineering and Information Technologies

Credit points: 6 Session: Semester 1 Classes: 2hr Lectures per week, 2hr Lab/Tutorial per week. Prerequisites: ELEC2104 AND ELEC2602. Familiarity with transistor operations, basic electrical circuits, embedded programming is required. 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%) Campus: Camperdown/Darlington Mode of delivery: Normal (lecture/lab/tutorial) Day

Note: Department permission required for enrolment.

Associated degrees: B E, Grad Cert E.

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

Engineering and Information Technologies


Note: Department permission required for enrolment.

Associated degrees: M E, M Inf Tech, M Inf Tech Man, M P E, M P L, M P M.

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

Engineering and Information Technologies


Note: Department permission required for enrolment.

Associated degrees: M E, M Inf Tech, M Inf Tech Man, M P E, M P L, M P M.

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.
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).
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.

<table>
<thead>
<tr>
<th>Unit of study</th>
<th>Credit points</th>
<th>A: Assumed knowledge</th>
<th>P: Prerequisites</th>
<th>C: Corequisites</th>
<th>N: Prohibition</th>
<th>Session</th>
</tr>
</thead>
<tbody>
<tr>
<td>ENGG5102 Entrepreneurship for Engineers</td>
<td>6</td>
<td>A Some limited industry experience is preferred but not a must.</td>
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<td></td>
<td>Semester 1</td>
</tr>
<tr>
<td>ENGG5202 Sustainable Design, Eng and Mgt</td>
<td>6</td>
<td>A General knowledge in science and calculus and understanding of basic principles of chemistry, physics and mechanics</td>
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<td>Semester 1</td>
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<tr>
<td>ENGG5103 Safety Systems and Risk Analysis</td>
<td>6</td>
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<td>Semester 2</td>
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<tr>
<td>PMGT5871 Project Task Planning and Control</td>
<td>6</td>
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<td>Int December</td>
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</table>

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<thead>
<tr>
<th>Unit of study</th>
<th>Credit points</th>
<th>A: Assumed knowledge</th>
<th>P: Prerequisites</th>
<th>C: Corequisites</th>
<th>N: Prohibition</th>
<th>Session</th>
</tr>
</thead>
<tbody>
<tr>
<td>CIVL5666 Open Channel Flow &amp; Hydraulic Structures</td>
<td>6</td>
<td>A CIVL3612</td>
<td></td>
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<td>Semester 1</td>
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<tr>
<td>CIVL5668 Wind Engineering for Design-Fundamentals</td>
<td>6</td>
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<td></td>
<td>Semester 1</td>
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<tr>
<td>CIVL5669 Applied Fluid Engineering Computing</td>
<td>6</td>
<td>A CIVL5511. 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.</td>
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<td>Semester 2</td>
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</tbody>
</table>

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.

<table>
<thead>
<tr>
<th>Unit of study</th>
<th>Credit points</th>
<th>A: Assumed knowledge</th>
<th>P: Prerequisites</th>
<th>C: Corequisites</th>
<th>N: Prohibition</th>
<th>Session</th>
</tr>
</thead>
<tbody>
<tr>
<td>CHNG5005 Wastewater Eng - Systems and Practice</td>
<td>6</td>
<td>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.</td>
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<td>Semester 1</td>
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<tr>
<td>CIVL5651 Project Task Planning and Control</td>
<td>6</td>
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<td>Int December</td>
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</table>

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<thead>
<tr>
<th>Unit of study</th>
<th>Credit points</th>
<th>A: Assumed knowledge</th>
<th>P: Prerequisites</th>
<th>C: Corequisites</th>
<th>N: Prohibition</th>
<th>Session</th>
</tr>
</thead>
<tbody>
<tr>
<td>CIVL5020 Capstone Project A</td>
<td>6</td>
<td>P 48 credits from MPE degree program Note: Department permission required for enrolment</td>
<td></td>
<td></td>
<td></td>
<td>Semester 1</td>
</tr>
<tr>
<td>CIVL5021 Capstone Project B</td>
<td>6</td>
<td>C CIVL5020 Note: Department permission required for enrolment</td>
<td></td>
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<td></td>
<td>Semester 1</td>
</tr>
<tr>
<td>CIVL5022 Capstone Project B Extended</td>
<td>12</td>
<td>P 42 credit points in the Master of Engineering and WAM &gt;70, or 66 credit points in the Master of Professional Engineering and WAM &gt;70 or exemption Note: Department permission required for enrolment</td>
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<td>Semester 1</td>
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<tr>
<td>CIVL5222 Dissertation A</td>
<td>12</td>
<td>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.</td>
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<td>Semester 1</td>
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**Unit of study table**

<table>
<thead>
<tr>
<th>Unit of study</th>
<th>Credit points</th>
<th>A: Assumed knowledge</th>
<th>P: Prerequisites</th>
<th>C: Corequisites</th>
<th>N: Prohibition</th>
<th>Session</th>
</tr>
</thead>
<tbody>
<tr>
<td>CIVL5223</td>
<td>12</td>
<td>N ENGG5220, ENGG5221</td>
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<tr>
<td>Dissertation B</td>
<td></td>
<td>Note: Department permission required for enrolment</td>
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<td></td>
<td>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.</td>
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<td>Semester 2</td>
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<tr>
<td>Note: Department permission required for enrolment of electives with CIVL5222 &amp; CIVL5223 Dissertation A &amp; B.</td>
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**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.

<table>
<thead>
<tr>
<th>Unit of study</th>
<th>Credit points</th>
<th>A: Assumed knowledge</th>
<th>P: Prerequisites</th>
<th>C: Corequisites</th>
<th>N: Prohibition</th>
<th>Session</th>
</tr>
</thead>
<tbody>
<tr>
<td>AMME5202 Advanced Computational Fluid Dynamics</td>
<td>6</td>
<td>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.</td>
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<tr>
<td>CIVL5266 Steel Structures - Stability</td>
<td>6</td>
<td>A Knowledge: CIVL2201 AND CIVL3206 AND CIVL3235. There are no prerequisites for this unit of study but it is assumed that students are competent in the content covered in CIVL2201 Structural Mechanics, CIVL3206 Steel Structures 1, and CIVL3235 Structural Analysis. Students who have failed previous units of study should note that no special consideration will be given to them if they do choose to enrol in this unit of study (on the basis of timetable clashes or lack of knowledge of basics), and they are discouraged from enrolling in this unit of study. Students who have not yet passed first, second or third year units of study must enrol in those units of study in precedence to any later year units of study.</td>
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<tr>
<td>CIVL5269 Concrete Structures - Strength &amp; Service</td>
<td>6</td>
<td>P CIVL3205 OR CIVL5507</td>
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<tr>
<td>CIVL5351 Geoenvironmental Engineering</td>
<td>6</td>
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<tr>
<td>CIVL5452 Foundation Engineering</td>
<td>6</td>
<td>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)</td>
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<tr>
<td>CIVL5458 Numerical Methods in Civil Engineering</td>
<td>6</td>
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<td>Semester 1</td>
</tr>
<tr>
<td>CIVL5665 Advanced Water Resources Management</td>
<td>6</td>
<td>A CIVL3612.</td>
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<td></td>
<td>Semester 2</td>
</tr>
<tr>
<td>CIVL5670 Reservoir Stream &amp; Coastal Eng</td>
<td>6</td>
<td>A CIVL3612 AND MATH2061. Students who have previously studied CIVL3613 will only be permitted to enrol in this unit by approval of the Director of Undergraduate Studies.)</td>
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<tr>
<td>ENGG5231 Engineering Graduate Exchange A</td>
<td>6</td>
<td>P Permission from faculty and school. Note: Department permission required for enrolment</td>
<td></td>
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<td></td>
<td>Int January</td>
</tr>
<tr>
<td>ENGG5232 Engineering Graduate Exchange B</td>
<td>6</td>
<td>P Permission from faculty and school. Note: Department permission required for enrolment</td>
<td></td>
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<td>Int January</td>
</tr>
</tbody>
</table>

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.

ENNG5102
Entrepreneurship for Engineers

Assessment: Through semester assessment (70%), Final Exam (30%) Mode of delivery: Normal (lecture/lab/tutorial) Day

ENNG5202
Sustainable Design, Eng and Mgt

Assessment: Through semester assessment (100%)

ENGG5103
Safety Systems and Risk Analysis

Assessment: Through semester assessment (100%)

ENGG5071
Project Process Planning and Control

Assessment: Through session assessment (60%) , Final Exam (40%)

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.
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 Eng - Systems and Practice
Engineering and Information Technologies
Credit points: 6 Session: Semester 1 Classes: 4 hours of lectures and tutorials per week. Assumed knowledge: Ability to conduct mass and energy balances, and the integration of these concepts to solve `real' chemical engineering problems. Ability to understand basic principles of physical chemistry, physics and mechanics. Ability to use basic calculus and linear algebra, and carry out such computations using Matlab and MS Excel. Ability to read widely outside of the technical literature and to synthesise arguments based on such literature. Ability to write coherent reports and essays based on information from diverse sources. Assessment: Through semester assessment (50%), Final Exam (50%) Campus: Camperdown/Darlington Mode of delivery: Normal (lecture/lab/tutorial) Day
Associated degrees: B E, M E, M P E.

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
Engineering and Information Technologies
Credit points: 6 Session: Semester 1 Classes: 3-hr combined lecture and tutorial per week Assumed knowledge: CIVL3612 Assessment: Through semester assessment (50%), Final Exam (50%) Campus: Camperdown/Darlington Mode of delivery: Normal (lecture/lab/tutorial) Day
Associated degrees: B E, Grad Cert E, M P E, PG Coursework Exchange.

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
Engineering and Information Technologies
Credit points: 6 Session: Semester 1 Classes: 3-hr combined lecture and tutorial per week. Assessment: Through semester assessment (60%), Final Exam (40%) Campus: Camperdown/Darlington Mode of delivery: Normal (lecture/lab/tutorial) Day
Associated degrees: B E, Grad Cert E, M P E, PG Coursework Exchange.

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
Engineering and Information Technologies
Credit points: 6 Session: Semester 2 Classes: Lecture 1 hr per week, Tutorial 1hr per week, Laboratory 2hrs per week. Assumed knowledge: CIVL5511. 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%) Campus: Camperdown/Darlington Mode of delivery: Normal (lecture/lab/tutorial) Day
Associated degrees: B E, Grad Cert E, M P E, PG Coursework Exchange.

The objective of this unit is to provide students with advanced knowledge of Computational Fluid Dynamics (CFD) techniques and skills in solving fluid and thermal flow problems relevant to Civil and Environmental Engineering applications. Students will also gain experience in using a state-of-the-art commercial CFD package and advanced understanding of a range of engineering problems through working on projects.

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

CIVL5020
Capstone Project A
Engineering and Information Technologies
Credit points: 6 Session: Semester 1, Semester 2 Classes: Independent project work. Prerequisites: 48 credits from MPE degree program. Assessment: Through semester assessment (100%) Campus: Camperdown/Darlington Mode of delivery: Supervision
Note: Department permission required for enrolment.
Associated degrees: M E, M P E.

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
Engineering and Information Technologies
Credit points: 6 Session: Semester 1, Semester 2 Classes: Independent project work. Corequisites: CIVL5020 Assessment: Through semester assessment (100%) Campus: Camperdown/Darlington Mode of delivery: Supervision
Note: Department permission required for enrolment.
Associated degrees: M E, M P E.

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
Engineering and Information Technologies
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 Assessment: Through semester assessment (100%) Campus: Camperdown/Darlington Mode of delivery: Supervision Note: Department permission required for enrolment. Associated degrees: M P E, M P L.

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
Engineering and Information Technologies
Credit points: 12 Session: Semester 1, Semester 2 Classes: no formal classes Prohibitions: ENGG5220, ENGG5221 Assessment: Through semester assessment (100%) Campus: Camperdown/Darlington 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. Associated degrees: M E, M P E.

To complete a substantial research project and successfully analyse a problem, devise appropriate experiments, analyse the results and produce a well-argued, in-depth thesis.

Department permission required for enrolment in the following session(s): 1.2

With permission from the Program Director candidates progressing with distinction (75%) average or higher results may replace CIVL5020, CIVL5021 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
Engineering and Information Technologies
Credit points: 6 Session: Semester 1 Classes: Lectures: 1 hour per week; Tutorials: 1 hour per week; Laboratory Sessions: 2 hours per week Assumed knowledge: Partial differential equations; Finite difference methods; Taylor series; Basic fluid mechanics including pressure, velocity, boundary layers, separated and recirculating flows. Basic computer programming skills. Assessment: Through semester assessment (100%) Campus: Camperdown/Darlington Mode of delivery: Normal (lecture/lab/tutorial) Day Associated degrees: B E, Grad Cert E, M P E, PG Coursework Exchange.

Objectives: To provide students with the necessary skills to use commercial Computational Fluid Dynamics packages and to carry out research in the area of Computational Fluid Dynamics. Expected outcomes: Students will have a good understanding of the basic theory of Computational Fluid Dynamics, including discretisation, accuracy and stability. They will be capable of writing a simple solver and using a sophisticated commercial CFD package. Syllabus summary: A course of lectures, tutorials and laboratories designed to provide the student with the necessary tools for using a sophisticated commercial CFD package. A set of laboratory tasks will take the student through a series of increasingly complex flow simulations, requiring an understanding of the basic theory of computational fluid dynamics (CFD). The laboratory tasks will be complemented by a series of lectures in which the basic theory is covered, including: governing equations; finite difference methods accuracy and stability for the advection equation, diffusion equation; direct and iterative solution techniques; solution of the full Navier-Stokes equations; turbulent flow; Cartesian tensors; turbulence models.

CIVL5266
Steel Structures - Stability
Engineering and Information Technologies
Credit points: 6 Session: Semester 1 Classes: 2 hrs of lecture and 2hrs of tutorial/laboratory per week. Assumed knowledge: Knowledge: CIVL2201 AND CIVL3206 AND CIVL3235. There are no prerequisites for this unit of study but it is assumed that students are competent in the content covered in CIVL2201 Structural Mechanics, CIVL3206 Steel Structures 1, and CIVL3235 Structural Analysis. Students who have failed previous units of study should note that no special consideration will be given to them if they do choose to enrol in this unit of study (on the basis of timetable clashes or lack of knowledge of basics), and they are discouraged from enrolling in this unit of study. Students who have not yet passed first, second or third year units of study must enrol in those units of study in precedence to any later year units of study. Assessment: Through semester assessment (30%), Final Exam (70%) Campus: Camperdown/Darlington Mode of delivery: Normal (lecture/lab/tutorial) Day Associated degrees: B E, Grad Cert E, M P E, PG Coursework Exchange.

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 Engineering and Information Technologies
Credit points: 6 Session: Semester 2 Classes: 4-hr combined lecture and tutorial per week. Prerequisites: CIVL3205 OR CIVL5507 Assessment: Through semester assessment (50%), Final Exam (50%) Campus: Camperdown/Darlington Mode of delivery: Normal (lecture/lab/tutorial) Day
Associated degrees: B E, Grad Cert E, M P E

Objectives:
This Unit reviews the fundamental concepts of 'elastic' behaviour of reinforced concrete structures and introduces models of behaviour and methods of analysis related to the time-dependent effects of creep and shrinkage (at service loads). This Unit also examines the non-linear (strain-softening) behaviour of reinforced concrete and the related effects concerning the strength of statically-indeterminate reinforced concrete structures. In particular, this Unit examines the concepts of ductility, moment-redistribution and plastic design (for beams and slabs). Strut-and-tie modelling of reinforced concrete members is also described.

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

CIVL5452
Foundation Engineering Engineering and Information Technologies
Credit points: 6 Session: Semester 2 Classes: Lectures 3 hrs per week, presented in 2 sessions per week for 11 weeks of semester. Tutorials 1hr per week. Assumed knowledge: 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%) Campus: Camperdown/Darlington Mode of delivery: Normal (lecture/lab/tutorial) Day
Associated degrees: B E, Grad Cert E, M P E

Objectives:
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 Engineering and Information Technologies
Credit points: 6 Session: Semester 1 Classes: 2 hrs lecture, 2hr. tutorial and laboratory per week. Assessment: Through semester assessment (100%) Campus: Camperdown/Darlington Mode of delivery: Normal (lecture/lab/tutorial) Day
Associated degrees: B E, Grad Cert E, M P E

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 assemblies 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.
5. Extended knowledge of the application of FE to solve civil engineering problems.

CIVL5665
Advanced Water Resources Management
Engineering and Information Technologies
Credit points: 6 Session: Semester 2 Classes: 2 hours of lectures and 1 hour of tutorials per week Assumed knowledge: CIVL3612. Assessment: Through semester assessment (50%), Final Exam (50%) Campus: Camperdown/Darlington Mode of delivery: Normal (lecture/lab/tutorial) Day

Associated degrees: B E, Grad Cert App Sc (Enviro Sci), Grad Cert E, M Appl Sc (Env Sc), M P E.

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.

CIVL5670
Reservoir Stream & Coastal Eng
Engineering and Information Technologies
Credit points: 6 Session: Semester 1 Classes: Lectures 2 hours per week, Tutorials 2 hours per week. Assumed knowledge: CIVL3612 AND MATH2061. Assessment: Through semester assessment (40%), Final Exam (60%) Campus: Camperdown/Darlington Mode of delivery: Normal (lecture/lab/tutorial) Day

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

Associated degrees: B E, Grad Cert E, M P E, PG Coursework Exchange.

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
Engineering and Information Technologies

Note: Department permission required for enrolment.

Associated degrees: M E, M Inf Tech, M Inf Tech Man, M P E, M P L, M P M.

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
Engineering and Information Technologies

Note: Department permission required for enrolment.

Associated degrees: M E, M Inf Tech, M Inf Tech Man, M P E, M P L, M P M.

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.
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 in order
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).
# 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.

<table>
<thead>
<tr>
<th>Unit of study</th>
<th>Credit points</th>
<th>A: Assumed knowledge</th>
<th>P: Prerequisites</th>
<th>C: Corequisites</th>
<th>N: Prohibition</th>
<th>Session</th>
</tr>
</thead>
<tbody>
<tr>
<td>ENGS5102 Entrepreneurship for Engineers</td>
<td>6</td>
<td>Some limited industry experience is preferred but not a must.</td>
<td>N ELEC5701</td>
<td>Semester 1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>ENGS5202 Sustainable Design, Eng and Mgt</td>
<td>6</td>
<td>General knowledge in science and calculus and understanding of basic principles of chemistry, physics and mechanics</td>
<td>Semester 1</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>ENGS5103 Safety Systems and Risk Analysis</td>
<td>6</td>
<td></td>
<td></td>
<td>Semester 2</td>
<td></td>
<td></td>
</tr>
<tr>
<td>PMGT5871 Project Process Planning and Control</td>
<td>6</td>
<td></td>
<td></td>
<td>Int December</td>
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<td></td>
</tr>
</tbody>
</table>

## 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.

<table>
<thead>
<tr>
<th>Unit of study</th>
<th>Credit points</th>
<th>A: Assumed knowledge</th>
<th>P: Prerequisites</th>
<th>C: Corequisites</th>
<th>N: Prohibition</th>
<th>Session</th>
</tr>
</thead>
<tbody>
<tr>
<td>CIVL5450 Analysis and Design of Pile Foundations</td>
<td>6</td>
<td></td>
<td></td>
<td>Semester 1</td>
<td></td>
<td></td>
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<tr>
<td>CIVL5451 Computer Methods in Geotechnical Eng</td>
<td>6</td>
<td></td>
<td></td>
<td>Semester 1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>CIVL5454 Rock Engineering</td>
<td>6</td>
<td>Undergraduate geology and soil mechanics.</td>
<td>Semester 2</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>CIVL5455 Engineering Behaviour of Soils</td>
<td>6</td>
<td>A CIVL3410 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.</td>
<td>Semester 2</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

## Research units

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

<table>
<thead>
<tr>
<th>Unit of study</th>
<th>Credit points</th>
<th>A: Assumed knowledge</th>
<th>P: Prerequisites</th>
<th>C: Corequisites</th>
<th>N: Prohibition</th>
<th>Session</th>
</tr>
</thead>
<tbody>
<tr>
<td>CIVL5020 Capstone Project A</td>
<td>6</td>
<td>48 credits from MPE degree program</td>
<td>Note: Department permission required for enrolment</td>
<td>Semester 1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>CIVL5021 Capstone Project B</td>
<td>6</td>
<td>C CIVL5020</td>
<td>Note: Department permission required for enrolment</td>
<td>Semester 2</td>
<td></td>
<td></td>
</tr>
<tr>
<td>CIVL5022 Capstone Project B Extended</td>
<td>12</td>
<td>P 42 credit points in the Master of Engineering and WAM &gt;70, or 66 credit points in the Master of Professional Engineering and WAM &gt;70 or exemption</td>
<td>Note: Department permission required for enrolment</td>
<td>Semester 1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>CIVL5222 Dissertation A</td>
<td>12</td>
<td>N ENGG5220, ENGG5221</td>
<td>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.</td>
<td>Semester 1</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

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### 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.

<table>
<thead>
<tr>
<th>Unit of study</th>
<th>Credit points</th>
<th>A: Assumed knowledge</th>
<th>P: Prerequisites</th>
<th>C: Corequisites</th>
<th>N: Prohibition</th>
<th>Session</th>
</tr>
</thead>
<tbody>
<tr>
<td>CIVL5223 Dissertation B</td>
<td>12</td>
<td>N ENGG5220, ENGG5221</td>
<td>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.</td>
<td>Semester 1 Semester 2</td>
<td></td>
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</tr>
<tr>
<td>AMME5202 Advanced Computational Fluid Dynamics</td>
<td>6</td>
<td>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.</td>
<td>Semester 1</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>CIVL5266 Steel Structures - Stability</td>
<td>6</td>
<td>A Knowledge: CIVL2201 AND CIVL3206 AND CIVL3235. There are no prerequisites for this unit of study but it is assumed that students are competent in the content covered in CIVL2201 Structural Mechanics, CIVL3206 Steel Structures 1, and CIVL3235 Structural Analysis. Students who have failed previous units of study should note that no special consideration will be given to them if they do choose to enrol in this unit of study (on the basis of timetable clashes or lack of knowledge of basics), and they are discouraged from enrolling in this unit of study. Students who have not yet passed first, second or third year units of study must enrol in those units of study in precedence to any later year units of study.</td>
<td>Semester 1</td>
<td></td>
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</tr>
<tr>
<td>CIVL5269 Concrete Structures - Strength &amp; Service</td>
<td>6</td>
<td>P CIVL3205 OR CIVL5507</td>
<td>Semester 2</td>
<td></td>
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<tr>
<td>CIVL5351 Geoenvironmental Engineering</td>
<td>6</td>
<td></td>
<td>Semester 1</td>
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<tr>
<td>CIVL5452 Foundation Engineering</td>
<td>6</td>
<td>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)</td>
<td>Semester 2</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>CIVL5458 Numerical Methods in Civil Engineering</td>
<td>6</td>
<td>A CIVL3612.</td>
<td>Semester 1</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>CIVL5665 Advanced Water Resources Management</td>
<td>6</td>
<td>A CIVL3612. AND MATH2061. Students who have previously studied CIVL3613 will only be permitted to enrol in this unit by approval of the Director of Undergraduate Studies.)</td>
<td>Semester 1</td>
<td></td>
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<tr>
<td>CIVL5670 Reservoir Stream &amp; Coastal Eng</td>
<td>6</td>
<td></td>
<td>Semester 1</td>
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</tr>
<tr>
<td>ENGG5231 Engineering Graduate Exchange A</td>
<td>6</td>
<td>P Permission from faculty and school. Note: Department permission required for enrolment</td>
<td>Int January Int July</td>
<td></td>
<td></td>
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</tr>
<tr>
<td>ENGG5232 Engineering Graduate Exchange B</td>
<td>6</td>
<td>P Permission from faculty and school. Note: Department permission required for enrolment</td>
<td>Int January Int July</td>
<td></td>
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<td></td>
</tr>
</tbody>
</table>

For more information on degree program requirements visit CUSP.
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
Engineering and Information Technologies
Credit points: 6 Session: Semester 1 Classes: 2hr Lectures per week, 2hr Tutorials per week Prohibitions: ELEC5701 Assumed knowledge: Some limited industry experience is preferred but not a must. Assessment: Through semester assessment (100%) Campus: Camperdown/Darlington Mode of delivery: Normal (lecture/lab/tutorial) Day
Associated degrees: Grad Cert E, M P E.

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.


ENGG5202 Sustainable Design, Eng and Mgt
Engineering and Information Technologies
Credit points: 6 Session: Semester 1 Classes: 2 lectures per week, tutorials 2 hour per week and projects and self assisted learning (4 hours per week) Assumed knowledge: General knowledge in science and calculus and understanding of basic principles of chemistry, physics and mechanics Assessment: Through semester assessment (70%), Final Exam (30%) Campus: Camperdown/Darlington Mode of delivery: Normal (lecture/lab/tutorial) Day
Associated degrees: Grad Cert E, M P E.

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
Engineering and Information Technologies
Credit points: 6 Session: Semester 2 Classes: 2hrs of Lectures per week, 2hrs of Tutorials per week Assessment: Through semester assessment (100%) Campus: Camperdown/Darlington Mode of delivery: Normal (lecture/lab/tutorial) Day
Associated degrees: Grad Cert E, M P E.

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.

PMGTS871 Project Process Planning and Control
Engineering and Information Technologies
Credit points: 6 Session: Int Decemt, Int July, Semester 1, Semester 2, Summer Late Classes: Session 1: Evening, Online Session 2: Evening, Online, Block mode July Int and Dec Int : Block mode Assessment: Through session assessment (60%), Final Exam (40%). Campus: Camperdown/Darlington Mode of delivery: Block Mode or On-line or Normal (lecture/lab/tutorial) Evening
Associated degrees: Grad Cert I T, Grad Cert Inf Tech Man, Grad Cert P M, Grad Dip E, M Inf Tech Man, M P E.

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
Engineering and Information Technologies
Credit points: 6 Session: Semester 1 Classes: 3 hours of lecture/project work in class per week. 3 hours of laboratory work per semester. Assessment: Through semester assessment (100%) Campus: Camperdown/Darlington Mode of delivery: Normal (lecture/lab/tutorial) Day

Associated degrees: B E, Grad Cert E, M P E.
Objectives: To develop an understanding of the modern principles of design of pile foundations and the application of those principles to practice.
Expected outcomes: Students should gain an advanced understanding of the types of pile foundations used in practice, and the procedures for analysis of pile foundations under various types of loading, and gain experience in carrying out pile design for real geotechnical profiles.

Syllabus summary: Types of piles and their uses, effects of pile installation, axial capacity of piles and pile groups, settlement of pile foundations, ultimate lateral capacity, lateral deformations, analysis of pile groups subjected to general loading conditions, piled raft foundations, piles subjected to ground movements, pile load testing, code provisions for pile design.

CIVL5451
Computer Methods in Geotechnical Eng
Engineering and Information Technologies
Credit points: 6 Session: Semester 1 Classes: 3-hr combined lecture and tutorial per week. Assessment: Through semester assessment (100%) Campus: Camperdown/Darlington Mode of delivery: Normal (lecture/lab/tutorial) Day

Associated degrees: Grad Cert E, M P E.
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 geomaterials.
3. To develop students' ability at critically assessing assumptions behind computer models and critically evaluating the quality of numerical results.

CIVL5454
Rock Engineering
Engineering and Information Technologies
Credit points: 6 Session: Semester 2 Classes: 3 hours of project work in class per week. Assumed knowledge: Undergraduate geology and soil mechanics. Assessment: Through semester assessment (100%) Campus: Camperdown/Darlington Mode of delivery: Normal (lecture/lab/tutorial) Day

Associated degrees: B E, Grad Cert E, M P E.
Objectives: to develop an understanding of the behaviour and design of engineering structures in rock masses.
Expected outcomes: Students will have learnt how to classify and characterise rocks and rock masses for engineering purposes and developed an understanding of basic rock mechanics etc.

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

Engineering and Information Technologies

Credit points: 6 Session: Semester 1 Classes: Lectures: 1 hour per week; Tutorials: 1 hour per week; Laboratory Sessions: 2 hours per week Assumed knowledge: Partial differential equations; Finite difference methods; Taylor series; Basic fluid mechanics including pressure, velocity, boundary layers, separated and recirculating flows. Basic computer programming skills. Assessment: Through semester assessment (100%) Campus: Camperdown/Darlington Mode of delivery: Normal (lecture/lab/tutorial) Day

Associated degrees: B E, Grad Cert E, M P E, PG Coursework Exchange.

Objectives: To provide students with the necessary skills to use commercial Computational Fluid Dynamics packages and to carry out research in the area of Computational Fluid Dynamics. Expected outcomes: Students will have a good understanding of the basic theory of Computational Fluid Dynamics, including discretisation, accuracy and stability. They will be capable of writing a simple solver and using a sophisticated commercial CFD package. Syllabus summary: A course of lectures, tutorials and laboratories designed to provide the student with the necessary tools for using a sophisticated commercial CFD package. A set of laboratory tasks will take the student through a series of increasingly complex flow simulations, requiring an understanding of the basic theory of computational fluid dynamics (CFD). The laboratory tasks will be complemented by a series of lectures in which the basic theory is covered, including: governing equations; finite difference methods accuracy and stability for the advection equation, diffusion equation; direct and iterative solution techniques; solution of the full Navier-Stokes equations; turbulent flow; Cartesian tensors; turbulence models.

CIVL5266

Steel Structures - Stability

Engineering and Information Technologies

Credit points: 6 Session: Semester 1 Classes: 2 hrs of lecture and 2hrs of tutorial/laboratory per week Assumed knowledge: Knowledge: CIVL2201 AND CIVL3206 AND CIVL3235. There are no prerequisites for this unit of study but it is assumed that students are competent in the content covered in CIVL2201 Structural Mechanics, CIVL3206 Steel Structures 1, and CIVL3235 Structural Analysis. Students who have failed previous units of study should note that no special consideration will be given to them if they do choose to enrol in this unit of study (on the basis of timetable clashes or lack of knowledge of basics), and they are discouraged from enrolling in this unit of study. Students who have not yet passed first, second or third year units of study must enrol in those units of study in precedence to any later year units of study. Assessment: Through semester assessment (30%), Final Exam (70%) Campus: Camperdown/Darlington Mode of delivery: Normal (lecture/lab/tutorial) Day

Associated degrees: B E, Grad Cert E, M P E, PG Coursework Exchange.

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
Engineering and Information Technologies
Credit points: 6  Session: Semester 2 Classes: 4-hr combined lecture and tutorial per week. Prerequisites: CIVL3205 OR CIVL5507  Assessment: Through semester assessment (50%), Final Exam (50%)  Campus: Camperdown/Darlington  Mode of delivery: Normal (lecture/lab/tutorial) Day

Associated degrees: B E, Grad Cert E, M P E. PG Coursework Exchange.
Objectives: This Unit reviews the fundamental concepts of 'elastic' behaviour of reinforced concrete structures and introduces models of behaviour and methods of analysis related to the time-dependent effects of creep and shrinkage (at service loads). This Unit also examines the non-linear (strain-softening) behaviour of reinforced concrete and the related effects concerning the strength of statically- and laminated 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.
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/deforations) 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- and laminated reinforced-concrete beams and slabs
* ability to use strut-and-tie models of reinforced concrete behaviour

CIVL5351
Geoenvironmental Engineering
Engineering and Information Technologies
Credit points: 6  Session: Semester 1 Classes: 4 hours of lectures/project work per week  Assessment: Through semester assessment (100%)  Campus: Camperdown/Darlington  Mode of delivery: Normal (lecture/lab/tutorial) Day

Associated degrees: B E, Grad Cert E, M P E.
Objectives: To develop an understanding of the geotechnical aspects of the design and management of industrial and domestic waste disposal systems.
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
Engineering and Information Technologies
Credit points: 6  Session: Semester 2 Classes: Lectures 3 hrs per week, presented in 2 sessions per week for 11 weeks of semester. Tutorials 1hr per week. Assumed knowledge: 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%)  Campus: Camperdown/Darlington  Mode of delivery: Normal (lecture/lab/tutorial) Day

Associated degrees: B E, Grad Cert E, M P E.
Objectives: 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
Engineering and Information Technologies
Credit points: 6  Session: Semester 1 Classes: 2 hrs lecture, 2hr. tutorial and laboratory per week  Assessment: Through semester assessment (100%)  Campus: Camperdown/Darlington  Mode of delivery: Normal (lecture/lab/tutorial) Day

Associated degrees: B E, Grad Cert E, M P E.
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.
5. Extended knowledge of the application of FE to solve civil engineering problems.

CIVL5665
Advanced Water Resources Management Engineering and Information Technologies
Credit points: 6 Session: Semester 2 Classes: 2 hours of lectures and 1 hour of tutorials per week. Assumed knowledge: CIVL3612. Assessment: Through semester assessment (50%), Final Exam (50%) Campus: Camperdown/Darlington Mode of delivery: Normal (lecture/lab/tutorial) Day
Associated degrees: B E, Grad Cert Sc (Environ Sci), Grad Cert E, M Appl Sc (Env Sc), M P E.

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, dissolved oxygen, stormwater, bioremediation and phyto remediation techniques. The topics mentioned above will be covered in both a qualitative and quantitative aspects.

CIVL5670
Reservoir Stream & Coastal Eng Engineering and Information Technologies
Credit points: 6 Session: Semester 1 Classes: Lectures 2 hours per week, Tutorials 2 hours per week. Assumed knowledge: CIVL3612 AND MATH2061. Assessment: Through semester assessment (40%), Final Exam (60%) Campus: Camperdown/Darlington Mode of delivery: Normal (lecture/lab/tutorial) Day
Note: Students who have previously studied CIVL3613 will only be permitted to enrol in this unit by approval of the Director of Undergraduate Studies.

Associated degrees: B E, Grad Cert E, M P E, PG Coursework Exchange.

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.)

ENGG5232
Engineering Graduate Exchange B Engineering and Information Technologies
Note: Department permission required for enrolment.

Associated degrees: M E, M Inf Tech, M Inf Tech Man, M P E, M P L, M P M.

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.
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).
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.

<table>
<thead>
<tr>
<th>Unit of Study</th>
<th>Credit Points</th>
<th>A: Assumed knowledge</th>
<th>P: Prerequisites</th>
<th>C: Corequisites</th>
<th>Session</th>
</tr>
</thead>
<tbody>
<tr>
<td>ENGG5102 Entrepreneurship for Engineers</td>
<td>6</td>
<td>A Some limited industry experience is preferred but not a must.</td>
<td>N ELEC5701</td>
<td></td>
<td>Semester 1</td>
</tr>
<tr>
<td>ENGG5202 Sustainable Design, Eng and Mgt</td>
<td>6</td>
<td>A General knowledge in science and calculus and understanding of basic principles of chemistry, physics and mechanics</td>
<td></td>
<td></td>
<td>Semester 1</td>
</tr>
<tr>
<td>ENGG5103 Safety Systems and Risk Analysis</td>
<td>6</td>
<td></td>
<td></td>
<td></td>
<td>Summer Late</td>
</tr>
<tr>
<td>FMGT5871 Project Process Planning and Control</td>
<td>6</td>
<td></td>
<td></td>
<td></td>
<td>Int December Int July</td>
</tr>
</tbody>
</table>

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.

<table>
<thead>
<tr>
<th>Unit of Study</th>
<th>Credit Points</th>
<th>A: Assumed knowledge</th>
<th>P: Prerequisites</th>
<th>C: Corequisites</th>
<th>Session</th>
</tr>
</thead>
<tbody>
<tr>
<td>AERO5010 Optimisation Methods in Engineering</td>
<td>6</td>
<td>A BE in the area of Aerospace or related Engineering field. Note: Department permission required for enrolment</td>
<td></td>
<td></td>
<td>Semester 2</td>
</tr>
<tr>
<td>AERO5301 Applied Finite Element Analysis</td>
<td>6</td>
<td>A AMME5301 or BE in area of Aerospace Engineering or related Engineering field.</td>
<td>P AERO5310 OR MECH5361</td>
<td></td>
<td>Semester 1</td>
</tr>
<tr>
<td>AMME5101 Energy and the Environment</td>
<td>6</td>
<td>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.</td>
<td></td>
<td></td>
<td>Semester 1</td>
</tr>
<tr>
<td>AMME5202 Advanced Computational Fluid Dynamics</td>
<td>6</td>
<td>A Students are required to have an understanding of basic principles of Newtonian mechanics, physics and chemistry, fluid mechanics and solid mechanics. General knowledge of how to operate a computer and work with different software is also required. Note: Department permission required for enrolment</td>
<td></td>
<td></td>
<td>Semester 1</td>
</tr>
<tr>
<td>AMME5271 Computational Nanotechnology</td>
<td>6</td>
<td>A Students are required to have an understanding of basic principles of Newtonian mechanics, physics and chemistry, fluid mechanics and solid mechanics. General knowledge of how to operate a computer and work with different software is also required. Note: Department permission required for enrolment</td>
<td></td>
<td></td>
<td>Semester 2</td>
</tr>
<tr>
<td>AMME5310 Engineering Tribology</td>
<td>6</td>
<td>A (AMME2302 OR AMME5302) AND (AMME2301 OR AMME5301) AND (MECH3261 OR AMME5361)</td>
<td></td>
<td></td>
<td>Semester 1</td>
</tr>
<tr>
<td>AMME5510 Vibration and Acoustics</td>
<td>6</td>
<td>A (AMME2301 OR AMME5301) AND (AMME2200 OR AMME5200) AND (AMME2500 OR AMME5500)</td>
<td>Note: Department permission required for enrolment</td>
<td></td>
<td>Semester 2</td>
</tr>
<tr>
<td>AMME5602 Product Life Cycle Design</td>
<td>6</td>
<td>A Some knowledge of product and process design is assumed and a basic understanding of business activity will also be helpful.</td>
<td></td>
<td></td>
<td>Semester 2</td>
</tr>
<tr>
<td>AMME5902 Advanced Computer Aided Manufacturing</td>
<td>6</td>
<td>A Computer Aided Drafting, Basic FEA principles and Solid Mechanics</td>
<td></td>
<td></td>
<td>Semester 1</td>
</tr>
<tr>
<td>AMME5912 Crash Analysis and Design</td>
<td>6</td>
<td>A Computer Aided Drafting, Basic FEA principles and Solid Mechanics</td>
<td></td>
<td></td>
<td>Semester 2</td>
</tr>
<tr>
<td>MECH5255 Air Conditioning and Refrigeration</td>
<td>6</td>
<td>A Students are expected to be familiar with the basic laws of thermodynamics, fluid mechanics and heat transfer.</td>
<td>P MECH3260 or MECH5262 N MECH4255</td>
<td></td>
<td>Semester 2</td>
</tr>
</tbody>
</table>
### Unit of study table

<table>
<thead>
<tr>
<th>Unit of study</th>
<th>Credit points</th>
<th>A: Assumed knowledge</th>
<th>P: Prerequisites</th>
<th>C: Corequisites</th>
<th>N: Prohibition</th>
<th>Session</th>
</tr>
</thead>
<tbody>
<tr>
<td>MECH5265 Advanced Combustion</td>
<td>6</td>
<td>P (MECH5262 or MECH5260) and (MECH5261 or MECH5261)</td>
<td>N MECH4265</td>
<td></td>
<td></td>
<td>Semester 2</td>
</tr>
<tr>
<td>MECH5275 Advanced Renewable Energy</td>
<td>6</td>
<td>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.</td>
<td>P MECH5262 or MECH5260</td>
<td></td>
<td></td>
<td>Semester 2</td>
</tr>
<tr>
<td>AMME5305 Smart Materials</td>
<td>6</td>
<td>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</td>
<td></td>
<td></td>
<td></td>
<td>Semester 2</td>
</tr>
<tr>
<td>AMME5310 Advanced Engineering Materials</td>
<td>6</td>
<td>N MECH4310</td>
<td></td>
<td></td>
<td></td>
<td>Semester 1</td>
</tr>
<tr>
<td>AMME5416 Advanced Design and Analysis</td>
<td>6</td>
<td>A Eng Mechanics, balance of forces and moments Mechanics of Solids, 2 and 3 dimensional stress and strain Engineering Dynamics - dynamic forces and moments. Mechanical Design, approach to design problems and report writing, and preparation of engineering drawing. Mechanical design intermediate, means of applying fatigue analysis to a wide range of machine components</td>
<td></td>
<td></td>
<td></td>
<td>Semester 1</td>
</tr>
<tr>
<td>AMME5720 Sensors and Signals</td>
<td>6</td>
<td>A Strong MATLAB skills</td>
<td>N MECH4720</td>
<td></td>
<td></td>
<td>Semester 2</td>
</tr>
<tr>
<td>MTRX5700 Experimental Robotics</td>
<td>6</td>
<td>A Knowledge of statics and dynamics, rotation matrices, programming and some electronic and mechanical design experience is assumed.</td>
<td>N MTRX4700</td>
<td></td>
<td></td>
<td>Semester 1</td>
</tr>
</tbody>
</table>

### Research units

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

| AMME5020 Capstone Project A                        | 6             | P 48 cp from MPE degree program or 24 cp from the ME program. Note: Department permission required for enrolment |                |                |                | Semester 1    |
| AMME5021 Capstone Project B                        | 6             | C AMME5020           | Note: Department permission required for enrolment |                |                | 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 2    |
| AMME5222 Dissertation A                            | 12            | N AMME5020, AMME5021, ENGG5220, ENGG5221 Note: Department permission required for enrolment |                |                |                | Semester 1    |
| AMME5223 Dissertation B                            | 12            | N AMME5020, AMME5021, ENGG5220, ENGG5221 Note: Department permission required for enrolment |                |                |                | Semester 1    |

*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                      | 6             | A BE in the area of Aerospace Engineering or related Engineering field. P AERO5210 or AERO5260 Note: Department permission required for enrolment |                |                |                | Semester 1    |
| AERO5400 Advanced Aircraft Design Analysis          | 6             | A BE in area of Aerospace Engineering or related Engineering field with familiarity in aircraft design. |                |                |                | Semester 2    |
| AERO5500 Flight Mechanics Test and Evaluation Adv   | 6             | A BE in area of Aerospace Engineering or related Engineering Field. P AERO5510 OR AERO3560. All MPE and ME students are required to do AERO5510 unless they have already completed an equivalent to AERO5510/AERO3560. This UoS can then be taken as an advanced elective. |                |                |                | Semester 2    |
| AERO5760 Spacecraft and Satellite Design            | 6             | Note: Department permission required for enrolment |                |                |                | Semester 2    |
| AMME5520 Advanced Control and Optimisation          | 6             | P AMME3500 or AMME5501. |                |                |                | Semester 1    |
| AMME5591 Fundamentals of Neurmodulation            | 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. |                |                |                | Semester 1    |
| AMME5596 Biomedical Engineering                     | 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 Assumed Knowledge: Chemistry, biology, materials engineering, and engineering design at least at the Junior level. |                |                |                | Semester 2    |
| AMME5597 Applied 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. |                |                |                | Semester 1    |
| AMME5598 Computational Biomedical Engineering       | 6             | A AMME5301 and AMM5500 and MECH5361 and MECH3921 |                |                |                | Semester 1    |
| AMME5990 Biomedical Engineering Tech 1             | 6             | A Junior level chemistry, intermediate level biology, and specific knowledge of cell biology at least at the junior level, and preferably at the intermediate level. |                |                |                | Semester 1    |
| ENGG5231 Engineering Graduate Exchange A            | 6             | P Permission from faculty and school. Note: Department permission required for enrolment |                |                |                | Int January    |
| ENGG5232 Engineering Graduate Exchange B            | 6             | P Permission from faculty and school. Note: Department permission required for enrolment |                |                |                | Int January    |
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

Engineering and Information Technologies

Credit points: 6 Session: Semester 1 Classes: 2hrs Lectures per week, 2hrs Tutorials per week Prohibitions: ELEC5701 Assumed knowledge: Some limited industry experience is preferred but not a must. Assessment: Through semester assessment (100%) Campus: Camperdown/Darlington 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.


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

ENGG5202 Sustainable Design, Eng and Mgt

Engineering and Information Technologies

Credit points: 6 Session: Semester 1 Classes: 2 lectures per week, tutorials 2 hour per week and projects and self assisted learning (4 hours per week) Assumed knowledge: General knowledge in science and calculus and understanding of basic principles of chemistry, physics and mechanics Assessment: Through semester assessment (70%), Final Exam (30%) Campus: Camperdown/Darlington 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.

ENGG5013 Safety Systems and Risk Analysis

Engineering and Information Technologies

Credit points: 6 Session: Semester 2 Classes: 2hrs of Lectures per week, 2hrs of Tutorials per week Assessment: Through semester assessment (100%) Campus: Camperdown/Darlington 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

Engineering and Information Technologies

Credit points: 6 Session: Int December, Int July, Semester 1, Semester 2, Summer Late Classes: Session 1: Evening, Online Session 2: Evening, Online, Block mode July Int and Dec Int : Block mode Assessment: Through session assessment (60%) , Final Exam (40%). Campus: Camperdown/Darlington Mode of delivery: Block Mode or On-line or Normal (lecture/lab/tutorial) Evening

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
Tutorials: 1 hour per week; Laboratory Sessions: 2 hours per week
Credit points:
Engineering and Information Technologies
Advanced Computational Fluid Dynamics
AMME5202
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 code and using a sophisticated commercial CFD package. Syllabus summary: A course of lectures, tutorials and laboratories designed to provide the student with the necessary tools for using a sophisticated commercial CFD package. A set of laboratory tasks will take the student through a series of increasingly complex flow simulations, requiring an understanding of the basic theory of computational fluid dynamics (CFD). The laboratory tasks will be complemented by a series of lectures in which the basic theory is covered, including: governing equations; finite difference methods accuracy and stability for the advection equation, diffusion equation; direct and iterative solution techniques; solution of the full Navier-Stokes equations; turbulent flow; Cartesian tensors; turbulence models.

AMME5271
Computational Nanotechnology
Engineering and Information Technologies
Credit points: 6 Session: Semester 2 Classes: Lectures: 2 hours per week; Tutorials: 3 hours per week Assumed knowledge: Students are required to have an understanding of basic principles of Newtonian mechanics, physics and chemistry, fluid mechanics and solid mechanics. General knowledge of how to operate a computer and work with different software is also required. Assessment: Through semester assessment (100%) Campus: Camperdown/Darlington 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, nanobiology 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
Engineering and Information Technologies
Credit points: 6 Session: Semester 1 Classes: 2 hrs of Lectures per week, 3hr of Tutorials per week, 12 hours or laboratory work per semester Assumed knowledge: Students are required to separated and recirculating flows. Basic computer programming skills. Assessment: Through semester assessment (100%) Campus: Camperdown/Darlington Mode of delivery: Normal (lecture/lab/tutorial) Day Note: Department permission required for enrolment.

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

Unit of study descriptions
Engineering and Information Technologies
Credit points: 6 Session: Semester 2 Classes: 2 hrs of lectures per week, 2 hrs of tutorials per week. 8 hours of laboratory work per semester. Assumed knowledge: (AMME2301 OR AMME3501) AND (AMME2200 OR AMME3200) AND (AMME2500 OR AMME5500). Assessment: Through semester assessment (35%), Final Exam (65%). Campus: Camperdown/Darlington 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, impendance, 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 Engineering and Information Technologies
Credit points: 6 Session: Semester 2 Classes: Project Work in Class: 5 hours per week. Assumed knowledge: Some knowledge of product and process design is assumed and a basic understanding of business activity will also be helpful. Assessment: Through semester assessment (100%) Campus: Camperdown/Darlington Mode of delivery: Normal (lecture/lab/tutorial) Day
This unit cover the following topics: 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 Engineering and Information Technologies
Credit points: 6 Session: Semester 2 Classes: Lectures: 2 hours per week; Tutorials: 2 hours per week; Laboratory: 3 hours per semester. Assessment: Through semester assessment (100%) Campus: Camperdown/Darlington Mode of delivery: Normal (lecture/lab/tutorial) Day
The aim of this course is to enhance the student’s manufacturing engineering skills in the CAD/CAM area. The course focuses on CNC milling as a manufacturing automation process applied to a project. The management, planning and marketing of a typical engineering project are also discussed. Objectives: Through integrated project-based learning and hands-on-machine training, you will learn
* How to successfully complete a CAD/CAM and CNC mill based project.
* Manufacturing management and system skills, such as product planning, manufacturing sequence, time and cost;
* The science in designing and selecting a manufacturing method.
* How to effectively present your ideas and outcomes using oral and report based methods.
It is expected that through your hard work in the semester, you will find
* Enhanced learning by real-world problems.
* Improved comprehensive skill in manufacturing design.

MECH5255
Air Conditioning and Refrigeration (Adv) Engineering and Information Technologies
Credit points: 6 Session: Semester 2 Classes: 2 hours of lectures and 1 hour of tutorials per week. Prerequisites: MECH3260 or MECH5262 Prohibitions: MECH4255 Assessment: Through semester assessment (60%), Final Exam (40%)
Campus: Camperdown/Darlington Mode of delivery: Normal (lecture/lab/tutorial) Day
This unit of study develops an advanced knowledge of air conditioning systems and refrigeration applications. At the completion of this unit students will be able to determine thermal loads on structures and design an air conditioning or refrigeration system with attention to comfort, control, air distribution and energy consumption. Course content will include: applied psychrometrics, air conditioning systems, design principles, comfort in the built environment, cooling load calculations, heating load calculations, introduction and use of computer-based load estimation packages software, air distribution, fans, ducts, air conditioning controls, advanced refrigeration cycles, evaporators, condensers, cooling towers, compressors, pumps, throttling devices, piping, refrigerants, control, refrigeration equipment, simulation of refrigeration systems, food refrigeration and industrial applications; Use of CFD packages as tools to simulate flows in building and to optimise air conditioning design, energy estimation methods and software, energy evaluation and management in the built environment. Use of experimental air conditioning systems to test for thermal balances and compare with simulations.

MECH5265
Advanced Combustion Engineering and Information Technologies
Credit points: 6 Session: Semester 2 Classes: 2 hours of lectures and 1 hour of tutorials per week. Prerequisites: (MECH5262 or MECH3260) and (MECH4265) Prohibitions: MECH4265 Assessment: Through semester assessment (60%), Final Exam (40%)
Campus: Camperdown/Darlington Mode of delivery: Normal (lecture/lab/tutorial) Day
This UoS aims to teach the basic principles of combustion highlighting the role of chemical kinetics, fluid mechanics, and molecular transport in determining the structure of flames. Students will become familiar with laminar and turbulent combustion of gaseous and liquid fuels including the formation of pollutants. They will also be briefly introduced to various applications such as internal combustion engines, gas turbines, furnaces and fires.
This UoS will cover equilibrium compositions, flammability limits, simple chemically reacting systems, detailed chemical kinetics, and the basic theory underlying laminar and turbulent combustion for both premixed and non-premixed cases. There will be an introduction to droplet combustion, the concept of mixture fraction for non-premixed flames, combustion in engines and gas turbines as well as the formation of pollutants. Fire ignition, growth and spread will also be covered with respect to safety in buildings including the hazards related to the formation of smoke and toxic products.

MECH5275
Advanced Renewable Energy Engineering and Information Technologies
Credit points: 6 Session: Semester 2 Classes: 2 hours of lectures and 3 hours of tutorials per week. Prerequisites: MECH5262 or MECH3260 Assumed knowledge: The students will require an understanding of the basic principles of thermodynamics, fluid mechanics 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%) **Campus:** Camperdown/Darlington **Mode of delivery:** Normal (lecture/lab/tutorial) Day

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

**MECH5305**  
**Smart Materials**

**Engineering and Information Technologies**

**Credit points:** 6 **Session:** Semester 2 **Classes:** 1 hour of lectures, 1 hour of tutorials and 3 hours of laboratory work per week. **Assumed knowledge:** Fundamental knowledge in materials science and engineering; 1) atomic and crystal structures 2) metallurgy 3) structure-property relationship 4) mechanics of engineering materials; 5) solid mechanics. **Assessment:** Through semester assessment (100%) **Campus:** Camperdown/Darlington **Mode of delivery:** Normal (lecture/lab/tutorial) Day

Develop an essential understanding of structure-property relationship of smart materials, as well as their applications in practical applications; develop student's capability to design functional structures using smart materials; and provide students an opportunity to learn the new knowledge through project approaches.

**MECH5310**  
**Advanced Engineering Materials**

**Engineering and Information Technologies**

**Credit points:** 6 **Session:** Semester 1 **Classes:** 2 hours of lectures and 3 hours of tutorials per week. **Prohibitions:** MECH4310 **Assessment:** Through semester assessment (100%) **Campus:** Camperdown/Darlington **Mode of delivery:** Normal (lecture/lab/tutorial) Day

To understand (a) how to define the relationship between properties and microstructures of advanced engineering materials, (b) how to improve mechanical design with the knowledge of mechanics and properties of materials, and (c) how to conduct failure diagnosis of engineering materials.

**MECH5416**  
**Advanced Design and Analysis**

**Engineering and Information Technologies**

**Credit points:** 6 **Session:** Semester 1 **Classes:** 2 hrs of lectures, 2hrs of tutorial per week. **Assumed knowledge:** Eng Mechanics, balance of forces and moments Mechanics of Solids, 2 and 3 dimensional stress and strain Engineering Dynamics - dynamic forces and moments. Mechanical Design, approach to design problems and report writing, and preparation of engineering drawing Mechanical design intermediate, means of applying fatigue analysis to a wide range of machine components. **Assessment:** Through semester assessment (100%) **Campus:** Camperdown/Darlington **Mode of delivery:** Normal (lecture/lab/tutorial) Day

This UoS utilises assumed theoretical knowledge and skills to elucidate the stresses and strains that exit in the different categories of machine parts. It sets out to make the students familiar with the simplifications that are applied to arrive at the analytic expressions commonly used to analyse each individual categories parts. These simplifications usually begin by assuming that only particular types of loads are carried by teh parts in that category. The resulting analyses provide approximations to the actual stresses. It is possible to have different degrees of simplifications, requiring more or less work, giving better or poorer approximations. Should a part be used to carry loads that were not allowed for in the traditional method then some more appropriate method must be found or developed. An important aspect is to make the student practiced in a range of modern concepts, techniques and tools, and to be made aware of their strengths and limitations.

This UoS teaches the student how to recognise where and how their theoretical skills can be applied to the practical situations that they may encounter in this field of design.

Options may be provided in the choice of design assignments. Biomedical engineering and vehicle design problems may be provided as options to more general machine design problems.

**MECH5720**  
**Sensors and Signals**

**Engineering and Information Technologies**

**Credit points:** 6 **Session:** Semester 2 **Classes:** 3 hours of lectures and 2 hours of tutorials per week. **Prohibitions:** MECH4720 **Assumed knowledge:** Strong MATLAB skills **Assessment:** Through semester assessment (70%), Final Exam (30%) **Campus:** Camperdown/Darlington **Mode of delivery:** Normal (lecture/lab/tutorial) Day

Syllabus Summary: This course starts by providing a background to the signals and transforms required to understand modern sensors. It goes on to provide an overview of the workings of typical active sensors (Radar, Lidar and Sonar). It provides insight into basic sensing methods as well as aspects of interfacing and signal processing. It includes both background material and a number of case studies.

The course covers the following topics:

a) **SIGNS.:** 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


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**

**Engineering and Information Technologies**

**Credit points:** 6 **Session:** Semester 1 **Classes:** 2hrs lectures and 3hrs of laboratory work per week. **Prohibitions:** MTRX4700 **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%) **Campus:** Camperdown/Darlington **Mode of delivery:** Normal (lecture/lab/tutorial) Day

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

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

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

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

**AMME5020**
Capstone Project A
Engineering and Information Technologies
Credit points: 6  Session: Semester 1, Semester 2 Classes: Independent project work. Prerequisites: 48 cp from MPE degree program or 24 cp from the project proposal. Assessment: Through semester assessment (100%) Campus: Camperdown/Darlington 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 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 thesis itself. The final thesis must be the student's individual work, although research is sometimes conducted in the framework of a group project shared with others. Students undertaking research on this basis will need to take care in ensuring the individual quality of their own research work and the final thesis submission. The thesis will be judged on the extent and quality of the student's original work and particularly how critical, perceptive and constructive he or she has been in assessing his/her work and that of others. Students will also be required to present the results of their findings to their peers and supervisors as part of a seminar program.

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

**AMME5021**
Capstone Project B
Engineering and Information Technologies
Credit points: 12  Session: Semester 1, Semester 2 Classes: Self paced research Prerequisites: 42 credit points in the Master of Professional Engineering and WAM >70, or 66 credit points in the Master of Professional Engineering and WAM >70 or exemption Assessment: Through semester assessment (100%) Campus: Camperdown/Darlington 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 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 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.
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 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.

AMME5222
Dissertation A
Engineering and Information Technologies
Credit points: 12 Session: Semester 1, Semester 2 Classes: no formal classwork Prohibitions: AMME5020, AMME5021, ENG55220, ENG55221 Assessment: Through semester assessment (100%) Campus: Camperdown/Darlington Mode of delivery: Supervision Note: Department permission required for enrolment.

Aim: 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.

AMME5223
Dissertation B
Engineering and Information Technologies
Credit points: 12 Session: Semester 1, Semester 2 Classes: no formal classwork Prohibitions: AMME5020, AMME5021, ENG55220, ENG55221 Assessment: Through semester assessment (100%) Campus: Camperdown/Darlington Mode of delivery: Supervision Note: Department permission required for enrolment.

Aim: 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.

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.

AEROS200
Advanced Aerodynamics
Engineering and Information Technologies
Credit points: 6 Session: Semester 1 Classes: 2 hours of lectures and 2 hours of tutorials per week. Prerequisites: AEROS210 or AEROS260 Assumed knowledge: BE in the area of Aerospace Engineering or related Engineering field. Assessment: Through semester assessment (100%) Campus: Camperdown/Darlington Mode of delivery: Normal (lecture/lab/tutorial) Day Note: Department permission required for enrolment.


AEROS400
Advanced Aircraft Design Analysis
Engineering and Information Technologies
Credit points: 6 Session: Semester 2 Classes: 4 hours of lectures per week. Prerequisites: BE in Aerospace Engineering or related Engineering field with familiarity in aircraft design. Assessment: Through semester assessment (100%) Campus: Camperdown/Darlington Mode of delivery: Normal (lecture/lab/tutorial) Day

This Unit aims to provide familiarity and understanding with practical aircraft design processes expected in industry, including the evaluation and case studies of existing aircraft designs. Students will gain a better understanding of relevant issues particularly related to the design of aircraft with a level of confidence to lead them to develop new designs or modifications, having a good balance between theory and real-world applications. Good familiarity with unique and stringent international aviation regulations and certification processes will be expected with respect to the design of aircraft. Topics covered by the lectures will include aircraft specifications; aircraft selection and evaluation; aircraft configuration design; design considerations for aerodynamics, structures, systems, manufacturing, testing, certification, life-cycle-cost, operations; the use of computational aircraft design tools, in particular DARcorp's Advanced Aircraft Analysis (AAA); and introduction to multidisciplinary design optimisation methods. Projects will be based on case study analyses and evaluation of aircraft types to operational specifications and requirements.

AEROS500
Flight Mechanics Test and Evaluation Adv
Engineering and Information Technologies
Credit points: 6 Session: Semester 2 Classes: 3 hours of lectures and 2 hours of tutorials per week. 2hrs of laboratory per semester. Prerequisites: AEROS510 OR AEROS660. Assumed knowledge: BE in area of Aerospace Engineering or related Engineering Field. Assessment: Through semester assessment (100%) Campus: Camperdown/Darlington Mode of delivery: Normal (lecture/lab/tutorial) Day Note: All ME and ME students are required to do AEROS510 unless they have already completed an equivalent to AEROS510/AEROS660. This UoS can then be taken as an advanced elective.

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.

**AEROS760**

**Spacecraft and Satellite Design**

Engineering and Information Technologies

**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%)  
**Campus:** Camperdown/Darlington  
**Mode of delivery:** Normal (lecture/lab/tutorial) Day

This course aims to introduce the students to the engineering aspects of spacecraft and mission design, covering the space environment and spacecraft sub-systems, including thermal control, power systems, attitude decision and control system, tracking, telemetry & telecommand, and on-board data handling.

**AMME5520**

**Advanced Control and Optimisation**

Engineering and Information Technologies

**Credit points:** 6  
**Session:** Semester 1  
**Classes:** 2hr lectures per week; 2hr tutorial per week  
**Prerequisites:** AMME3500 OR AMME5501  
**Assessment:** Through semester assessment (50%), Final exam (50%)  
**Campus:** Camperdown/Darlington  
**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 OP), 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**

Engineering and Information Technologies

**Credit points:** 6  
**Session:** Semester 1  
**Classes:** 3hrs of lecture/tutorial per 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  
**Assessment:** Through semester assessment (100%)  
**Campus:** Camperdown/Darlington  
**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**

Engineering and Information Technologies

**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 Assumed Knowledge: Chemistry, biology, materials engineering, and engineering design at least at the Junior level  
**Assessment:** Through semester assessment (60%), Final Exam (40%)  
**Campus:** Camperdown/Darlington  
**Mode of delivery:** Normal (lecture/lab/tutorial) Day

To gain a basic understanding of the major areas of interest in the biomaterials field, learn to apply basic engineering principles to biomedical systems, and understand the challenges and difficulties of biomedical systems. To participate in a project-based-learning approach to the topic of design with Biomaterials.

**AMME5971**

**Applied Tissue Engineering**

Engineering and Information Technologies

**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 6 credit points of intermediate physics or equivalent  
**Assessment:** Through semester assessment (60%), Final Exam (40%)  
**Campus:** Camperdown/Darlington  
**Mode of delivery:** Normal (lecture/lab/tutorial) Day

Elective Unit of Study: With the severe worldwide shortage of donor organs and the ubiquitous problem of donor organ rejection, there is a strong need for developing technologies for engineering replacement organs and other body parts. Recent developments in biochemistry and cell biology have begun to make this possible, and as a consequence, the very new field of tissue engineering has been making dramatic progress in the last few years. This UoS will provide an introduction to the principles of tissue engineering, as well as an up to date overview of recent progress in the field of tissue engineering 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**

Engineering and Information Technologies

**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 MECH5951  
**Assessment:** Through semester assessment (100%)  
**Campus:** Camperdown/Darlington  
**Mode of delivery:** Normal (lecture/lab/tutorial) Day

This UoS will give students a comprehensive understanding of finite element method, material constitutive modelling, CT/MRI based solid modelling, design analysis and optimisation, and their applications in biomedical engineering. The students are expected to expand their research and development skills in relevant topics, and gain
experience and skills in finite element software for the solution to sophisticated problems associated with biomedical engineering.

The objectives are:
1. Understanding of the nature of biomedical engineering problems;
2. Exploring CT/MRI image processing, solid modelling etc;
3. Understanding of finite element methods and developing FE models for biomedical engineering analysis;
4. Understanding biomaterials constitutive modelling;
5. Understanding bone remodelling simulation, fracture mechanics;
6. Developing prosthetic design optimisation;

AMME5990
Biomedical Engineering Tech 1
Engineering and Information Technologies

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%)
Campus: Camperdown/Darlington
Mode of delivery: Normal (lecture/lab/tutorial) Day

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

The objectives are:
1. To gain a broad understanding of biomedical product development within the regulatory framework.
2. To understand the challenges and difficulties of Good Manufacturing Practice.
3. Understand the purpose and conduct of preclinical and clinical testing.
4. To understand how each of these components fit together to support regulatory filings.

ENGG5231
Engineering Graduate Exchange A
Engineering and Information Technologies

Credit points: 6
Session: Int January, Int July
Classes: overseas short-course
Prerequisites: Permission from faculty and school.
Assessment: Through semester assessment (100%)
Campus: Camperdown/Darlington
Mode of delivery: Normal (lecture/lab/tutorial) Day
Note: Department permission required for enrolment.

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.

ENGG5232
Engineering Graduate Exchange B

Engineering and Information Technologies

Credit points: 6
Session: Int January, Int July
Classes: overseas short-course
Prerequisites: Permission from faculty and school.
Assessment: Through semester assessment (100%)
Campus: Camperdown/Darlington
Mode of delivery: Normal (lecture/lab/tutorial) Day
Note: Department permission required for enrolment.

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, 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.

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).
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.

<table>
<thead>
<tr>
<th>Unit of study</th>
<th>Credit points</th>
<th>A: Assumed knowledge</th>
<th>P: Prerequisites</th>
<th>C: Corequisites</th>
<th>N: Prohibition</th>
<th>Session</th>
</tr>
</thead>
<tbody>
<tr>
<td>ENGG5102 Entrepreneurship for Engineers</td>
<td>6</td>
<td>A Some limited industry experience is preferred but not a must.</td>
<td>N ELEC5701</td>
<td></td>
<td></td>
<td>Semester 1</td>
</tr>
<tr>
<td>ENGG5202 Sustainable Design, Eng and Mgt</td>
<td>6</td>
<td>A General knowledge in science and calculus and understanding of basic principles of chemistry, physics and mechanics</td>
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<td>Semester 1</td>
</tr>
<tr>
<td>ENGG5103 Safety Systems and Risk Analysis</td>
<td>6</td>
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<tr>
<td>FMGT5871 Project Process Planning and Control</td>
<td>6</td>
<td></td>
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<td>Int December, Int July, Semester 1, Semester 2, Summer Late</td>
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</tbody>
</table>

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.

<table>
<thead>
<tr>
<th>Unit of study</th>
<th>Credit points</th>
<th>A: Assumed knowledge</th>
<th>P: Prerequisites</th>
<th>C: Corequisites</th>
<th>N: Prohibition</th>
<th>Session</th>
</tr>
</thead>
<tbody>
<tr>
<td>ELEC5203 Topics in Power Engineering</td>
<td>6</td>
<td>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.</td>
<td></td>
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<td></td>
<td>Semester 2</td>
</tr>
<tr>
<td>ELEC5204 Power Systems Analysis and Protection</td>
<td>6</td>
<td>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.</td>
<td></td>
<td></td>
<td></td>
<td>Semester 1</td>
</tr>
<tr>
<td>ELEC5205 High Voltage Engineering</td>
<td>6</td>
<td>P ELEC3203, The following previous knowledge is assumed for this unit. Circuit analysis techniques, electricity networks, power system fundamentals.</td>
<td></td>
<td></td>
<td></td>
<td>Semester 2</td>
</tr>
<tr>
<td>ELEC5206 Sustainable Energy Systems</td>
<td>6</td>
<td>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.</td>
<td></td>
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<td></td>
<td>Semester 2</td>
</tr>
<tr>
<td>ELEC5207 Advanced Power Conversion Technologies</td>
<td>6</td>
<td>A Fundamentals of Power Electronics and Applications</td>
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<td>Semester 2</td>
</tr>
<tr>
<td>ELEC5208 Intelligent Electricity Networks</td>
<td>6</td>
<td>A Fundamentals of Electricity Networks, Control Systems and Telecommunications. Note: Department permission required for enrolment</td>
<td></td>
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<td></td>
<td>Semester 1</td>
</tr>
<tr>
<td>ELEC5211 Power Systems Dynamics and Control</td>
<td>6</td>
<td>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. P ELEC3203 or ELEC5732 or equivalent</td>
<td></td>
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<td></td>
<td>Semester 1</td>
</tr>
<tr>
<td>ELEC5212 Power Systems Planning and Markets</td>
<td>6</td>
<td>P ELEC3203 or ELEC5732 or equivalent</td>
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<td>Semester 2</td>
</tr>
</tbody>
</table>

Research units

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

<table>
<thead>
<tr>
<th>Unit of study</th>
<th>Credit points</th>
<th>A: Assumed knowledge</th>
<th>P: Prerequisites</th>
<th>C: Corequisites</th>
<th>N: Prohibition</th>
<th>Session</th>
</tr>
</thead>
<tbody>
<tr>
<td>ELEC5200 Capstone Project A</td>
<td>6</td>
<td>P 48 credits from MPE degree program</td>
<td></td>
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<td>Semester 1, Semester 2</td>
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<td>Note: Department permission required for enrolment</td>
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<tr>
<td>Unit of study</td>
<td>Credit points</td>
<td>A: Assumed knowledge</td>
<td>P: Prerequisites</td>
<td>C: Corequisites</td>
<td>N: Prohibition</td>
<td>Session</td>
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<tr>
<td>ELEC5021 Capstone Project B</td>
<td>6</td>
<td>C ELEC5020</td>
<td></td>
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<td>Semester 1, Semester 2</td>
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<td>Note: Department permission required for enrolment</td>
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<tr>
<td>ELEC5022 Capstone Project B Extended</td>
<td>12</td>
<td>P 42 credit points in the Master of Engineering and WAM &gt;70, or 66 credit points in the Master of Professional Engineering and WAM &gt;70 or exemption</td>
<td></td>
<td></td>
<td></td>
<td>Semester 1, Semester 2</td>
</tr>
<tr>
<td>ELEC5222 Dissertation A</td>
<td>12</td>
<td>N ELEC8901, ELEC8902, ENGG5222, ENGG5223</td>
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<td></td>
<td></td>
<td>Semester 1, Semester 2</td>
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<td></td>
<td></td>
<td>Note: Department permission required for enrolment</td>
<td>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.</td>
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<tr>
<td>ELEC5223 Dissertation B</td>
<td>12</td>
<td>N ELEC8901, ELEC8902, ENGG5222, ENGG5223</td>
<td></td>
<td></td>
<td></td>
<td>Semester 1, Semester 2</td>
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<tr>
<td></td>
<td></td>
<td>Note: Department permission required for enrolment</td>
<td>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.</td>
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</tbody>
</table>

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.

<table>
<thead>
<tr>
<th>Unit of study</th>
<th>Credit points</th>
<th>A: Assumed knowledge</th>
<th>P: Prerequisites</th>
<th>C: Corequisites</th>
<th>N: Prohibition</th>
<th>Session</th>
</tr>
</thead>
<tbody>
<tr>
<td>COMP5047 Pervasive Computing</td>
<td>6</td>
<td>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.</td>
<td></td>
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<td></td>
<td>Semester 2</td>
</tr>
<tr>
<td>COMP5416 Advanced Network Technologies</td>
<td>6</td>
<td>A COMP5116 OR ELEC3506</td>
<td></td>
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<td></td>
<td>Semester 2</td>
</tr>
<tr>
<td>COMP5426 Parallel and Distributed Computing</td>
<td>6</td>
<td>A COMP5116</td>
<td></td>
<td></td>
<td></td>
<td>Semester 1</td>
</tr>
<tr>
<td>ELEC5303 Computer System Design</td>
<td>6</td>
<td>A This unit assumes a basic knowledge of calculus, functions of real variables, Laplace transform, matrix theory and control theory.</td>
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<td></td>
<td>Semester 1</td>
</tr>
<tr>
<td>ELEC5402 Digital Integrated Circuit Design</td>
<td>6</td>
<td>A Electronic circuit design and physics of electronic devices.</td>
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<td>Semester 1</td>
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<tr>
<td></td>
<td></td>
<td>N ELEC4402</td>
<td>Note: Department permission required for enrolment</td>
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<tr>
<td>ELEC5403 Radio Frequency Engineering</td>
<td>6</td>
<td>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.</td>
<td></td>
<td></td>
<td></td>
<td>Semester 1</td>
</tr>
<tr>
<td>ELEC5507 Error Control Coding</td>
<td>6</td>
<td>A Basic knowledge on digital communications. Fundamental mathematics including probability theory and linear algebra.</td>
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<td></td>
<td>Semester 1</td>
</tr>
<tr>
<td>ELEC5508 Wireless Engineering</td>
<td>6</td>
<td>A Basic knowledge in probability and statistics, analog and digital communications, error probability calculation in communications channels, and telecommunications network.</td>
<td></td>
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<td></td>
<td>Semester 2</td>
</tr>
<tr>
<td>ELEC5509 Mobile Networks</td>
<td>6</td>
<td>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.</td>
<td></td>
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<td></td>
<td>Semester 1</td>
</tr>
<tr>
<td>ELEC5510 Satellite Communication Systems</td>
<td>6</td>
<td>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.</td>
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<td>Semester 2</td>
</tr>
<tr>
<td>ELEC5511 Optical Communication Systems</td>
<td>6</td>
<td>A</td>
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<td></td>
<td></td>
<td>Semester 1</td>
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<tr>
<td></td>
<td></td>
<td>(ELEC3505 Communications) and (ELEC3405 Communications Electronics and Photonics) or equivalent</td>
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<tr>
<td>ELEC5512 Optical Networks</td>
<td>6</td>
<td>A Knowledge of digital communications, wave propagation, and fundamental optics</td>
<td></td>
<td></td>
<td></td>
<td>Semester 2</td>
</tr>
<tr>
<td>ELEC5514 Networked Embedded Systems</td>
<td>6</td>
<td>A ELEC3305, ELEC3506, ELEC3607 and ELEC5508 or equivalent</td>
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<td></td>
<td></td>
<td>Semester 2</td>
</tr>
<tr>
<td>ELEC5614 Real Time Computing</td>
<td>6</td>
<td>A SOFT2130 Software Construction (or SOFT2004 Software Development Methods 1) and ELEC3607 Embedded Computing (or ELEC2601 Microprocessor Systems)</td>
<td></td>
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<td></td>
<td>Semester 1</td>
</tr>
<tr>
<td>ELEC5616 Computer and Network Security</td>
<td>6</td>
<td>A A programming language, basic maths.</td>
<td></td>
<td></td>
<td></td>
<td>Semester 1</td>
</tr>
<tr>
<td>ELEC5618 Software Quality Engineering</td>
<td>6</td>
<td>A You are capable of writing programs with multiple functions or methods in multiple files. You are capable of design complex data structures and combine them in non-trivial algorithms. You know how to use an integrated development environment. You are familiar and have worked previously with software version control systems. You know how to distribute the workload derived from the unit of study effectively throughout the week and make sure that time is truly productive.</td>
<td></td>
<td></td>
<td></td>
<td>Semester 1</td>
</tr>
<tr>
<td>ELEC5619 Object Oriented Application Frameworks</td>
<td>6</td>
<td>A Java programming, and some web development experience are essential. Databases strongly recommended</td>
<td></td>
<td></td>
<td></td>
<td>Semester 2</td>
</tr>
<tr>
<td>ELEC5620 Model Based Software Engineering</td>
<td>6</td>
<td>A A programming language, basic maths</td>
<td></td>
<td></td>
<td></td>
<td>Semester 2</td>
</tr>
<tr>
<td>ELEC5622 Signals, Software and Health</td>
<td>6</td>
<td>A Programming permission required for enrolment</td>
<td></td>
<td></td>
<td></td>
<td>Semester 2</td>
</tr>
<tr>
<td>Unit of study</td>
<td>Credit points</td>
<td>A: Assumed knowledge</td>
<td>P: Prerequisites</td>
<td>C: Corequisites</td>
<td>N: Prohibition</td>
<td>Session</td>
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<tr>
<td>ELEC5803 Advanced Bioelectronics</td>
<td>6</td>
<td>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.</td>
<td>ELEC2104 AND ELEC2602. Familiarity with transistor operations, basic electrical circuits, embedded programming is required. Note: Department permission required for enrolment</td>
<td></td>
<td></td>
<td>Semester 1</td>
</tr>
<tr>
<td>ENGG5231 Engineering Graduate Exchange A</td>
<td>6</td>
<td>P Permission from faculty and school. Note: Department permission required for enrolment</td>
<td></td>
<td></td>
<td></td>
<td>Int January</td>
</tr>
<tr>
<td>ENGG5232 Engineering Graduate Exchange B</td>
<td>6</td>
<td>P Permission from faculty and school. Note: Department permission required for enrolment</td>
<td></td>
<td></td>
<td></td>
<td>Int January</td>
</tr>
</tbody>
</table>

For more information on degree program requirements visit CUSP.
Unit of study table
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: Normal (lecture/lab/tutorial) Day Block mode July Int and Dec Int

Prohibitions: ELEC5701

Assumed knowledge: Some limited industry experience is preferred but not a must. Assessment: Through semester assessment (100%) Campus: Camperdown/Darlington Mode of delivery: Normal (lecture/lab/tutorial) Day

Associated degrees: Grad Cert E, M P E.

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.


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: 2 lectures per week, tutorials 2 hour per week and projects and self assisted learning (4 hours per week) Assumed knowledge: General knowledge in science and calculus and understanding of basic principles of chemistry, physics and mechanics Assessment: Through semester assessment (70%), Final Exam (30%) Campus: Camperdown/Darlington Mode of delivery: Normal (lecture/lab/tutorial) Day

Associated degrees: Grad Cert E, M P E.

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: 2hrs of Lectures per week, 2hrs of Tutorials per week Assessment: Through semester assessment (100%) Campus: Camperdown/Darlington Mode of delivery: Normal (lecture/lab/tutorial) Day

Associated degrees: Grad Cert I T, Grad Cert Inf Tech Man, Grad Cert P M, Grad Dip E, M Inf Tech Man, M P E.

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: Int December, Int July, Semester 1, Semester 2, Summer, Late Classes: Session 1: Evening, Online Session 2: Evening, Online, Block mode July Int and Dec Int : Block mode Assessment: Through session assessment (60%) , Final Exam (40%), Campus: Camperdown/Darlington Mode of delivery: Block Mode or On-line or Normal (lecture/lab/tutorial) Evening

Associated degrees: Grad Cert I T, Grad Cert Inf Tech Man, Grad Cert P M, Grad Dip E, M Inf Tech Man, M P E.

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
Engineering and Information Technologies
Credit points: 6 Session: Semester 2 Classes: 2 hours of lectures and 2 hour tutorial/laboratory per 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%) Campus: Camperdown/Darlington Mode of delivery: Normal (lecture/lab/tutorial) Day
Associated degrees: B E, Grad Cert E, M P E, UG Study Abroad Program.
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
Engineering and Information Technologies
Credit points: 6 Session: Semester 1 Classes: 2 hours of lectures and 1 hour tutorial per week, 2 hours laboratory per 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 (40%), Final Exam (60%) Campus: Camperdown/Darlington Mode of delivery: Normal (lecture/lab/tutorial) Day
Associated degrees: B E, Grad Cert E, M P E, UG Study Abroad Program.
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
Engineering and Information Technologies
Associated degrees: B E, Grad Cert E, M P E, PG Coursework Exchange.
The unit aims to cover advanced topics in power electronics and its 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

**Engineering and Information Technologies**

Credit points: 6 
Session: Semester 1 
Classes: 2hr lectures per week, 1 hr of tutorial per week. 
Assumed knowledge: Fundamentals of Electricity Networks, Control Systems and Telecommunications

**Assessment:** Through semester assessment (40%), Final Exam (60%)

**Campus:** Camperdown/Darlington 
**Mode of delivery:** Normal (lecture/lab/tutorial) Day

**Note:** Department permission required for enrolment.

**Associated degrees:** B E, Grad Cert E, M P E.

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 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

**Engineering and Information Technologies**

Credit points: 6 
Session: Semester 1 
Classes: 2hr lectures per week, 2hr Tutorial per week; 3hr Laboratory per fortnight. 
**Prerequisites:** ELEC3203 or ELEC5732 or equivalent

**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 (40%), Final Exam (60%)

**Campus:** Camperdown/Darlington 
**Mode of delivery:** Normal (lecture/lab/tutorial) Day

**Note:** Department permission required for enrolment.

**Associated degrees:** B E, Grad Cert E, M P E.

- 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; Voltage stability; Frequency stability; Small signal stability.
- Power system control: Voltage control; Frequency control; Power system stabilizers; 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

**Engineering and Information Technologies**

Credit points: 6 
Session: Semester 2 
Classes: 2hr lecture per week; 2hr tutorial per week; 2hr Laboratory per fortnight. 
**Prerequisites:** ELEC3203 or ELEC5732 or equivalent

**Assessment:** Through semester assessment (55%), Final Exam (45%)

**Campus:** Camperdown/Darlington 
**Mode of delivery:** Normal (lecture/lab/tutorial) Day

**Associated degrees:** B E, Grad Cert E, M P E.

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. The increasing penetration of intermittent renewable energy sources has further increased the complexity. To equip the student with the 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 and unit commitment; Power system reliability.
- Drivers for the restructuring of the electricity industry.
- Electricity market design: Market structures (spot, bilateral, hybrid)
  - Energy market; Ancillary services market.
- Electricity industry in Australia and the National Electricity Market.
- Power system expansion planning: Transmission planning; Generation planning; Power system adequacy assessment.
- Distribution systems: Modern developments (distributed generation, demand management).

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).

**Research units**

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

**ELEC5020**

Capstone Project A

**Engineering and Information Technologies**

Credit points: 6 
Session: Semester 1, Semester 2 
Classes: Independent project work. 
**Prerequisites:** 48 credits from MPE degree program

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

**Campus:** Camperdown/Darlington 
**Mode of delivery:** Supervision

**Note:** Department permission required for enrolment.

**Associated degrees:** M E, M P E.

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

**Engineering and Information Technologies**

Credit points: 6 
Session: Semester 1, Semester 2 
Classes: Independent project work. 
**Corequisites:** ELEC5020

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

**Campus:** Camperdown/Darlington 
**Mode of delivery:** Supervision

**Note:** Department permission required for enrolment.
Associated degrees: M E, M P E.

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
Engineering and Information Technologies
Credit points: 12 Session: Semester 1, Semester 2 Classes: 0 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 Assessment: Through semester assessment (100%) Campus: Camperdown/Darlington Mode of delivery: Supervision
Note: Department permission required for enrolment.

Associated degrees: M E, M P E.

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.

ELEC5222
Dissertation A
Engineering and Information Technologies
Credit points: 12 Session: Semester 1, Semester 2 Classes: 0 formal classes Prerequisites: ELEC8901, ELEC8902, ENGG5222, ENG5223 Assessment: Through semester assessment (100%) Campus: Camperdown/Darlington 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.

Associated degrees: M E, M P E.

To complete a substantial research project and successfully analyse a problem, devise appropriate experiments, analyse the results and produce a well-argued, in-depth thesis. Department permission required for enrolment in the following session(s); 1,2

ELEC5223
Dissertation B
Engineering and Information Technologies
Credit points: 12 Session: Semester 1, Semester 2 Classes: 0 formal classes Prerequisites: ELEC8901, ELEC8902, ENGG5222, ENG5223 Assessment: Through semester assessment (100%) Campus: Camperdown/Darlington 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.

Associated degrees: M E, M P E.

To complete a substantial research project and successfully analyse a problem, devise appropriate experiments, analyse the results and produce a well-argued, in-depth thesis. Department permission required for enrolment in the following session(s); 1,2

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
Engineering and Information Technologies
Credit points: 6 Session: Semester 2 Classes: 3hr integrated lecture and practical session Prohibitions: NETS4047 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%) Campus: Camperdown/Darlington Mode of delivery: Normal (lecture/lab/tutorial) Day
Associated degrees: B C S T (Hons), B E, B I T (Hons), B Sc (Hons), Grad Cert I T, M P E.

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.

COMP5146
Advanced Network Technologies
Engineering and Information Technologies
Credit points: 6 Session: Semester 2 Classes: (Lec 2hrs & Prac 1hr) per week Assumed knowledge: COMP5116 OR ELEC5006 Assessment: Through semester assessment (40%), Final Exam (60%) Campus: Camperdown/Darlington Mode of delivery: Normal (lecture/lab/tutorial) Day
Associated degrees: B C S T (Hons), B E, B I T (Hons), B Psych (Hons), B Sc (Hons), Grad Cert I T, Grad Dip E.

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
Engineering and Information Technologies
Credit points: 6 Session: Semester 1 Classes: (Lec 2hrs & Prac 1hr) per week Assumed knowledge: COMP5116 Assessment: Through semester assessment (40%), Final Exam (60%) Campus: Camperdown/Darlington Mode of delivery: Normal (lecture/lab/tutorial) Day
Associated degrees: B C S T (Hons), B E, B I T (Hons), B Psych (Hons), B Sc (Hons), Grad Cert E, Grad Cert I T, M P E.

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
Engineering and Information Technologies
Credit points: 6 Session: Semester 1 Classes: 2 hours of lectures and a 2 hours lab/tutorial per 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%) Campus: Camperdown/Darlington Mode of delivery: Normal (lecture/lab/tutorial) Day
Associated degrees: B E, Grad Cert E, Grad Cert I T, M P E, PG Coursework Exchange.
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.


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 implementations.

ELEC5402 Digital Integrated Circuit Design Engineering and Information Technologies

This unit of study is not available in 2014

Credit points: 6 Session: Semester 1 Classes: 2 hours of lectures and a 2 hours project work in class per week. Prohibitions: ELEC4402 Assumed knowledge: Electronic circuit design and physics of electronic devices. Assessment: Lab Skills (70%), Final Exam (30%) Campus: Camperdown/Darlington Mode of delivery: Normal (lecture/lab/tutorial) Day Note: Department permission required for enrolment.

Associated degrees: B E, Grad Cert E, Grad Cert I T, M P E, PG Coursework Exchange.

This unit of study explores CMOS technology and integrated circuit design and fabrication. The fundamental theory and techniques behind digital integrated circuit design are introduced. A primary focus of this unit is providing the student with practical laboratory design experience using a professional VLSI CAD tool to design digital integrated circuits. This unit provides a foundation for more advanced digital integrated circuit design techniques and also analogue integrated circuit design.

Topics covered in this unit are: IC manufacturing process and CMOS technology, CMOS static logic design, CMOS dynamic logic design, arithmetic building block design, sequential logic design, VLSI interconnection and wiring issues, timing issues, digital memory design, digital system design methodologies.

ELEC5403 Radio Frequency Engineering Engineering and Information Technologies

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

Associated degrees: B E, Grad Cert E, M P E, PG Coursework Exchange.

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 Engineering and Information Technologies

Credit points: 6 Session: Semester 1 Classes: 2 hours of lectures and a 1 hour tutorial per week. Assumed knowledge: Basic knowledge on digital communications. Fundamental mathematics including probability theory and linear algebra. Assessment: Through semester assessment (50%), Final Exam (50%) Campus: Camperdown/Darlington Mode of delivery: Normal (lecture/lab/tutorial) Day

Associated degrees: B E, Grad Cert E, Grad Cert I T, M P E, PG Coursework Exchange.

This unit deals with the principles of error control coding techniques and their applications in various communication and data storage systems. Its aim is to present the fundamentals of error control coding techniques and develop theoretical and practical skills in the design of error control encoders/decoders. Successful completion of this unit will facilitate progression to advanced study or to work in the fields of telecommunications and computer engineering. It is assumed that the students have some background in communications principles and probability theory.

The following topics are covered. Introduction to error control coding, linear algebra. Linear block codes, cyclic codes, BCH codes, Reed-Solomon codes, burst-error correcting codes, design of codes for block codes, applications of block codes in communications and digital recording. Convolutional codes, Viterbi algorithm, design of codes for convolutional codes, applications of convolutional codes in communications, soft decision decoding of block and convolutional codes, trellis coded modulation, block coded modulation, design of codes for trellis codes, applications of trellis codes in data transmission. Turbo codes and applications to space and mobile communications.

ELEC5508 Wireless Engineering Engineering and Information Technologies

Credit points: 6 Session: Semester 2 Classes: 2 hours of lectures and a 1 hour tutorial per 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%) Campus: Camperdown/Darlington Mode of delivery: Normal (lecture/lab/tutorial) Day

Associated degrees: B C S T (Hons), B E, B I T (Hons), Grad Cert E, Grad Cert I T, M P E, PG Coursework Exchange.

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.


ELEC5509 Mobile Networks
Unit of study descriptions

Engineering and Information Technologies
Credit points: 6  Session: Semester 1  Classes: 2 hours of lecture and a 2 hours tutorial/project meeting per 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: Throug... 40%, Final Exam (60%)  Campus: Camperdown/Darlington  Mode of delivery: Normal (lecture/lab/tutorial) Day

Associated degrees: B C S T (Hons), B E, B I T (Hons), Grad Cert E, Grad Cert I T, M P E, PG Coursework Exchange.

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
Engineering and Information Technologies
Credit points: 6  Session: Semester 2  Classes: 2 hours of lectures,1 hour tutorial per week, 3 hour site visit during semester.  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%)  Campus: Camperdown/Darlington  Mode of delivery: Normal (lecture/lab/tutorial) Day

Associated degrees: B E, Grad Cert E, Grad Cert I T, M P E, PG Coursework Exchange.

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
Engineering and Information Technologies
Credit points: 6  Session: Semester 1  Classes: 2 hours of lectures and 2 hours laboratory/tutorial per week.  Assumed knowledge: (ELEC3505 Communications) and (ELEC3405 Communications and Photonics) or equivalent  Assessment: Through semester assessment (25%), Final Exam (75%)  Campus: Camperdown/Darlington  Mode of delivery: Normal (lecture/lab/tutorial) Day

Associated degrees: B E, Grad Cert E, Grad Cert I T, M P E, PG Coursework Exchange.

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
Engineering and Information Technologies
Credit points: 6  Session: Semester 2  Classes: 2 hours of lectures and 1 hour laboratory/tutorial per week.  Assumed knowledge: Knowledge of digital communications, wave propagation, and fundamental optics  Assessment: Through semester assessment (25%), Final Exam (75%)  Campus: Camperdown/Darlington  Mode of delivery: Normal (lecture/lab/tutorial) Day

Associated degrees: B E, Grad Cert E, Grad Cert I T, M P E, PG Coursework Exchange.

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 design. 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, 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
Engineering and Information Technologies
Credit points: 6  Session: Semester 2  Classes: 2 hours lecture and 2 hours lab per week.  Assumed knowledge: ELEC3305, ELEC3506, ELEC3607 and ELEC5508 or equivalent  Assessment: Through semester assessment (60%), Final Exam (40%)  Campus: Camperdown/Darlington  Mode of delivery: Normal (lecture/lab/tutorial) Day

Associated degrees: B C S T (Hons), B E, B I T (Hons), Grad Cert E, Grad Cert I T, M P E, PG Coursework Exchange.

This unit aim to teach the fundamentals concepts associated with:
*Networked Embedded Systems, wireless sensor networks
*Wireless channel propagation and radio power consumption
*Wireless networks, ZigBee, Bluetooth, etc.
*Sensor principle, data fusion, source detection and identification
*Multiple source detection, multiple access communications.
*Network topology, routing, network information theory
*Networked systems, 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. Student involvement with projects will expose them to the usage of simulators and/or programming some types of networked embedded systems platforms.
distribute the workload derived from the unit of study effectively throughout the project.

how to use an integrated development environment. You are familiar and have experience with multiple functions or methods in multiple files. You are capable of designing and controlling the flow of execution in a program.

Credit points: 6

Session: Semester 1

Assessment: Final Exam (70%)

Campus: Camperdown/Darlington

Mode of delivery: Normal (lecture/lab/tutorial) Day

ELEC5614
Real Time Computing

Engineering and Information Technologies

Credit points: 6

Session: Semester 1

Classes: 2 hours of lectures, 1 hour tutorial per week, 2 hours labs per week.

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%)

Campus: Camperdown/Darlington

Mode of delivery: Normal (lecture/lab/tutorial) Day

Associated degrees: B C S T (Hons), B E, B I T (Hons), Grad Cert E, Grad Cert I T, M P E, PG Coursework Exchange.

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.


ELEC5616

Computer and Network Security

Engineering and Information Technologies

Credit points: 6

Session: Semester 1

Classes: 2 hours of lectures, 1 hour of tutorial and 2 hours labs per week.

Assumed knowledge: A programming language, basic maths.

Assessment: Through semester assessment (50%), Final Exam (50%)

Campus: Camperdown/Darlington

Mode of delivery: Normal (lecture/lab/tutorial) Day

Associated degrees: B C S T (Hons), B E, B I T (Hons), Grad Cert E, Grad Cert I T, M P E, PG Coursework Exchange.

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

Engineering and Information Technologies

Credit points: 6

Session: Semester 1

Classes: 2 hours lecture and 2 hours tutorials per week.

Assumed knowledge: You are capable of writing programs with multiple functions or methods in multiple files. You are capable of designing complex data structures and combine them in non trivial algorithms. You know how to use an integrated development environment. You are familiar and have worked previously with software version control systems. You know how to distribute the workload derived from the unit of study effectively throughout the week and make sure that time is truly productive.

Assessment: Through semester assessment (30%), Final Exam (70%)

Campus: Camperdown/Darlington

Mode of delivery: Normal (lecture/lab/tutorial) Day

Associated degrees: B C S T (Hons), B E, B I T (Hons), Grad Cert I T, Grad Dip E, M P E, UG Study Abroad Program.

This unit will cover software quality planning, validation and verification methods and techniques, risk analysis, software review techniques, software standards and software process improvement and software reliability. The unit covers testing and quality assurance from a unit testing/developer-based focus up to an overall quality process overview of the software development life cycle. Students who successfully complete this unit will: understand the fundamental concepts of software quality, be able to assess the quality of a software design, be acquainted with methods of building for quality and be able to verify and test a unit of code through familiarity with unit testing strategies and understanding software quality assurance as a rigorous and structured formal process.

ELEC5619

Object Oriented Application Frameworks

Engineering and Information Technologies

Credit points: 6

Session: Semester 2

Classes: 3 hours project work in class per week.

Assumed knowledge: Java programming, and some web development experience are essential.

Databases strongly recommended.

Assessment: Through semester assessment (100%)

Campus: Camperdown/Darlington

Mode of delivery: Normal (lecture/lab/tutorial) Day

Associated degrees: B E, Grad Cert I T, Grad Dip E, M P E, UG Study Abroad Program.

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.

Note: Department permission required for enrolment.

ELEC5620

Model Based Software Engineering

Engineering and Information Technologies

Credit points: 6

Session: Semester 2

Classes: 2 hours lectures, 1 hour of tutorial and 2 hours labs per week.

Assumed knowledge: A programming language, basic maths.

Assessment: Through semester assessment (50%), Final Exam (50%)

Campus: Camperdown/Darlington

Mode of delivery: Normal (lecture/lab/tutorial) Day

Note: Department permission required for enrolment.

Associated degrees: B E, B I T, Grad Cert E, M P E.

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  
Engineering and Information Technologies  
Credit points: 6  
Session: Semester 2  
Classes: 3 hr project work session per week, 3 hr tutorials/labs per week.  
Assessment: Through semester assessment (100%)  
Campus: Camperdown/Darlington  
Mode of delivery: Normal (lecture/lab/tutorial) Day  
Associated degrees: B E, Grad Cert E, M P E.  

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  
Engineering and Information Technologies  
Credit points: 6  
Session: Semester 1  
Lectures per week, 2 hr Lab/Tutorial per week.  
Prerequisites: ELEC2104 AND ELEC2602. Familiarity with transistor operations, basic electrical circuits, embedded programming is required.  
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%)  
Campus: Camperdown/Darlington  
Mode of delivery: Normal (lecture/lab/tutorial) Day  
Note: Department permission required for enrolment.  
Associated degrees: B E, Grad Cert E.  

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.

ENGG5232  
Engineering Graduate Exchange B  
Engineering and Information Technologies  
Credit points: 6  
Session: Int January, Int July  
Classes: overseas short-course  
Prerequisites: Permission from faculty and school.  
Assessment: Through semester assessment (100%)  
Campus: Camperdown/Darlington  
Mode of delivery: Normal (lecture/lab/tutorial) Day  
Note: Department permission required for enrolment.  
Associated degrees: M E, M Inf Tech, M Inf Tech Man, M P E, M P L, M P M.  

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.

ENNG5231  
Engineering Graduate Exchange A  
Engineering and Information Technologies  
Credit points: 6  
Session: Int January, Int July  
Classes: overseas short-course.  
Prerequisites: Permission from faculty and school.  
Assessment: Through semester assessment (100%)  
Campus: Camperdown/Darlington  
Mode of delivery: Normal (lecture/lab/tutorial) Day  
Note: Department permission required for enrolment.  
Associated degrees: M E, M Inf Tech, M Inf Tech Man, M P E, M P L, M P M.  

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).
### 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.

<table>
<thead>
<tr>
<th>Unit of study</th>
<th>Credit points</th>
<th>A: Assumed knowledge</th>
<th>P: Prerequisites</th>
<th>C: Corequisites</th>
<th>N: Prohibition</th>
<th>Session</th>
</tr>
</thead>
<tbody>
<tr>
<td>ENGG5102 Entrepreneurship for Engineers</td>
<td>6</td>
<td>A Some limited industry experience is preferred but not a must.</td>
<td></td>
<td></td>
<td></td>
<td>Semester 1</td>
</tr>
<tr>
<td>ENGG5202 Sustainable Design, Eng and Mgt</td>
<td>6</td>
<td>A General knowledge in science and calculus and understanding of basic principles of chemistry, physics and mechanics</td>
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<td></td>
<td>Semester 1</td>
</tr>
<tr>
<td>ENGG5103 Safety Systems and Risk Analysis</td>
<td>6</td>
<td></td>
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<td></td>
<td>Semester 2</td>
</tr>
<tr>
<td>PMGT5871 Project Process Planning and Control</td>
<td>6</td>
<td></td>
<td></td>
<td></td>
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<td>Int December</td>
</tr>
</tbody>
</table>

### 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.

<table>
<thead>
<tr>
<th>Unit of study</th>
<th>Credit points</th>
<th>A: Assumed knowledge</th>
<th>P: Prerequisites</th>
<th>C: Corequisites</th>
<th>N: Prohibition</th>
<th>Session</th>
</tr>
</thead>
<tbody>
<tr>
<td>ELEC5614 Real Time Computing</td>
<td>6</td>
<td>A SOFT2130 Software Construction (or SOFT2004 Software Development Methods 1) and ELEC3607 Embedded Computing (or ELEC2601 Microprocessor Systems)</td>
<td></td>
<td></td>
<td></td>
<td>Semester 1</td>
</tr>
<tr>
<td>ELEC5618 Software Quality Engineering</td>
<td>6</td>
<td>A You are capable of writing programs with multiple functions or methods in multiple files. You are capable of design complex data structures and combine them in non trivial algorithms. You know how to use an integrated development environment. You are familiar and have worked previously with software version control systems. You know how to distribute the workload derived from the unit of study effectively throughout the week and make sure that time is truly productive.</td>
<td></td>
<td></td>
<td></td>
<td>Semester 1</td>
</tr>
<tr>
<td>ELEC5619 Object Oriented Application Frameworks</td>
<td>6</td>
<td>A Java programming, and some web development experience are essential. Databases strongly recommended</td>
<td></td>
<td></td>
<td></td>
<td>Semester 2</td>
</tr>
<tr>
<td>ELEC5620 Model Based Software Engineering</td>
<td>6</td>
<td>A A programming language, basic maths</td>
<td>Note: Department permission required for enrolment</td>
<td></td>
<td></td>
<td>Semester 2</td>
</tr>
<tr>
<td>COMP5047 Pervasive Computing</td>
<td>6</td>
<td>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.</td>
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<td></td>
<td></td>
<td>Semester 2</td>
</tr>
<tr>
<td>COMP5416 Advanced Network Technologies</td>
<td>6</td>
<td>A COMP5116 OR ELEC3506</td>
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<td>Semester 2</td>
</tr>
<tr>
<td>COMP5424 Information Technology in Biomedicine</td>
<td>6</td>
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<td></td>
<td>Semester 1</td>
</tr>
</tbody>
</table>

### Research units

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

<table>
<thead>
<tr>
<th>Unit of study</th>
<th>Credit points</th>
<th>A: Assumed knowledge</th>
<th>P: Prerequisites</th>
<th>C: Corequisites</th>
<th>N: Prohibition</th>
<th>Session</th>
</tr>
</thead>
<tbody>
<tr>
<td>ELEC5020 Capstone Project A</td>
<td>6</td>
<td>P 48 credits from MPE degree program</td>
<td>Note: Department permission required for enrolment</td>
<td></td>
<td></td>
<td>Semester 1</td>
</tr>
<tr>
<td>ELEC5021 Capstone Project B</td>
<td>6</td>
<td>C ELEC5020</td>
<td>Note: Department permission required for enrolment</td>
<td></td>
<td></td>
<td>Semester 2</td>
</tr>
</tbody>
</table>
## Unit of study table

<table>
<thead>
<tr>
<th>Unit of study</th>
<th>Credit points</th>
<th>A: Assumed knowledge</th>
<th>P: Prerequisites</th>
<th>C: Corequisites</th>
<th>N: Prohibition</th>
<th>Session</th>
</tr>
</thead>
<tbody>
<tr>
<td>ELEC5022 Capstone Project B Extended</td>
<td>12</td>
<td>P 42 credit points in the Master of Engineering and WAM &gt;70, or 68 credit points in the Master of Professional Engineering and WAM &gt;70 or exemption</td>
<td>Note: Department permission required for enrolment</td>
<td></td>
<td></td>
<td>Semester 1 Semester 2</td>
</tr>
<tr>
<td>ELEC5222 Dissertation A</td>
<td>12</td>
<td>N ELEC8901, ELEC8902, ENGS5222, ENGS5223</td>
<td>Note: Department permission required for enrolment</td>
<td></td>
<td></td>
<td>Semester 1 Semester 2</td>
</tr>
<tr>
<td>ELEC5223 Dissertation B</td>
<td>12</td>
<td>N ELEC8901, ELEC8902, ENGS5222, ENGS5223</td>
<td>Note: Department permission required for enrolment</td>
<td></td>
<td></td>
<td>Semester 1 Semester 2</td>
</tr>
</tbody>
</table>

With permission from the Head of Department candidates progressing with distinction (75%) average or higher results may replace ELEC5020, ELEC2021 and 12 ct 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.

<table>
<thead>
<tr>
<th>Unit of study</th>
<th>Credit points</th>
<th>A: Assumed knowledge</th>
<th>P: Prerequisites</th>
<th>C: Corequisites</th>
<th>N: Prohibition</th>
<th>Session</th>
</tr>
</thead>
<tbody>
<tr>
<td>COMP5116 Design of Networks &amp; Distributed Systems</td>
<td>6</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Semester 1 Semester 2</td>
</tr>
<tr>
<td>COMP5211 Algorithms</td>
<td>6</td>
<td>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.</td>
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<td></td>
<td></td>
<td>Semester 1 Semester 2</td>
</tr>
<tr>
<td>COMP5214 Software Development in Java</td>
<td>6</td>
<td></td>
<td></td>
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<td></td>
<td>Semester 1 Semester 2</td>
</tr>
<tr>
<td>COMP5347 e-Commerce Technology</td>
<td>6</td>
<td>A COMP5028. The course assumes basic knowledge on OO design and UML diagrams.</td>
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<td></td>
<td>Semester 1</td>
</tr>
<tr>
<td>COMP5348 Enterprise Scale Software Architecture</td>
<td>6</td>
<td>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.</td>
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<td></td>
<td>Semester 1</td>
</tr>
<tr>
<td>COMP5426 Parallel and Distributed Computing</td>
<td>6</td>
<td>A COMP5116</td>
<td></td>
<td></td>
<td></td>
<td>Semester 1</td>
</tr>
<tr>
<td>COMP5456 Introduction to Bioinformatics</td>
<td>6</td>
<td>A Some experience with basic programming (coding) in Java, C, C++ or Perl. Some proven ability in mathematical or information sciences (as evidenced in the prerequisites): Some knowledge of molecular biology either through first year BIOL papers or MBLG1001. N COMP3496</td>
<td></td>
<td></td>
<td></td>
<td>Semester 1</td>
</tr>
<tr>
<td>ELEC506 Sustainable Energy Systems</td>
<td>6</td>
<td>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.</td>
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<td></td>
<td>Semester 2</td>
</tr>
<tr>
<td>ELEC5208 Intelligent Electricity Networks</td>
<td>6</td>
<td>A This unit assumes a basic knowledge of calculus, functions of real variables, Laplace transform, matrix theory and control theory.</td>
<td>Note: Department permission required for enrolment</td>
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<td></td>
<td>Semester 1</td>
</tr>
<tr>
<td>ELEC5303 Computer Control System Design</td>
<td>6</td>
<td>A This unit assumes a basic knowledge of calculus, functions of real variables, Laplace</td>
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<td></td>
<td>Semester 1</td>
</tr>
<tr>
<td>ELEC5308 Wireless Engineering</td>
<td>6</td>
<td>A Basic knowledge in probability and statistics, analog and digital communications, error probability calculation in communications channels, and telecommunications networks.</td>
<td></td>
<td></td>
<td></td>
<td>Semester 2</td>
</tr>
<tr>
<td>ELEC5509 Mobile Networks</td>
<td>6</td>
<td>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.</td>
<td></td>
<td></td>
<td></td>
<td>Semester 1</td>
</tr>
<tr>
<td>ELEC5510 Satellite Communication Systems</td>
<td>6</td>
<td>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.</td>
<td></td>
<td></td>
<td></td>
<td>Semester 2</td>
</tr>
<tr>
<td>ELEC5514 Networked Embedded Systems</td>
<td>6</td>
<td>A ELEC3305, ELEC3506, ELEC6307 and ELEC5508 or equivalent</td>
<td></td>
<td></td>
<td></td>
<td>Semester 2</td>
</tr>
<tr>
<td>ELEC5616 Computer and Network Security</td>
<td>6</td>
<td>A A programming language, basic maths.</td>
<td></td>
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<td></td>
<td>Semester 1</td>
</tr>
<tr>
<td>ELEC5622 Signals, Software and Health</td>
<td>6</td>
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<td></td>
<td>Semester 2</td>
</tr>
<tr>
<td>ELEC5701 Technology Venture Creation</td>
<td>6</td>
<td>N ENGS5102</td>
<td></td>
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<td></td>
<td>Semester 2</td>
</tr>
<tr>
<td>ENGS5231 Engineering Graduate Exchange A</td>
<td>6</td>
<td>P Permission from faculty and school. Note: Department permission required for enrolment</td>
<td></td>
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<td></td>
<td>Int January Int July</td>
</tr>
<tr>
<td>ENGS5232 Engineering Graduate Exchange B</td>
<td>6</td>
<td>P Permission from faculty and school. Note: Department permission required for enrolment</td>
<td></td>
<td></td>
<td></td>
<td>Int January Int July</td>
</tr>
<tr>
<td>INFO5010 IT Advanced Topic A</td>
<td>6</td>
<td>A Good programming skills, especially in Java for the practical assignment, as well as proficiency in databases and SQL. P Permission of Head of School N INFO4010 Note: Department permission required for enrolment</td>
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<td>Semester 1 Semester 2</td>
</tr>
<tr>
<td>INFO6010 Advanced Topics in IT Project Management</td>
<td>6</td>
<td>A Students are assumed to understand the role of IT projects. P INFO6007, OR 3-5 years working experience in IT Project Management</td>
<td></td>
<td></td>
<td></td>
<td>Semester 2 Summer Late</td>
</tr>
<tr>
<td>Unit of study</td>
<td>Credit points</td>
<td>A: Assumed knowledge</td>
<td>P: Prerequisites</td>
<td>C: Corequisites</td>
<td>N: Prohibition</td>
<td>Session</td>
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<td>INFS6004 Business Transformation Projects</td>
<td>6</td>
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<td>Semester 1</td>
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For more information on degree program requirements visit CUSP.
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

Engineering and Information Technologies

Credit points: 6 Session: Semester 1 Classes: 2hr Lectures per week, 2hr Tutorials per week Prohibitions: ELEC5701 Assumed knowledge: Some limited industry experience is preferred but not a must. Assessment: Through semester assessment (100%) Campus: Camperdown/Darlington Mode of delivery: Normal (lecture/lab/tutorial) Day

Associated degrees: Grad Cert E.

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.


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

ENGG5202
Sustainable Design, Eng and Mgt

Engineering and Information Technologies

Credit points: 6 Session: Semester 1 Classes: 2 lectures per week, tutorials 2 hour per week and projects and self assisted learning (4 hours per week) Assumed knowledge: General knowledge in science and calculus and understanding of basic principles of chemistry, physics and mechanics Assessment: Through semester assessment (70%), Final Exam (30%) Campus: Camperdown/Darlington Mode of delivery: Normal (lecture/lab/tutorial) Day

Associated degrees: Grad Cert E, M P E.

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

Engineering and Information Technologies

Credit points: 6 Session: Semester 2 Classes: 2hrs of Lectures per week, 2hrs of Tutorials per week Assessment: Through semester assessment (100%) Campus: Camperdown/Darlington Mode of delivery: Normal (lecture/lab/tutorial) Day

Associated degrees: Grad Cert E, M P E.

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

Engineering and Information Technologies

Credit points: 6 Session: Int December, Int July, Semester 1, Semester 2, Summer Late Classes: Session 1: Evening, Online Session 2: Evening, Online, Block mode July Int and Dec Int : Block mode Assessment: Through session assessment (60%), Final Exam (40%). Campus: Camperdown/Darlington Mode of delivery: Block Mode or On-line or Normal (lecture/lab/tutorial) Evening

Associated degrees: Grad Cert I T, Grad Cert Inf Tech Man, Grad Cert P M, Grad Dip E, M Int Tech Man, M P E.

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.

**ELEC5614 Real Time Computing**

**Engineering and Information Technologies**

**Credit points:** 6  
**Session:** Semester 1  
**Classes:** 2 hours lecture and 2 hours tutorials per week.  
**Assumed knowledge:** Java programming, and some previous experience with software version control systems. You know how to write programs in multiple languages.  
**Assessment:** Through semester assessment (60%), Final Exam (40%)  
**Campus:** Camperdown/Darlington  
**Mode of delivery:** Normal (lecture/lab/tutorial) Day

**Associated degrees:** B E, B I T (Hons), Grad Cert E, Grad Cert I T, M P E, PG Coursework Exchange

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.


**ELEC5618 Software Quality Engineering**

**Engineering and Information Technologies**

**Credit points:** 6  
**Session:** Semester 1  
**Classes:** 2 hours lecture and 2 hours tutorials per week.  
**Assumed knowledge:** You are capable of writing programs with multiple functions and methods in multiple files. You are capable of design complex data structures and combine them in non-trivial algorithms. You know how to use an integrated development environment. You are familiar and have worked previously with software version control systems. You know how to distribute the workload derived from the unit of study effectively throughout the week and make sure that time is truly productive.  
**Assessment:** Through semester assessment (70%), Final Exam (30%)  
**Campus:** Camperdown/Darlington  
**Mode of delivery:** Normal (lecture/lab/tutorial) Day

**Associated degrees:** B C S T (Hons), B E, B I T (Hons), Grad Cert I T, Grad Dip E, M P E, UG Study Abroad Program

This unit will cover software quality planning, validation and verification methods and techniques, risk analysis, software review techniques, software standards and software process improvement and software reliability. The unit covers testing and quality assurance from a unit testing/developer-based focus up to an overall quality process overview of the software development life cycle. Students who successfully complete this unit will: understand the fundamental concepts of software quality, be able to assess the quality of a software design, be acquainted with methods of building for quality and be able to verify and test a unit of code through familiarity with unit testing strategies and understanding software quality assurance as a rigorous and structured formal process.

**ELEC5619 Object Oriented Application Frameworks**

**Engineering and Information Technologies**

**Credit points:** 6  
**Session:** Semester 2  
**Classes:** 5 hours project work in class per week.  
**Assumed knowledge:** Java programming, and some web development experience are essential. Databases strongly recommended.  
**Assessment:** Through semester assessment (100%)  
**Campus:** Camperdown/Darlington  
**Mode of delivery:** Normal (lecture/lab/tutorial) Day

**Associated degrees:** B C S T (Hons), B E, B I T (Hons), B Sc (Hons), Grad Cert I T, M P E

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**

**Engineering and Information Technologies**

**Credit points:** 6  
**Session:** Semester 2  
**Classes:** 2 hours lecture, 1 hour of tutorial and 2 hours lab/project work in class per week.  
**Assumed knowledge:** A programming language, basic maths  
**Assessment:** Through semester assessment (50%), Final Exam (50%)  
**Campus:** Camperdown/Darlington  
**Mode of delivery:** Normal (lecture/lab/tutorial) Day

**Note:** Department permission required for enrolment

**Associated degrees:** B E, B I T, Grad Cert E, M P E

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 project group, 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.

**COMP5047 Pervasive Computing**

**Engineering and Information Technologies**

**Credit points:** 6  
**Session:** Semester 2  
**Classes:** 3hr integrated lecture and practical session  
**Prohibitions:** NETS4047  
**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%)  
**Campus:** Camperdown/Darlington  
**Mode of delivery:** Normal (lecture/lab/tutorial) Day

**Associated degrees:** B C S T (Hons), B E, B I T (Hons), Graduate Certificate in IT, M P E, UG Study Abroad Program

This unit is concerned with the practical and theoretical aspects of real-time computer systems as applied to the design of embedded systems and computer control systems in engineering, manufacturing and automation.
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
Engineering and Information Technologies
Credit points: 6 Session: Semester 2 Classes: (Lec 2hrs & Prac 1hr) per week
Assumed knowledge: COMP5116 OR ELEC3506 Assessment: Through semester assessment (40%), Final Exam (60%) Campus: Camperdown/Darlington Mode of delivery: Normal (lecture/lab/tutorial) Day
Associated degrees: B C S T (Hons), B E, B I T (Hons), B Psych (Hons), B Sc (Hons), Grad Cert I T, Grad Dip E.

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
Engineering and Information Technologies
Credit points: 6 Session: Semester 1 Classes: (Lec 2hrs & Tut 1hr) per week Assessment: Through semester assessment (40%), Final Exam (60%) Campus: Camperdown/Darlington Mode of delivery: Normal (lecture/lab/tutorial) Day
Associated degrees: B C S T (Hons), B E, B I T (Hons), B Psych (Hons), B Sc (Hons), Grad Cert I T, Grad Dip I T, M Appl Sc (Bioinformatics).

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 biomedical 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.

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

ELEC5020
Capstone Project A
Engineering and Information Technologies
Credit points: 6 Session: Semester 1, Semester 2 Classes: Independent project work. Prerequisites: 48 credits from MPE degree program Assessment: Through semester assessment (100%) Campus: Camperdown/Darlington Mode of delivery: Supervision
Note: Department permission required for enrolment.
Associated degrees: M E, M P E.

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
Engineering and Information Technologies
Credit points: 6 Session: Semester 1, Semester 2 Classes: Independent project work. Corequisites: ELEC5020 Assessment: Through semester assessment (100%) Campus: Camperdown/Darlington Mode of delivery: Supervision
Note: Department permission required for enrolment.
Associated degrees: M E, M P E.

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
Engineering and Information Technologies
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 Assessment: Through semester assessment (100%) Campus: Camperdown/Darlington Mode of delivery: Supervision
Note: Department permission required for enrolment.
Associated degrees: M E, M P E.

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.

ELEC5222
Dissertation A
Engineering and Information Technologies
Credit points: 12 Session: Semester 1, Semester 2 Classes: no formal classes Prohibitions: ELEC8901, ELEC8902, ENGG5222, ENGG5223 Assessment: Through semester assessment (100%) Campus: Camperdown/Darlington 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.
Associated degrees: M E, M P E.

To complete a substantial research project and successfully analyse a problem, devise appropriate experiments, analyse the results and produce a well-argued, in-depth thesis.
Department permission required for enrolment in the following session(s): 1,2

ELEC5223
Dissertation B
Engineering and Information Technologies
Credit points: 12 Session: Semester 1, Semester 2 Classes: no formal classes Prohibitions: ELEC8901, ELEC8902, ENGG5222, ENGG5223 Assessment: Through semester assessment (100%) Campus: Camperdown/Darlington 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.
Associated degrees: M E, M P E.

To complete a substantial research project and successfully analyse a problem, devise appropriate experiments, analyse the results and produce a well-argued, in-depth thesis.
Department permission required for enrolment in the following session(s): 1,2
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

**Engineering and Information Technologies**

**Credit points:** 6  **Session:** Semester 1, Semester 2  **Classes:** One 2 hour lecture and one 1 hour tutorial per week.  **Assessment:** Semester assessment (40%), Final Exam (60%)  **Campus:** Camperdown/Darlington  **Mode of delivery:** Normal (lecture/lab/tutorial) Day

**Associated degrees:** B.E, Grad Cert E, Grad Cert IT T, Grad Cert IT Tech Man, Grad Dip Comp, M I D M, M P E.

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

**Engineering and Information Technologies**

**Credit points:** 6  **Session:** Semester 1, Semester 2  **Classes:** One 2 hour lecture 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%)  **Campus:** Camperdown/Darlington  **Mode of delivery:** Normal (lecture/lab/tutorial) Day

**Associated degrees:** B.E, Grad Cert D C C, Grad Cert IT T, Grad Dip Comp, Grad Dip E (Prof Eng), M Appl Sc (Bioinformatics), M I D M, M Inf Tech, M P E, PG Coursework Exchange.

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.

COMP5214 Software Development in Java

**Engineering and Information Technologies**

**Credit points:** 6  **Session:** Semester 1, Semester 2  **Classes:** One 2 hour lecture and one 1 hour tutorial per week.  **Assessment:** Through semester assessment (40%), Final Exam (60%)  **Campus:** Camperdown/Darlington  **Mode of delivery:** Normal (lecture/lab/tutorial) Day

**Associated degrees:** B.E, Grad Cert D C C, Grad Cert IT T, Grad Dip Comp, M I D M, M Inf Tech, M P E, PG Coursework Exchange.

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.

COMP5347 e-Commerce Technology

**Engineering and Information Technologies**

**Credit points:** 6  **Session:** Semester 1  **Classes:** One 2 hour lecture and one 1 hour tutorial per week.  **Assumed knowledge:** COMP5028. The course assumes basic knowledge on OO design and UML diagrams.  **Assessment:** Through semester assessment (40%), Final Exam (60%)  **Campus:** Camperdown/Darlington  **Mode of delivery:** Normal (lecture/lab/tutorial) Day

**Associated degrees:** B E, B I T (Hons), B Psych (Hons), B Sc (Hons), Grad Cert IT T, PG Coursework Exchange.

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 hands-on experiences for the technologies covered.

COMP5348 Enterprise Scale Software Architecture

**Engineering and Information Technologies**

**Credit points:** 6  **Session:** Semester 1  **Classes:** (Lec 2hrs & Prac 1hr) per 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%)  **Campus:** Camperdown/Darlington  **Mode of delivery:** Normal (lecture/lab/tutorial) Day

**Associated degrees:** B C S T (Hons), B E, B I T (Hons), B Psych (Hons), B Sc (Hons), Grad Cert IT T, M P E.

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 if 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

**Engineering and Information Technologies**

**Credit points:** 6  **Session:** Semester 1  **Classes:** (Lec 2hrs & Prac 1hr) per week  **Assumed knowledge:** COMP5116  **Assessment:** Through semester assessment (40%), Final Exam (60%)  **Campus:** Camperdown/Darlington  **Mode of delivery:** Normal (lecture/lab/tutorial) Day

**Associated degrees:** B C S T (Hons), B E, B I T (Hons), B Psych (Hons), B Sc (Hons), Grad Cert IT T, M P E.

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

**Engineering and Information Technologies**

**Credit points:** 6  **Session:** Semester 1  **Classes:** (Lec 1hr per week)  **Assessment:** Through semester assessment (40%), Final Exam (60%)  **Campus:** Camperdown/Darlington  **Mode of delivery:** Normal (lecture/lab/tutorial) Day

**Associated degrees:** B C S T (Hons), Grad Cert E, Grad Cert IT T, M P E.

The unit also provides students with the ability to undertake more advanced topics and courses on high performance computing.
This unit builds upon the knowledge of engineering mathematics, electronics devices and circuit theory and simulation techniques. It deals with both technical and business aspects of sustainable electrical energy systems. Technical aspects of such energy conversion and electrical characteristics of different renewable energy sources, in addition to the integration of multiple energy resources into power system, are covered in the first semester and transmission levels. In business aspects, 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 in electronics and electrical power (energy) 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; grid-connected; microturbines; fuel cells; renewable energy sources: solar, wind, hydro, biomass, wind turbines; photovoltaic; grid-connected power systems; stand-alone power systems.

ELEC508
Intelligent Electricity Networks
Engineering and Information Technologies
Credit points: 6 Session: Semester 1 Classes: 2hr lectures per week, 1 hr tutorial per week. Assumed knowledge: This unit assumes a basic knowledge of probability and statistics, analog and digital communications, error probability calculation in communications channels, and telecommunications network. Assessment: Through semester assessment (40%), Final Exam (60%) Mode of delivery: Normal (lecture/lab/tutorial) Day. Associated degrees: B E, Grad Cert E, M P E.

Wireless Engineering
Engineering and Information Technologies
Credit points: 6 Session: Semester 2 Classes: 2 hours of lectures and a 2 hour tutorial per week. Assumed knowledge: This unit assumes a basic knowledge of probability and statistics, analog and digital communications, error probability calculation in communications channels, and telecommunications network. Assessment: Through semester assessment (40%), Final Exam (60%) Mode of delivery: Normal (lecture/lab/tutorial) Day. Associated degrees: B C S T (Hons), B E, B I T (Hons), Grad Cert E, Grad Cert I T, M P E, PG Coursework Exchange.

Wireless Engineering
Engineering and Information Technologies
Credit points: 6 Session: Semester 2 Classes: 2 hours of lectures and a 2 hour tutorial per week. Assumed knowledge: This unit assumes a basic knowledge of probability and statistics, analog and digital communications, error probability calculation in communications channels, and telecommunications network. Assessment: Through semester assessment (40%), Final Exam (60%) Mode of delivery: Normal (lecture/lab/tutorial) Day. Associated degrees: B C S T (Hons), B E, B I T (Hons), Grad Cert E, Grad Cert I T, M P E, PG Coursework Exchange.

Unit of study descriptions

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ELEC5509 Mobile Networks

Engineering and Information Technologies

Credit points: 6 Session: Semester 2 Classes: 2 hours of lecture and a 2 hours tutorial/project meeting per 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%) Campus: Camperdown/Darlington Mode of delivery: Normal (lecture/lab/tutorial) Day

Associated degrees: B C S T (Hons), B E, B I T (Hons), Grad Cert E, Grad Cert I T, M P E, PG Coursework Exchange.

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

Engineering and Information Technologies

Credit points: 6 Session: Semester 2 Classes: 2 hours of lectures,1 hour tutorial per week. 3 hour site visit during semester. Assumed knowledge: Knowledge of error probabilities, analog and digital modulation techniques and error performance evaluation studied in ELEC3505 Communications and ELEC4905 Digital Communication Systems, is assumed. Assessment: Through semester assessment (30%), Final Exam (70%) Campus: Camperdown/Darlington Mode of delivery: Normal (lecture/lab/tutorial) Day

Associated degrees: B E, Grad Cert E, Grad Cert I T, M P E, PG Coursework Exchange.

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.
Engineering and Information Technologies.
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

Engineering and Information Technologies
Credit points: 6 Session: Int January, Int July Classes: overseas short-course
Prerequisites: Permission from faculty and school. Assessment: Through semester assessment (100%) Campus: Camperdown/Darlington Mode of delivery: Normal (lecture/lab/tutorial) Day
Note: Department permission required for enrolment.

Associated degrees: M E, M Inf Tech, M Inf Tech Man, M P E, M P L, M P M.

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

Engineering and Information Technologies
Credit points: 6 Session: Semester 1, Semester 2 Classes: One 2 hour scheduled small-group class per week. Prerequisites: Permission of Head of School Prohibitions: INFO4010 Assumed knowledge: Good programming skills, especially in Java for the practical assignment, as well as proficiency in databases and SQL. Assessment: Through semester assessment (60%), Final Exam (40%) Campus: Camperdown/Darlington Mode of delivery: Normal (lecture/lab/tutorial) Day
Note: Department permission required for enrolment.

Associated degrees: B C S T (Hons), B I T (Hons), B Sc (Hons), M Inf Tech, M Inf Tech Man.

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, Force.com, 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.

INFO6010 Advanced Topics in IT Project Management

Engineering and Information Technologies
Credit points: 6 Session: Semester 2, Summer Late Classes: 2 hours lectures, 1 hour tutorial, 1 hour e-Learning per 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%) Campus: Camperdown/Darlington 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
Business (Business School)
Credit points: 6  Session: Semester 1  Classes: 1x 3hr seminar per week
Assessment: individual research assignment (15%), individual problem-based assignment (35%), and group problem-based assignment (50%)  Campus: Camperdown/Darlington  Mode of delivery: Normal (lecture/lab/tutorial) Day

Associated degrees: Grad Dip Com, M Com, PG Coursework Exchange.

The forces that currently drive business transformation, such as globalization, 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 you will learn how to analyse an organisation within a local and global context and develop your 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.
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 include 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).
### 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:

<table>
<thead>
<tr>
<th>Core units</th>
<th>Specialist units</th>
<th>Research units</th>
</tr>
</thead>
</table>

#### Core units

Candidates must complete 24 credit points of Core units.

- **ENGG5102 Entrepreneurship for Engineers**: 6 credit points  
  - A: Some limited industry experience is preferred but not a must.
  - Semester 1

- **ENGG5202 Sustainable Design, Eng and Mgt**: 6 credit points  
  - 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 credit points  
  - Semester 2

- **PMGT5871 Project Process Planning and Control**: 6 credit points  
  - Int December, Int July, Semester 1, Semester 2, Summer Late

- **Specialist units**

Candidates must complete 24 credit points of Specialist units, but may take additional units as Electives.

- **CIVL5257 Concrete Structures: Prestressed**: 6 credit points  
  - Semester 1

- **CIVL5264 Composite Steel-Concrete Structures**: 6 credit points  
  - Semester 2

- **CIVL5267 Steel Structures - Advanced Design**: 6 credit points  
  - Semester 1

- **CIVL5266 Structural Dynamics**: 6 credit points  
  - 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 credit points  
  - P: 48 credits from MPE degree program.
  - Note: Department permission required for enrolment.
  - Semester 1

- **CIVL5021 Capstone Project B**: 6 credit points  
  - C: CIVL5020.
  - Note: Department permission required for enrolment.
  - Semester 1

- **CIVL5022 Capstone Project B Extended**: 12 credit points  
  - 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

- **CIVL5222 Dissertation A**: 12 credit points  
  - 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

- **CIVL5223 Dissertation B**: 12 credit points  
  - 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
## 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.

<table>
<thead>
<tr>
<th>Unit of study</th>
<th>Credit points</th>
<th>A: Assumed knowledge</th>
<th>P: Prerequisites</th>
<th>C: Corequisites</th>
<th>N: Prohibition</th>
<th>Session</th>
</tr>
</thead>
<tbody>
<tr>
<td>AMME5202 Advanced Computational Fluid Dynamics</td>
<td>6</td>
<td>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.</td>
<td></td>
<td></td>
<td></td>
<td>Semester 1</td>
</tr>
<tr>
<td>CIVL5266 Steel Structures - Stability</td>
<td>6</td>
<td>A Knowledge: CIVL2201 AND CIVL3206 AND CIVL3235. There are no prerequisites for this unit of study but it is assumed that students are competent in the content covered in CIVL2201 Structural Mechanics, CIVL3206 Steel Structures 1, and CIVL3235 Structural Analysis. Students who have failed previous units of study should note that no special consideration will be given to them if they do choose to enrol in this unit of study (on the basis of timetable clashes of lack of knowledge of basics), and they are discouraged from enrolling in this unit of study. Students who have not yet passed first, second or third year units of study must enrol in those units of study in precedence to any later year units of study.</td>
<td></td>
<td></td>
<td></td>
<td>Semester 1</td>
</tr>
<tr>
<td>CIVL5269 Concrete Structures - Strength &amp; Service</td>
<td>6</td>
<td>P CIVL3205 OR CIVL5507</td>
<td></td>
<td></td>
<td></td>
<td>Semester 2</td>
</tr>
<tr>
<td>CIVL5351 Geoenvironmental Engineering</td>
<td>6</td>
<td></td>
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<td></td>
<td>Semester 1</td>
</tr>
<tr>
<td>CIVL5452 Foundation Engineering</td>
<td>6</td>
<td>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)</td>
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<td></td>
<td>Semester 2</td>
</tr>
<tr>
<td>CIVL5458 Numerical Methods in Civil Engineering</td>
<td>6</td>
<td>A CIVL3612.</td>
<td></td>
<td></td>
<td></td>
<td>Semester 1</td>
</tr>
<tr>
<td>CIVL5665 Advanced Water Resources Management</td>
<td>6</td>
<td>A CIVL3612.</td>
<td></td>
<td></td>
<td></td>
<td>Semester 2</td>
</tr>
<tr>
<td>CIVL5670 Reservoir Stream &amp; Coastal Eng</td>
<td>6</td>
<td>A CIVL3612 AND MATH2061. Students who have previously studied CIVL3613 will only be permitted to enrol in this unit by approval of the Director of Undergraduate Studies.</td>
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<td></td>
<td></td>
<td>Semester 1</td>
</tr>
<tr>
<td>ENGG5231 Engineering Graduate Exchange A</td>
<td>6</td>
<td>P Permission from faculty and school. Note: Department permission required for enrolment</td>
<td></td>
<td></td>
<td></td>
<td>Int January</td>
</tr>
<tr>
<td>ENGG5232 Engineering Graduate Exchange B</td>
<td>6</td>
<td>P Permission from faculty and school. Note: Department permission required for enrolment</td>
<td></td>
<td></td>
<td></td>
<td>Int January</td>
</tr>
</tbody>
</table>

For more information on degree program requirements visit CUSP.
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
Engineering and Information Technologies

Credit points: 6 Session: Semester 1 Classes: 2hr Lectures per week, 2hr Tutorials per week Prohibitions: ELEC5701 Assumed knowledge: Some limited industry experience is preferred but not a must. Assessment: Through semester assessment (100%) Campus: Camperdown/Darlington Mode of delivery: Normal (lecture/lab/tutorial) Day

Associated degrees: Grad Cert E.

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.


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

ENGG5202 Sustainable Design, Eng and Mgt
Engineering and Information Technologies

Credit points: 6 Session: Semester 1 Classes: 2 lectures per week, tutorials 2 hour per week and projects and self assisted learning (4 hours per week) Assumed knowledge: General knowledge in science and calculus and understanding of basic principles of chemistry, physics and mechanics Assessment: Through semester assessment (70%), Final Exam (30%) Campus: Camperdown/Darlington Mode of delivery: Normal (lecture/lab/tutorial) Day

Associated degrees: Grad Cert E, M P E.

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
Engineering and Information Technologies

Credit points: 6 Session: Semester 2 Classes: 2hrs of Lectures per week, 2hrs of Tutorials per week Assessment: Through semester assessment (100%) Campus: Camperdown/Darlington Mode of delivery: Normal (lecture/lab/tutorial) Day

Associated degrees: Grad Cert E, M P E.

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
Engineering and Information Technologies

Credit points: 6 Session: Int December, Int July, Semester 1, Semester 2, Summer Late Classes: Session 1: Evening, Online Session 2: Evening, Online, Block mode July Int and Dec Int : Block mode Assessment: Through session assessment (60%) , Final Exam (40%). Campus: Camperdown/Darlington Mode of delivery: Block Mode or On-line or Normal (lecture/lab/tutorial) Evening

Associated degrees: Grad Cert I T, Grad Cert Int Tech Man, Grad Cert P M, Grad Dip E, M Inf Tech Man, M P E.

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 Engineering and Information Technologies

Credit points: 6 Session: Semester 1 Classes: Lectures 2hrs per week, Project Work – in class 1hr per week. Assessment: Through semester assessment (60%), Final Exam (40%) Campus: Camperdown/Darlington Mode of delivery: Normal (lecture/lab/tutorial) Day

Associated degrees: B E, Grad Cert E, M P E

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

Engineering and Information Technologies

Credit points: 6 Teacher/Coordinator: Dr G Ranzi Session: Semester 2 Classes: Lectures 2hrs per week, Tutorial 1hr per week. Assessment: Through semester assessment (100%) Campus: Camperdown/Darlington Mode of delivery: Normal (lecture/lab/tutorial) Day

Associated degrees: B E, Grad Cert E, M P E, PG Coursework Exchange

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

CIVL5267
Steel Structures - Advanced Design

Engineering and Information Technologies

Credit points: 6 Session: Semester 1 Classes: 3hr combined lecture and tutorial per week. Assessment: Through semester assessment (50%), Final Exam (50%) Campus: Camperdown/Darlington Mode of delivery: Normal (lecture/lab/tutorial) Day

Associated degrees: B E, Grad Cert E, M P E, PG Coursework Exchange

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

Engineering and Information Technologies

Credit points: 6 Session: Semester 2 Classes: 3-hr combined lecture and tutorial per week. Assessment: Through semester assessment (65%), Final Exam (35%) Campus: Camperdown/Darlington Mode of delivery: Normal (lecture/lab/tutorial) Day

Associated degrees: B E, Grad Cert E, M P E, PG Coursework Exchange

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 Parts 4 of the Australian loading standard AS1170 for determining earthquake loads.

Outcomes: This Unit will provide students with the following knowledge and skills:
- Understanding of the fundamental concepts and definitions used in structural dynamics
- Ability to calculate the natural frequency of a system using equilibrium or energy methods
- Ability to determine the effect of viscous damping on the response of a freely vibrating system
- Ability to determine the response of a system to a harmonic excitation
- 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

Engineering and Information Technologies

Credit points: 6 Session: Semester 1, Semester 2 Classes: Independent project work. Prerequisites: 48 credits from MPE degree program Assessment: Through semester assessment (100%) Campus: Camperdown/Darlington Mode of delivery: Supervision

Note: Department permission required for enrolment

Associated degrees: M E, M P E

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
Engineering and Information Technologies

Credit points: 6 Session: Semester 1, Semester 2 Classes: Independent project work. Corequisites: CIVL5020 Assessment: Through semester assessment (100%) Campus: Camperdown/Darlington Mode of delivery: Supervision

Note: Department permission required for enrolment.

Associated degrees: M E, M P E.

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
Engineering and Information Technologies

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 Assessment: Through semester assessment (100%) Campus: Camperdown/Darlington Mode of delivery: Supervision

Note: Department permission required for enrolment.

Associated degrees: M P E, M P L.

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
Engineering and Information Technologies

Credit points: 12 Session: Semester 1, Semester 2 Classes: no formal classes Prohibitions: ENGG5220, ENGG5221 Assessment: Through semester assessment (100%) Campus: Camperdown/Darlington 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.

Associated degrees: M E, M P E.

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.

CIVL5223
Dissertation B

Engineering and Information Technologies
Credit points: 12 Session: Semester 1, Semester 2 Classes: no formal classes Prohibitions: ENGG5220, ENGG5221 Assessment: Through semester assessment (100%) Campus: Camperdown/Darlington 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.

Associated degrees: M E, M P E.

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.

AMME5202
Advanced Computational Fluid Dynamics
Engineering and Information Technologies

Credit points: 6 Session: Semester 1 Classes: Lectures: 1 hour per week; Tutorials: 1 hour per week; Laboratory Sessions: 2 hours per week Assumed knowledge: Partial differential equations; Finite difference methods; Taylor series; Basic fluid mechanics including pressure, velocity, boundary layers, separated and recirculating flows. Basic computer programming skills. Assessment: Through semester assessment (100%) Campus: Camperdown/Darlington Mode of delivery: Normal (lecture/lab/tutorial) Day

Associated degrees: B E, Grad Cert E, M P E, PG Coursework Exchange.

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. A set of laboratory tasks will take the student through a series of increasingly complex flow simulations, requiring an understanding of the basic theory of computational fluid dynamics (CFD). The laboratory tasks will be complemented by a series of lectures in which the basic theory is covered, including: governing equations; finite difference methods accuracy and stability for the advection equation, diffusion equation; direct and iterative solution techniques; solution of the full Navier-Stokes equations; turbulent flow; Cartesian tensors; turbulence models.

CIVL5266
Steel Structures - Stability
Engineering and Information Technologies

Credit points: 6 Session: Semester 1 Classes: 2 hrs of lecture and 2hrs of tutorial/laboratory per week. Assumed knowledge: Knowledge: CIVL2201 AND CIVL3206 AND CIVL3235. There are no prerequisites for this unit of study but it is assumed that students are competent in the content covered in CIVL2201 Structural Mechanics, CIVL3206 Steel Structures 1, and CIVL3235 Structural Analysis. Students who have failed previous units of study should note that no special consideration will be given to them if they do choose to enrol in this unit of study (on the basis of timetable clashes or lack of knowledge of basics), and they are discouraged from enrolling in this unit of study. Students who have not yet passed first, second or third year units of study must enrol in those units of
study in precedence to any later year units of study. Assessment: Through semester assessment (30%), Final Exam (70%) 
Campus: Camperdown/Darlington Mode of delivery: Normal (lecture/lab/tutorial) Day

Associated degrees: B E, Grad Cert E, M P E, PG Coursework Exchange.

Objectives: 
This Unit aims to:

- provide fundamental understanding at advanced level of the behaviour and design of 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 
Engineering and Information Technologies

Credit points: 6 Session: Semester 2 Classes: 4-hr combined lecture and tutorial per week. Prerequisites: CIVL3205 OR CIVL5507 Assessment: Through semester assessment (50%), Final Exam (50%) 
Campus: Camperdown/Darlington Mode of delivery: Normal (lecture/lab/tutorial) Day

Associated degrees: B E, Grad Cert E, M P E, PG Coursework Exchange.

Objectives: This Unit reviews the fundamental concepts of ‘elastic’ behaviour of reinforced concrete structures and introduces models of behaviour and methods of analysis related to the time-dependent effects of creep and shrinkage (at service loads). This Unit also examines the non-linear (strain-softening) behaviour of reinforced concrete and the related effects concerning the strength of statically-indeterminate reinforced concrete structures. In particular, this Unit examines the concepts of ductility, moment redistribution and plastic design (for beams and slabs). Strut-and-tie modelling of reinforced concrete members is also described.

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 
Engineering and Information Technologies

Credit points: 6 Session: Semester 1 Classes: 4 hours of lectures/project work per week. Assessment: Through semester assessment (100%) 
Campus: Camperdown/Darlington Mode of delivery: Normal (lecture/lab/tutorial) Day

Associated degrees: B E, Grad Cert E, M P E.

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 of a 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 
Engineering and Information Technologies

Credit points: 6 Session: Semester 2 Classes: Lectures 3 hrs per week, presented in 2 sessions per week for 11 weeks of semester. Tutorials 1hr per week. Assumed knowledge: 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%) 
Campus: Camperdown/Darlington Mode of delivery: Normal (lecture/lab/tutorial) Day

Associated degrees: B E, Grad Cert E, M P E.

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; to 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 
Engineering and Information Technologies

Credit points: 6 Session: Semester 1 Classes: 2 hrs lecture, 2hr. tutorial and laboratory per week. Assessment: Through semester assessment (100%) 
Campus: Camperdown/Darlington Mode of delivery: Normal (lecture/lab/tutorial) Day

Associated degrees: B E, Grad Cert E, M P E.

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

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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 axisymmetric; 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.


5. Extended knowledge of the application of FE to solve civil engineering problems.

CIVL5665
Advanced Water Resources Management

Engineering and Information Technologies

Credit points: 6 Session: Semester 2 Classes: 2 hours of lectures and 1 hour of tutorials per week. Assumed knowledge: CIVL3612. Assessment: Through semester assessment (50%), Final Exam (50%) Campus: Camperdown/Darlington Mode of delivery: Normal (lecture/lab/tutorial) Day

Associated degrees: B E, Grad Cert App Sc (Enviro Sci), Grad Cert E, M Appl Sc (Env Sc), M P E.

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.

CIVL5670
Reservoir Stream & Coastal Eng

Engineering and Information Technologies

Credit points: 6 Session: Semester 1 Classes: Lectures 2 hours per week, Tutorials 2 hours per week. Assumed knowledge: CIVL3612 AND MATH2061. Assessment: Through semester assessment (40%), Final Exam (60%) Campus: Camperdown/Darlington Mode of delivery: Normal (lecture/lab/tutorial) Day

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

Associated degrees: B E, Grad Cert E, M P E, PG Coursework Exchange.

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

Engineering and Information Technologies


Note: Department permission required for enrolment.

Associated degrees: M E, M Inf Tech, M Inf Tech Man, M P E, M P L, M P M.

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

Engineering and Information Technologies


Note: Department permission required for enrolment.

Associated degrees: M E, M Inf Tech, M Inf Tech Man, M P E, M P L, M P M.

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.
Course overview
A postgraduate major in Sustainability and Environmental Engineering will be 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).
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.

<table>
<thead>
<tr>
<th>Unit of study</th>
<th>Credit points</th>
<th>A: Assumed knowledge</th>
<th>P: Prerequisites</th>
<th>C: Corequisites</th>
<th>N: Prohibition</th>
<th>Session</th>
</tr>
</thead>
<tbody>
<tr>
<td>ENGG5102 Entrepreneurship for Engineers</td>
<td>6</td>
<td>A Limited industry experience is preferred but not a must.</td>
<td>N ELEC5701</td>
<td></td>
<td></td>
<td>Semester 1</td>
</tr>
<tr>
<td>ENGG5202 Sustainable Design, Eng and Mgt</td>
<td>6</td>
<td>A General knowledge in science and calculus and understanding of basic principles of chemistry, physics and mechanics</td>
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<td>Semester 1</td>
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<tr>
<td>ENGG5103 Safety Systems and Risk Analysis</td>
<td>6</td>
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<td></td>
<td>Semester 2</td>
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<tr>
<td>PMGT5871 Project Process Planning and Control</td>
<td>6</td>
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<td>Int December Int July Semester 1 Semester 2 Semester 2 Summer Late</td>
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</tbody>
</table>

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.

<table>
<thead>
<tr>
<th>Unit of study</th>
<th>Credit points</th>
<th>A: Assumed knowledge</th>
<th>P: Prerequisites</th>
<th>C: Corequisites</th>
<th>N: Prohibition</th>
<th>Session</th>
</tr>
</thead>
<tbody>
<tr>
<td>CHNG5003 Green Engineering</td>
<td>6</td>
<td>A CHNG3801 AND CHNG3802 AND CHNG3803 AND CHNG3805 AND CHNG3806 AND CHNG3807. All core third year chemical engineering.</td>
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<td>Semester 2</td>
</tr>
<tr>
<td>CHNG5004 Particles and Surfaces</td>
<td>6</td>
<td>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</td>
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<td></td>
<td>Semester 1</td>
</tr>
<tr>
<td>CHNG5005 Wastewater Eng - Systems and Practice</td>
<td>6</td>
<td>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.</td>
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<td>Semester 1</td>
</tr>
<tr>
<td>CHNG5006 Advanced Wastewater Engineering</td>
<td>6</td>
<td>A CHNG5005 OR CHNG3804.</td>
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<td>Semester 2</td>
</tr>
<tr>
<td>CHNG5008 Chemical &amp; Biomolecular Engineering Adv</td>
<td>6</td>
<td>P CHNG5801 OR (CHNG3802 AND CHNG3805 AND CHNG3806) Note: Department permission required for enrolment</td>
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<td>Semester 2</td>
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<tr>
<td>CHNG5601 Membrane Science</td>
<td>6</td>
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<td>Semester 1</td>
</tr>
<tr>
<td>CHNG5604 Membrane Science Laboratory</td>
<td>6</td>
<td>A CHNG5601</td>
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<td>Semester 2</td>
</tr>
</tbody>
</table>

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

<table>
<thead>
<tr>
<th>Unit of study</th>
<th>Credit points</th>
<th>A: Assumed knowledge</th>
<th>P: Prerequisites</th>
<th>C: Corequisites</th>
<th>N: Prohibition</th>
<th>Session</th>
</tr>
</thead>
<tbody>
<tr>
<td>CHNG5020 Capstone Project A</td>
<td>6</td>
<td>A CHNG5801 AND CHNG5802 AND CHNG5803 AND CHNG5805 AND CHNG5806. P Completion of 24 credits of ME or exemption, or 42 credits of MPE Note: Department permission required for enrolment</td>
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<td></td>
<td>Semester 1 Semester 2</td>
</tr>
</tbody>
</table>
### Unit of Study Table

<table>
<thead>
<tr>
<th>Unit of Study</th>
<th>Credit Points</th>
<th>A: Assumed Knowledge</th>
<th>P: Prerequisites</th>
<th>C: Corequisites</th>
<th>N: Prohibition</th>
<th>Session</th>
</tr>
</thead>
<tbody>
<tr>
<td>CHNG5021 Capstone Project B</td>
<td>6</td>
<td>A Enrolment in this unit of study assumes that Capstone Project A has been successfully completed.</td>
<td>P CHNG5020</td>
<td></td>
<td></td>
<td>Semester 1, 2</td>
</tr>
<tr>
<td>CHNG5022 Capstone Project B Extended</td>
<td>12</td>
<td>P 42 credit points in the Master of Engineering and WAM &gt;70, or 66 credit points in the Master of Professional Engineering and WAM &gt;70 or exemption</td>
<td>C CHNG5020</td>
<td></td>
<td></td>
<td>Semester 1, 2</td>
</tr>
<tr>
<td>CHNG5222 Dissertation A</td>
<td>12</td>
<td>N ENG5220, ENG5221. Note: Department permission required for enrolment</td>
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<td></td>
<td></td>
<td>Semester 1, 2</td>
</tr>
<tr>
<td>CHNG5223 Dissertation B</td>
<td>12</td>
<td>N ENGG5220, ENG5222. Note: Department permission required for enrolment</td>
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<td></td>
<td></td>
<td>Semester 1, 2</td>
</tr>
<tr>
<td></td>
<td></td>
<td>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 &amp; AMME5223, Dissertation A &amp; B.</td>
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</tbody>
</table>

### 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.

<table>
<thead>
<tr>
<th>Unit of Study</th>
<th>Credit Points</th>
<th>A: Assumed Knowledge</th>
<th>P: Prerequisites</th>
<th>C: Corequisites</th>
<th>N: Prohibition</th>
<th>Session</th>
</tr>
</thead>
<tbody>
<tr>
<td>CHNG5001 Process Systems Engineering</td>
<td>6</td>
<td>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.</td>
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<td></td>
<td>Semester 2</td>
</tr>
<tr>
<td>CHNG5002 Cellular Biophysics</td>
<td>6</td>
<td>Note: Department permission required for enrolment</td>
<td></td>
<td></td>
<td></td>
<td>Semester 1</td>
</tr>
<tr>
<td>CHNG5003 Analysis, Modelling, Control: BioPhy Sys</td>
<td>6</td>
<td>A It is assumed that students have a general knowledge of: MATH 1001 Differential Calculus MATH 1003 Integral Calculus and Modeling</td>
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<td></td>
<td>Semester 1</td>
</tr>
<tr>
<td>CHNG5005 Bio-Products: Laboratory to Marketplace</td>
<td>6</td>
<td>This course is for Master degree students and also is offered as an elective course for fourth year students.</td>
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<td></td>
<td>Semester 2</td>
</tr>
<tr>
<td>CIVL5670 Reservoir Stream &amp; Coastal Eng</td>
<td>6</td>
<td>A CIVL3612 AND MATH2061. Students who have previously studied CIVL3613 will only be permitted to enrol in this unit by approval of the Director of Undergraduate Studies.)</td>
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<td></td>
<td>Semester 1</td>
</tr>
<tr>
<td>ENGG5216 Management of Engineering Innovation</td>
<td>6</td>
<td>A Sound competence in all aspects of engineering, and some understanding of issues of engineering management</td>
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<td></td>
<td>Semester 1</td>
</tr>
<tr>
<td>ENGG5231 Engineering Graduate Exchange A</td>
<td>6</td>
<td>P Permission from faculty and school. Note: Department permission required for enrolment</td>
<td></td>
<td></td>
<td></td>
<td>Int January, July</td>
</tr>
<tr>
<td>ENGG5232 Engineering Graduate Exchange B</td>
<td>6</td>
<td>P Permission from faculty and school. Note: Department permission required for enrolment</td>
<td></td>
<td></td>
<td></td>
<td>Int January, July</td>
</tr>
<tr>
<td>MECH5275 Advanced Renewable Energy</td>
<td>6</td>
<td>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.</td>
<td>P MECH5202 or MECH5200</td>
<td></td>
<td></td>
<td>Semester 2</td>
</tr>
</tbody>
</table>

For more information on degree program requirements visit CUSP.
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

Engineering and Information Technologies

Credit points: 6 Session: Semester 1 Classes: 2hrs Lectures per week, 2hr Tutorials per week Prohibitions: ELEC5701 Assumed knowledge: Some limited industry experience is preferred but not a must. Campus: Camperdown/Darlington Mode of delivery: Normal (lecture/lab/tutorial) Day

Associated degrees: Grad Cert E, M P E.

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.


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

ENGG5202
Sustainable Design, Eng and Mgt

Engineering and Information Technologies

Credit points: 6 Session: Semester 1 Classes: 2 lectures per week, tutorials 2 hour per week and projects and self assisted learning (4 hours per week) Assumed knowledge: General knowledge in science and calculus and understanding of basic principles of chemistry, physics and mechanics. Campus: Camperdown/Darlington Mode of delivery: Normal (lecture/lab/tutorial) Day

Associated degrees: Grad Cert E, M P E.

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

Engineering and Information Technologies

Credit points: 6 Session: Semester 2 Classes: 2hrs Lectures per week, 2hrs of Tutorials per week Campus: Camperdown/Darlington Mode of delivery: Normal (lecture/lab/tutorial) Day

Associated degrees: Grad Cert E, M P E.

To develop an understanding of principles of safety systems management and risk management, as applied to engineering systems. AS/NZS 480:2001 & 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

Engineering and Information Technologies

Credit points: 6 Session: Int December, Int July, Semester 1, Semester 2, Summer Late Classes: Session 1: Evening, Online Session 2: Evening, Online, Block mode: July Int and Dec Int. Block mode: Campus: Camperdown/Darlington Mode of delivery: Block Mode or On-line or Normal (lecture/lab/tutorial) Evening

Associated degrees: Grad Cert I T, Grad Cert Inf Tech Man, Grad Cert P M, Grad Dip E, M Int Tech Man, M P E.

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
Chemical Engineering elective.

By the end of this course students should develop a proficiency in size reduction or comminution of the ore in liberating the valuable minerals, and an ability to cope with experimental data, change and uncertainty through critical thinking.

CHNG5004

Particles and Surfaces: Mineral Processing. Aims and Objectives: Solid-solids 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, leaching and ashing. 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 Eng - Systems and Practice

Engineering and Information Technologies

Credit points: 6
Session: Semester 1
Classes: 2 hr lectures per week; 1 hr tutorial per week.
Assumed knowledge: CHNG3801 OR CHNG3802 AND CHNG3805 AND CHNG3806 AND CHNG3807.
Campus: Normal (lecture/lab/tutorial) Day
Mode of delivery: Normal (lecture/lab/tutorial) Day

Associated degrees: B E, M E, M P E.

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.

CHNG5006

Advanced Wastewater Engineering

Engineering and Information Technologies

Credit points: 6
Session: Semester 1
Classes: 2 hr lectures per week; 1 hr tutorial per week.
Assumed knowledge: CHNG3801 OR CHNG3802 AND CHNG3805.
Campus: Normal (lecture/lab/tutorial) Day
Mode of delivery: Normal (lecture/lab/tutorial) Day

Associated degrees: B E, M E, M P E.

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

Chemical & Biomolecular Engineering Adv

Engineering and Information Technologies

Credit points: 6
Session: Semester 2
Classes: Project Work - own time.
Prerequisites: CHNG5801 OR (CHNG3802 AND CHNG3805 AND CHNG3806).
Campus: Normal (lecture/lab/tutorial) Day
Mode of delivery: Normal (lecture/lab/tutorial) Day

Associated degrees: B E, M P E.

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 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 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, leaching and ashing. 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.
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
Engineering and Information Technologies
Credit points: 6 Session: Semester 1 Classes: 4 hours of lectures and laboratory sessions per week. Campus: Camperdown/Darlington Mode of delivery: Normal (lecture/lab/tutorial) Day
Associated degrees: B E, Grad Cert E, M P E.
"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 understanding 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 Science Laboratory
Engineering and Information Technologies
Credit points: 6 Session: Semester 2 Classes: 2 hours of lectures or tutorials per week, 4 hours of laboratory sessions per week. Assumed knowledge: CHNG5601 Campus: Camperdown/Darlington Mode of delivery: Normal (lecture/lab/tutorial) Day
Associated degrees: B E, Grad Cert E, M P E.
Students will explore experimentally the theoretical concepts learned in the other modules of the MES course in Biophysical Processes. They will gain practical insights into electrodiffusion and other mass transport processes through membranes. Students will understand the construction and functional properties of synthetic separation membranes. Students will explore experimentally the various factors affecting the performance of synthetic separation membranes.

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

CHNG5020
Capstone Project A
Engineering and Information Technologies
Credit points: 6 Session: Semester 1, Semester 2 Classes: Independent project work. Prerequisites: Completion of 24 credits of ME or exemption, or 42 credits of MPE. Assumed knowledge: CHNG5801 AND CHNG5802 AND CHNG5803 AND CHNG5805 AND CHNG5806. Campus: Camperdown/Darlington Mode of delivery: Supervision Note: Department permission required for enrolment.
Associated degrees: M E, M P E.
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 systematic 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
Engineering and Information Technologies
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 Campus: Camperdown/Darlington Mode of delivery: Supervision Note: Department permission required for enrolment.
Associated degrees: M E, M P E.
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
Engineering and Information Technologies
Credit points: 12 Session: Semester 1, Semester 2 Classes: no formal classes
Prohibitions: ENGGS220, ENGGS221
Campus: Camperdown/Darlington 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.
Associated degrees: M E, M P E.
To complete a substantial research project and successfully analyse a problem, devise appropriate experiments, analyse the results and produce a well-argued, in-depth thesis. Department permission required for enrolment in the following session(s); 1, 2
CHNG5223
Dissertation B
Engineering and Information Technologies
Credit points: 12 Session: Semester 1, Semester 2 Classes: no formal classes
Prohibitions: ENGGS220, ENGGS221
Campus: Camperdown/Darlington Mode of delivery: Supervision
Note: Department permission required for enrolment.
Associated degrees: M E, M P E.
To complete a substantial research project and successfully analyse a problem, devise appropriate experiments, analyse the results and produce a well-argued, in-depth thesis. Department permission required for enrolment in the following session(s); 1, 2
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
Engineering and Information Technologies
Credit points: 6 Session: Semester 2 Classes: Lectures: 1 hour per week, Tutorials: 2 hours per 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. Campus: Camperdown/Darlington Mode of delivery: Normal (lecture/lab/tutorial) Day
Note: This unit of study is for Masters students and can be selected as an elective by 4th year students.
Associated degrees: B E, Grad Cert E, M P E, UG Study Abroad Program.
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
Engineering and Information Technologies
Credit points: 6 Session: Semester 1 Classes: 4 hours of lectures/ project work classes per week. Campus: Camperdown/Darlington Mode of delivery: Normal (lecture/lab/tutorial) Day
Note: Department permission required for enrolment.
Associated degrees: B E, Grad Cert E, M P E.
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
Engineering and Information Technologies
Note: This course is for Master degree students and also is offered as an elective course for fourth year students.
Associated degrees: B E, Grad Cert E, M P E.
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 biochemcials 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 quizes, 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
Engineering and Information Technologies

**Credit points:** 6
**Session:** Semester 1
**Classes:** Lectures 2 hours per week, Tutorials 2 hours per week. Assumed knowledge: CIVL3612 AND MATH2061.
**Campus:** Camperdown/Darlington
**Mode of delivery:** Normal (lecture/lab/tutorial) Day

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

**Associated degrees:** B E, Grad Cert E, M P E, PG Coursework Exchange.

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
Engineering and Information Technologies

**Credit points:** 6
**Session:** Semester 1
**Classes:** 1hr Lecture per week, 1 hr Tutorials per week, 2 hr Project work in class per week for first half of semester. Assumed knowledge: Sound competence in all aspects of engineering, and some understanding of issues of engineering management
**Campus:** Camperdown/Darlington
**Mode of delivery:** Normal (lecture/lab/tutorial) Day

**Associated degrees:** Grad Dip E, M P E.

This unit is designed as an elective unit of study for students interested in gaining 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 so that the unit can be used at work out what to do, and how to do it. Content will include 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
Engineering and Information Technologies

**Credit points:** 6
**Session:** Int January, Int July
**Classes:** overseas short-course

**Prerequisites:** Permission from faculty and school. **Campus:** Camperdown/Darlington
**Mode of delivery:** Normal (lecture/lab/tutorial) Day

**Note:** Department permission required for enrolment.

**Associated degrees:** M E, M Inf Tech, M Inf Tech Man, M P E, M P L, M P M.

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 from the school and the Sub-Dean Students for the Faculty of Engineering and Information Technologies.

**ENGG5232**
Engineering Graduate Exchange B
Engineering and Information Technologies

**Credit points:** 6
**Session:** Int January, Int July
**Classes:** overseas short-course

**Prerequisites:** Permission from faculty and school. **Campus:** Camperdown/Darlington
**Mode of delivery:** Normal (lecture/lab/tutorial) Day

**Note:** Department permission required for enrolment.

**Associated degrees:** M E, M Inf Tech, M Inf Tech Man, M P E, M P L, M P M.

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 from the school and the Sub-Dean Students for the Faculty of Engineering and Information Technologies.

**MECH5275**
Advanced Renewable Energy
Engineering and Information Technologies

**Credit points:** 6
**Session:** Semester 2
**Classes:** 2 hours of lectures and 3 hours of tutorials per week. **Prerequisites:** MECH5262 or MECH3260 Assumed knowledge: The students will require an understanding of the basic principles of fluid mechanics, thermodynamics and heat transfer, and the application of these principles to energy conversion systems. In particular, students should be able to analyse fluid flow in turbomachinery; perform first and second law thermodynamic analysis of energy conversion systems; and perform calculations of radiative, conductive and convective heat transfer.

**Campus:** Camperdown/Darlington
**Mode of delivery:** Normal (lecture/lab/tutorial) Day

**Associated degrees:** B E, Grad Cert E, M P E.

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.
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).
### 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.

<table>
<thead>
<tr>
<th>Unit of Study</th>
<th>Credit Points</th>
<th>A: Assumed knowledge</th>
<th>P: Prerequisites</th>
<th>C: Corequisites</th>
<th>N: Prohibition</th>
<th>Session</th>
</tr>
</thead>
<tbody>
<tr>
<td>ENGG5102 Entrepreneurship for Engineers</td>
<td>6</td>
<td>Some limited industry experience is preferred but not a must.</td>
<td>N ELEC5701</td>
<td></td>
<td></td>
<td>Semester 1</td>
</tr>
<tr>
<td>ENGG5202 Sustainable Design, Eng Mgt</td>
<td>6</td>
<td>General knowledge in science and calculus and understanding of basic principles of chemistry, physics and mechanics</td>
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<td>Semester 1</td>
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<tr>
<td>ENGG5103 Safety Systems and Risk Analysis</td>
<td>6</td>
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<td>Semester 2</td>
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<tr>
<td>PMGT5971 Project Process Planning and Control</td>
<td>6</td>
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<td>Int December</td>
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<td>Summer Late</td>
</tr>
</tbody>
</table>

### 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.

<table>
<thead>
<tr>
<th>Unit of Study</th>
<th>Credit Points</th>
<th>A: Assumed knowledge</th>
<th>P: Prerequisites</th>
<th>C: Corequisites</th>
<th>N: Prohibition</th>
<th>Session</th>
</tr>
</thead>
<tbody>
<tr>
<td>ELEC5101 Antennas and Propagation</td>
<td>6</td>
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<td></td>
<td>Semester 2</td>
</tr>
<tr>
<td>ELEC5403 Radio Frequency Engineering</td>
<td>6</td>
<td>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.</td>
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<td></td>
<td>Semester 1</td>
</tr>
<tr>
<td>ELEC5507 Error Control Coding</td>
<td>6</td>
<td>Basic knowledge on digital communications. Fundamental mathematics including probability theory and linear algebra.</td>
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<td>Semester 1</td>
</tr>
<tr>
<td>ELEC5508 Wireless Engineering</td>
<td>6</td>
<td>Basic knowledge in probability and statistics, analog and digital communications, error probability calculation in communications channels, and telecommunications network.</td>
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<td></td>
<td>Semester 2</td>
</tr>
<tr>
<td>ELEC5509 Mobile Networks</td>
<td>6</td>
<td>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.</td>
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<td></td>
<td>Semester 1</td>
</tr>
<tr>
<td>ELEC5510 Satellite Communication Systems</td>
<td>6</td>
<td>Knowledge of error probabilities, analog and digital modulation techniques and error performance evaluation studied in ELEC5505 Communications and ELEC4505 Digital Communication Systems, is assumed.</td>
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<td>Semester 2</td>
</tr>
<tr>
<td>ELEC5511 Optical Communication Systems</td>
<td>6</td>
<td>(ELEC3505 Communications) and (ELEC3405 Communications Electronics and Photonics) or equivalent</td>
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<td>Semester 1</td>
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<tr>
<td>ELEC5512 Optical Networks</td>
<td>6</td>
<td>Knowledge of digital communications, wave propagation, and fundamental optics</td>
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<td>Semester 2</td>
</tr>
<tr>
<td>ELEC5514 Networked Embedded Systems</td>
<td>6</td>
<td>ELEC3305, ELEC3506, ELEC3607 and ELEC5508 or equivalent</td>
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<td>Semester 2</td>
</tr>
</tbody>
</table>

### Research units

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

<table>
<thead>
<tr>
<th>Unit of Study</th>
<th>Credit Points</th>
<th>A: Assumed knowledge</th>
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<th>C: Corequisites</th>
<th>N: Prohibition</th>
<th>Session</th>
</tr>
</thead>
<tbody>
<tr>
<td>ELEC5020 Capstone Project A</td>
<td>6</td>
<td>48 credits from MPE degree program</td>
<td>Note: Department permission required for enrolment</td>
<td></td>
<td></td>
<td>Semester 1</td>
</tr>
<tr>
<td>ELEC5021 Capstone Project B</td>
<td>6</td>
<td>ELEC5020</td>
<td>Note: Department permission required for enrolment</td>
<td></td>
<td></td>
<td>Semester 2</td>
</tr>
</tbody>
</table>
## Unit of study table

<table>
<thead>
<tr>
<th>Unit of study</th>
<th>Credit points</th>
<th>A: Assumed knowledge</th>
<th>P: Prerequisites</th>
<th>C: Corequisites</th>
<th>N: Prohibition</th>
<th>Session</th>
</tr>
</thead>
<tbody>
<tr>
<td>ELEC5022 Capstone Project B Extended</td>
<td>12</td>
<td>P 42 credit points in the Master of Engineering and WAM &gt;70, or 68 credit points in the Master of Professional Engineering and WAM &gt;70 or exemption</td>
<td>Note: Department permission required for enrolment</td>
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<td>Semester 1 Semester 2</td>
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<tr>
<td>ELEC5222 Dissertation A</td>
<td>12</td>
<td>N ELEC8901, ELEC8902, ENGG5222, ENGG5223 Note: Department permission required for enrolment</td>
<td>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.</td>
<td></td>
<td></td>
<td>Semester 1 Semester 2</td>
</tr>
<tr>
<td>ELEC5223 Dissertation B</td>
<td>12</td>
<td>N ELEC8901, ELEC8902, ENGG5222, ENGG5223 Note: Department permission required for enrolment</td>
<td>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.</td>
<td></td>
<td></td>
<td>Semester 1 Semester 2</td>
</tr>
</tbody>
</table>

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.

| COMPS047 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. | N NETS3407 | | | 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 | P ELEC3203. The following previous knowledge is assumed for this unit: Circuit analysis techniques, electricity networks, power system fundamentals | | | 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 Fundamentals of Power Electronics and Applications | | | | Semester 2 |
| ELEC5208 Intelligent Electricity Networks | 6 | A Fundamentals of Electricity Networks, Control Systems and Telecommunications Note: Department permission required for enrolment | | | Semester 1 |
| ELEC5211 Power Systems Dynamics and Control | 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. P ELEC3203 or ELEC5732 or equivalent Note: Department permission required for enrolment | | | Semester 1 |
| ELEC5212 Power Systems Planning and Markets | 6 | P ELEC3203 or ELEC5732 or equivalent | | | Semester 2 |
| ELEC5203 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. | | | Semester 1 |
| ELEC5402 Digital Integrated Circuit Design | 6 | A Electronic circuit design and physics of electronic devices. N ELEC4402 Note: Department permission required for enrolment | | | Semester 1 |
| ELEC5614 Real Time Computing | 6 | A SOFT3130 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 throughout the week and make sure that time is truly productive. | | | 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 |
| ELEC5622 Signals, Software and Health | 6 | | | | | Semester 2 |
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 AND ELEC2602. Familiarity with transistor operations, basic electrical circuits, embedded programming is required.

Note: Department permission required for enrolment

| Unit of study                          | Credit points | A: Assumed knowledge                                                                 | P: Prerequisites                                                                 || C: Corequisites | N: Prohibition | Session     |
|---------------------------------------|---------------|--------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------|----------------|-------------|
| ELEC5803                              | 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 AND ELEC2602. Familiarity with transistor operations, basic electrical circuits, embedded programming is required. |                  |                | Semester 1  |
| ELEEN5231 Engineering Graduate Exchange A | 6             | P Permission from faculty and school.                                                | Permission from faculty and school.                                               |                  |                | Int January  |
| ELEEN5232 Engineering Graduate Exchange B | 6             | Permission from faculty and school.                                                 | Permission from faculty and school.                                               |                  |                | Int January  |

For more information on degree program requirements visit CUSP.
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
Engineering and Information Technologies
Credit points: 6 Session: Semester 1 Classes: 2hr Lectures per week, 2hr Tutorials per week Prohibitions: ELEC5701 Assumed knowledge: Some limited industry experience is preferred but not a must. Assessment: Through semester assessment (100%) Campus: Camperdown/Darlington Mode of delivery: Normal (lecture/lab/tutorial) Day
Associated degrees: Grad Cert E.

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.


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

ENGG5202 Sustainable Design, Eng and Mgt
Engineering and Information Technologies
Credit points: 6 Session: Semester 1 Classes: 2 lectures per week, tutorials 2 hour per week and projects self assisted learning (4 hours per 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%) Campus: Camperdown/Darlington Mode of delivery: Normal (lecture/lab/tutorial) Day
Associated degrees: Grad Cert E, M P E.

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
Engineering and Information Technologies
Credit points: 6 Session: Semester 2 Classes: 2hrs of Lectures per week, 2hrs of Tutorials per week Assessment: Through semester assessment (100%) Campus: Camperdown/Darlington Mode of delivery: Normal (lecture/lab/tutorial) Day
Associated degrees: Grad Cert E, M P E.

To develop an understanding of principles of safety systems management and risk management, as applied to engineering systems. AS/ENZ 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.

PMGTS871 Project Process Planning and Control
Engineering and Information Technologies
Credit points: 6 Session: Int December, Int July, Semester 1, Semester 2, Summer Late Classes: Session 1: Evening, Online Session 2: Evening, Online, Block mode July Int and Dec Int : Block mode Assessment: Through session assessment (60%), Final Exam (40%). Campus: Camperdown/Darlington Mode of delivery: Block Mode or On-line or Normal (lecture/lab/tutorial) Evening
Associated degrees: Grad Cert I T, Grad Cert Inf Tech Man, Grad Cert P M, Grad Dip E, M Inf Tech Man, M P E.

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
Engineering and Information Technologies
Credit points: 6 Session: Semester 2 Classes: 2 hours of lectures and a 3 hours laboratory each week. Assessment: Through semester assessment (40%), Final Exam (60%) Campus: Camperdown/Darlington Mode of delivery: Normal (lecture/lab/tutorial) Day

Associated degrees: B E, Grad Cert E, M P E, PG Coursework Exchange.

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 broadening techniques are introduced. Ionospheric propagation is discussed and also the reception efficiency of receiving antennas which allows consideration of a Transmitter - Receiver ‘Link budget’. The important Pocklington’s 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
Engineering and Information Technologies
Credit points: 6 Session: Semester 1 Classes: 2 hours of lectures and 2 hours lab/tutorial per 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%) Campus: Camperdown/Darlington Mode of delivery: Normal (lecture/lab/tutorial) Day

Associated degrees: B E, Grad Cert E, M P E, PG Coursework Exchange.

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
Engineering and Information Technologies
Credit points: 6 Session: Semester 1 Classes: 2 hours of lectures and a 1 hour tutorial per week. Assumed knowledge: Basic knowledge on digital communications. Fundamental mathematics including probability theory and linear algebra. Assessment: Through semester assessment (50%), Final Exam (50%) Campus: Camperdown/Darlington Mode of delivery: Normal (lecture/lab/tutorial) Day

Associated degrees: B E, Grad Cert E, Grad Cert I T, M P E, PG Coursework Exchange.

This unit deals with the principles of error control coding techniques and their applications in various communication and data storage systems. Its aim is to present the fundamentals of error control coding techniques and develop theoretical and practical skills in the design of error control encoders/decoders. Successful completion of this unit will facilitate progression to advanced study or to work in the fields of telecommunications and computer engineering. It is assumed that the students have some background in communications principles and probability theory.

The following topics are covered. Introduction to error control coding, linear algebra. Linear block codes, cyclic codes, BCH codes, Reed-Solomon codes, burst-error correcting codes, design of codes for block codes, applications of block codes in communications and digital recording. Convolutional codes, Viterbi algorithm, design of codes for convolutional codes, applications of convolutional codes in communications, soft decision decoding of block and convolutional codes, trellis coded modulation, block coded modulation, design of codes for trellis codes, applications of trellis codes in data transmission. Turbo codes and applications to space and mobile communications.

ELEC5508
Wireless Engineering
Engineering and Information Technologies
Credit points: 6 Session: Semester 2 Classes: 2 hours of lectures and a 1 hour tutorial per week. Assumed knowledge: Knowledge of basic circuit analysis techniques, semiconductor device models and behaviour, linear algebra. Linear block codes, cyclic codes, BCH codes, Reed-Solomon codes, Viterbi algorithm, design of codes for convolutional codes, applications of convolutional codes in communications, soft decision decoding of block and convolutional codes, trellis coded modulation, block coded modulation, design of codes for trellis codes, applications of trellis codes in data transmission. Turbo codes and applications to space and mobile communications.

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-aloah multiple access. GSM: System architecture, radio resource management, mobility management, connection management.


ELEC5509
Mobile Networks
Engineering and Information Technologies
Credit points: 6 Session: Semester 1 Classes: 2 hours of lecture and a 2 hours tutorial/project meeting per 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 I, 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%) Campus: Camperdown/Darlington Mode of delivery: Normal (lecture/lab/tutorial) Day

Associated degrees: B C S T (Hons), B E, B I T (Hons), Grad Cert E, Grad Cert I T, M P E, PG Coursework Exchange.

This unit of study serves as an introduction to communications networks research. The unit relies on a solid understanding of data communications theories 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

**ELEC5510 Satellite Communication Systems Engineering and Information Technologies**

Credit points: 6  Session: Semester 2  Classes: 2 hours of lectures, 1 hour tutorial per week. 3 hour site visit during semester.  Assumed knowledge: Knowledge of error probabilities, analog and digital modulation techniques and error performance evaluation studied in ELEC3505 Communications and ELEC4505 Digital Communication Systems.  Assessment: Through semester assessment (30%), Final Exam (70%)  Campus: Camperdown/Darlington  Mode of delivery: Normal (lecture/lab/tutorial) Day

Associated degrees: B E, Grad Cert E, Grad Cert I T, M P E, PG Coursework Exchange.

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 Engineering and Information Technologies**

Credit points: 6  Session: Semester 1  Classes: 2 hours of lectures and 2 hours laboratories/tutorial per week.  Assumed knowledge: (ELEC3505 Communications) and (ELEC3405 Communications and Photonics) or equivalent  Assessment: Through semester assessment (25%), Final Exam (75%)  Campus: Camperdown/Darlington  Mode of delivery: Normal (lecture/lab/tutorial) Day

Associated degrees: B E, Grad Cert E, Grad Cert I T, M P E, PG Coursework Exchange.

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 Engineering and Information Technologies**

Credit points: 6  Session: Semester 2  Classes: 2 hours of lectures and 1 hour laboratory/tutorial per week.  Assumed knowledge: Knowledge of digital communications, wave propagation, and fundamental optics  Assessment: Through semester assessment (25%), Final Exam (75%)  Campus: Camperdown/Darlington  Mode of delivery: Normal (lecture/lab/tutorial) Day

Associated degrees: B E, Grad Cert E, Grad Cert I T, M P E, PG Coursework Exchange.

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 networks. 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 lightweight 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 Engineering and Information Technologies**

Credit points: 6  Session: Semester 2  Classes: 2 hours lecture and 2 hours lab per week.  Assumed knowledge: ELEC3305, ELEC5006, ELEC3607 and ELEC5508 or equivalent  Assessment: Through semester assessment (60%), Final Exam (40%)  Campus: Camperdown/Darlington  Mode of delivery: Normal (lecture/lab/tutorial) Day

Associated degrees: B C S T (Hons), B E, B I T (Hons), Grad Cert E, Grad Cert I T, M P E, PG Coursework Exchange.

This unit aims to teach the fundamentals concepts associated with:

- Networked Embedded Systems, wireless sensor networks
- Wireless channel propagation and radio power consumption
- Wireless networks, ZigBee, Bluetooth, etc.
- Sensor principle, data fusion, source detection and identification
- Multiple source detection, multiple access communications.
- Network topology, routing, network information theory
- Distributed source channel coding for sensor networks
- Power-aware and energy-aware communication protocols.

* Distributed 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.

- Ability to identify the main issues and trade-offs in networked embedded systems.
- Understanding of the state-of-the-art solutions in the area
- Based on the above understanding, ability to analyze requirements and devise first-order solutions for particular networked embedded systems problems.
- Familiarization with a simulator platform and real hardware platforms for network embedded systems through the Students involvement in projects.

**Research units**

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

**ELEC5020 Capstone Project A Engineering and Information Technologies**

Credit points: 6  Session: Semester 1, Semester 2  Classes: Independent project work.  Prerequisites: 48 credits from MPE degree program  Assessment:
Through semester assessment (100%)  
**Campus:** Camperdown/Darlington  
**Mode of delivery:** Supervision  

**Note:** Department permission required for enrolment.  

**Associated degrees:** M E, M P E.  

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**  
**Engineering and Information Technologies**  
Credit points: 6  
**Session:** Semester 1, Semester 2  
**Classes:** Independent project work.  
Corequisites: ELEC5020  
**Assessment:** Through semester assessment (100%)  
**Campus:** Camperdown/Darlington  
**Mode of delivery:** Supervision  

**Note:** Department permission required for enrolment.  

**Associated degrees:** M E, M P E.  

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**  
**Engineering and Information Technologies**  
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  
**Assessment:** Through semester assessment (100%)  
**Campus:** Camperdown/Darlington  
**Mode of delivery:** Supervision  

**Note:** Department permission required for enrolment.  

**Associated degrees:** M E, M P E.  

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.

**ELEC5222 Dissertation A**  
**Engineering and Information Technologies**  
Credit points: 12  
**Session:** Semester 1, Semester 2  
**Classes:** no formal classes  
**Prerequisites:** ELEC8901, ELEC8902, ENGG5222, ENGG5223  
**Assessment:** Through semester assessment (100%)  
**Campus:** Camperdown/Darlington  
**Mode of delivery:** Supervision  

**Note:** Department permission required for enrolment.  

**Assumed knowledge:** 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.  

**Associated degrees:** M E, M P E.  

To complete a substantial research project and successfully analyse a problem, devise appropriate experiments, analyse the results and produce a well-argued, in-depth thesis.  

Department permission required for enrolment in the following session(s); 1.2

**ELEC5223 Dissertation B**  
**Engineering and Information Technologies**  
Credit points: 12  
**Session:** Semester 1, Semester 2  
**Classes:** no formal classes  
**Prerequisites:** ELEC8901, ELEC8902, ENGG5222, ENGG5223  
**Assessment:** Through semester assessment (100%)  
**Campus:** Camperdown/Darlington  
**Mode of delivery:** Supervision  

**Note:** Department permission required for enrolment.  

With permission from the Head of Department candidates progressing with distinction (75%) average or higher results may replace ELEC5020, ELEC6201 and 12 cp of electives with ELEG5222 & ELEC5223 Dissertation A & B.  

**Elective units**  
Candidates may complete a maximum of 12 credit points from the following units: Special 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**  
**Engineering and Information Technologies**  
Credit points: 6  
**Session:** Semester 2  
**Classes:** 3hr integrated lecture and practical session  
**Prohibitions:** NETS4047  
**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%)  
**Campus:** Camperdown/Darlington  
**Mode of delivery:** Normal (lecture/lab/tutorial) Day  

**Note:** Department permission required for enrolment.  

**Associated degrees:** M E, M P E.  

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**  
**Engineering and Information Technologies**  
Credit points: 6  
**Session:** Semester 2  
**Classes:** (Lec 2hrs & Prac 1hr) per week  
**Assumed knowledge:** COMP5116 OR ELEC3506  
**Assessment:** Through semester assessment (40%), Final Exam (60%)  
**Campus:** Camperdown/Darlington  
**Mode of delivery:** Normal (lecture/lab/tutorial) Day  

**Associated degrees:** B C S T (Hons), B E, B I T (Hons), B Sc (Hons), Grad Cert I T, Grad Dip E.  

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**  
**Engineering and Information Technologies**  
Credit points: 6  
**Session:** Semester 1  
**Classes:** (Lec 2hrs & Prac 1hr) per week  
**Assumed knowledge:** COMP5116  
**Assessment:** Through semester assessment (40%), Final Exam (60%)  
**Campus:** Camperdown/Darlington  
**Mode of delivery:** Normal (lecture/lab/tutorial) Day  

**Associated degrees:** B C S T (Hons), B E, B I T (Hons), B Psych (Hons), B Sc (Hons), Grad Cert E, Grad Cert I T, M P E.  

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

**Engineering and Information Technologies**

**Credit points:** 6 Session: Semester 2 Classes: 2 hours of lectures and 2 hour tutorial/laboratory per week. **Assumed knowledge:** ELEC5203 Power Engineering and ELEC5204 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%) **Campus:** Camperdown/Darlington **Mode of delivery:** Normal (lecture/lab/tutorial) Day

**Associated degrees:** B E, Grad Cert E, M P E, UG Study Abroad Program.

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 safety 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

**Engineering and Information Technologies**

**Credit points:** 6 Session: Semester 1 Classes: 2 hours of lectures and a 1 hour tutorial per week, 2 hours laboratory per 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 (40%), Final Exam (60%) **Campus:** Camperdown/Darlington **Mode of delivery:** Normal (lecture/lab/tutorial) Day

**Associated degrees:** B E, Grad Cert E, M P E, UG Study Abroad Program.

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

**Engineering and Information Technologies**

**Credit points:** 6 Session: Semester 2 Classes: 2 hours of lectures per week and 2 hours of labs and 2 hours of tutorials per fortnight. **Assumed knowledge:** Following concepts are assumed knowledge for this unit of study; familiarity with transformers, ac power, capacitors and inductors, electric circuits such as three-phase circuits and circuits with switches, and basic electronic circuit theory. **Assessment:** Through semester assessment (50%), Final Exam (50%) **Campus:** Camperdown/Darlington **Mode of delivery:** Normal (lecture/lab/tutorial) Day

**Associated degrees:** B E, B E, B A, B E, B Com, B E, B Sc, B E, LL B, Grad Cert E, M P E.

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

**Engineering and Information Technologies**

**Credit points:** 6 Session: Semester 2 Classes: 2 hr Lecture per week, 2-3hrs of tutorial/laboratory per week. **Assumed knowledge:** Fundamentals of Power Electronics and Applications. **Assessment:** Through semester assessment (45%), Final Exam (55%) **Campus:** Camperdown/Darlington **Mode of delivery:** Normal (lecture/lab/tutorial) Day

**Associated degrees:** B E, Grad Cert E, M P E, PG Coursework Exchange.

The unit aims to cover advanced topics in power electronics and its 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.
electromechanical transients - Analysis of power systems subject to electromagnetic and under transient conditions. The 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 source 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
Engineering and Information Technologies
Credit points: 6 Session: Semester 1
Classes: 2hr lectures per week, 1 hr of tutorial per week. Assumed knowledge: Fundamentals of Electrical Networks, Control Systems and Telecommunications. Assessment: Through semester assessment (40%), Final Exam (60%).
Campus: Camperdown/Darlington
Mode of delivery: Normal (lecture/lab/tutorial) Day
Note: Department permission required for enrolment.
Associated degrees: B E, Grad Cert E, M P E.
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
Engineering and Information Technologies
Credit points: 6 Session: Semester 1
Classes: 2hr lectures per week; 2hr tutorial per week; 3hr Laboratory per fortnight. Prerequisites: ELEC3203 or ELEC5732 or equivalent. Assumed knowledge: This unit studies 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 (40%), Final Exam (60%).
Campus: Camperdown/Darlington
Mode of delivery: Normal (lecture/lab/tutorial) Day
Note: Department permission required for enrolment.
Associated degrees: B E, Grad Cert E, M P E.
The unit deals with power systems modelling, analysis and simulation under transient conditions. The unit will cover the following topics:
- 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; Voltage stability; Frequency stability; Small signal stability.
- Power system control: Voltage control; Frequency control; Power system stabilizers; 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
Engineering and Information Technologies
Credit points: 6 Session: Semester 2
Classes: 2hr lecture per week; 2hr tutorial per week; 2hr Laboratory per fortnight. Prerequisites: ELEC3203 or ELEC5732 or equivalent. Assessment: Through semester assessment (55%), Final Exam (45%).
Campus: Camperdown/Darlington
Mode of delivery: Normal (lecture/lab/tutorial) Day
Associated degrees: B E, Grad Cert E, M P E.
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. The increasing penetration of intermittent renewable energy sources has further increased the complexity. To equip the student with the 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 and unit commitment; Power system reliability.
- Drivers for the restructuring of the electricity industry.
- Electricity market design: Market structures (spot, bilateral, hybrid); Energy market; Ancillary services market.
- Electricity industry in Australia and the National Electricity Market.
- Power system expansion planning: Transmission planning; Generation planning; Power system adequacy assessment.
- Distribution systems: Modern developments (distributed generation, demand management).
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).

ELEC5303
Computer Control System Design
Engineering and Information Technologies
Credit points: 6 Session: Semester 1
Classes: 2hrs of lectures and a 2 hours lab/tutorial per 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%).
Campus: Camperdown/Darlington
Mode of delivery: Normal (lecture/lab/tutorial) Day
Associated degrees: B E, Grad Cert E, Grad Cert I T, M P E, PG Coursework Exchange.
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.
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 implementations.

**ELEC5402**
Digital Integrated Circuit Design
Engineering and Information Technologies

This unit of study is not available in 2014

Credit points: 6
Session: Semester 1
Classes: 2 hours of lectures and a 2 hours project work in class per week.

**Prohibitions:** ELEC4402

**Assumed knowledge:** Electronic circuit design and physics of electronic devices.

**Assessment:** Lab Skills (70%), Final Exam (30%) Campus: Camperdown/Darlington Mode of delivery: Normal (lecture/lab/tutorial) Day

**Note:** Department permission required for enrolment.

**Associated degrees:** B E, Grad Cert E, Grad Cert I T, M P E, PG Coursework Exchange.

This unit of study explores CMOS technology and integrated circuit design and fabrication. The fundamental theory and techniques behind digital integrated circuit design are introduced. A primary focus of this unit is providing the student with practical laboratory design experience using a professional VLSI CAD tool to design digital integrated circuits. This unit provides a foundation for more advanced digital integrated circuit design techniques and also analogue integrated circuit design.

Topics covered in this unit are: IC manufacturing process and CMOS technology, CMOS static logic design, CMOS dynamic logic design, arithmetic building block design, sequential logic design, VLSI interconnection and wiring issues, timing issues, digital memory design, digital system design methodologies.

**ELEC5614**
Real Time Computing
Engineering and Information Technologies

Credit points: 6
Session: Semester 1
Classes: 2 hours of lectures, 1 hour tutorial per week, 2 hours labs per week.

**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%) Campus: Camperdown/Darlington Mode of delivery: Normal (lecture/lab/tutorial) Day

**Associated degrees:** B C S T (Hons), B E, B I T (Hons), Grad Cert E, Grad Cert I T, M P E, PG Coursework Exchange.

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
Engineering and Information Technologies

Credit points: 6
Session: Semester 1
Classes: 2 hours of lectures, 1 hour of tutorial and 2 hours labs per week.

**Assumed knowledge:** A programming language, basic maths.

**Assessment:** Through semester assessment (50%), Final Exam (50%) Campus: Camperdown/Darlington Mode of delivery: Normal (lecture/lab/tutorial) Day

**Associated degrees:** B C S T (Hons), B E, B I T (Hons), Grad Cert E, Grad Cert I T, M P E, PG Coursework Exchange.

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
Engineering and Information Technologies

Credit points: 6
Session: Semester 2
Classes: 2 hours lecture and 2 hours tutorials per 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 throughout the week and make sure that time is truly productive.

**Assessment:** Through semester assessment (30%), Final Exam (70%) Campus: Camperdown/Darlington Mode of delivery: Normal (lecture/lab/tutorial) Day

**Associated degrees:** B C S T (Hons), B E, B I T (Hons), Grad Cert E, Grad Cert I T, Grad Dip E, M P E, UG Study Abroad Program.

This unit will cover software quality planning, validation and verification methods and techniques, risk analysis, software review techniques, software standards and software process improvement and software reliability. The unit covers testing and quality assurance from a unit testing/developer-based focus up to an overall quality process overview of the software development life cycle. Students who successfully complete this unit will: understand the fundamental concepts of software quality, be able to assess the quality of a software design, be acquainted with methods of building for quality and be able to verify and test a unit of code through familiarity with unit testing strategies and understanding software quality assurance as a rigorous and structured formal process.

**ELEC5619**
Object Oriented Application Frameworks
Engineering and Information Technologies

Credit points: 6
Session: Semester 2
Classes: 3 hours project work in class per week.

**Assumed knowledge:** Java programming, and some web development experience are essential. Databases strongly recommended.

**Assessment:** Through semester assessment (50%), Final Exam (50%) Campus: Camperdown/Darlington Mode of delivery: Normal (lecture/lab/tutorial) Day

**Associated degrees:** B E, Grad Cert I T, Grad Dip E, M P E, UG Study Abroad Program.

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
**Engineering and Information Technologies**

**Credit points:** 6  
**Session:** Semester 2  
**Classes:** 2 hours lecture, 1 hour of tutorial and 2 hours of lab/project work in class per week.  
**Assumed knowledge:** A programming language, basic maths  
**Assessment:**  
Thorough semester assessment (50%), Final Exam (50%)  
**Campus:** Camperdown/Darlington  
**Mode of delivery:** Normal (lecture/lab/tutorial) Day  

**Note:** Department permission required for enrolment.  

**Associated degrees:** B E, B IT, Grad Cert E, M P E.  

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**  
**Engineering and Information Technologies**

**Credit points:** 6  
**Session:** Semester 2  
**Classes:** 3hr tutorials/labs per week, 1hr of lecture per week.  
**Assessment:**  
Through semester assessment (100%)  
**Campus:** Camperdown/Darlington  
**Mode of delivery:** Normal (lecture/lab/tutorial) Day  

**Associated degrees:** B E, Grad Cert E, M P E.  

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 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.

**ENGG5231**  
**Engineering Graduate Exchange A**  
**Engineering and Information Technologies**

**Credit points:** 6  
**Session:** Int January, Int July  
**Classes:** overseas short-course.  
**Prerequisites:**  
Permission from faculty and school.  
**Assessment:**  
Through semester assessment (100%)  
**Campus:** Camperdown/Darlington  
**Mode of delivery:** Normal (lecture/lab/tutorial) Day  

**Note:** Department permission required for enrolment.  

**Associated degrees:** M E, M Inf Tech, M Inf Tech Man, M P E, M P L, M P M.  

**ENGG5232**  
**Engineering Graduate Exchange B**  
**Engineering and Information Technologies**

**Credit points:** 6  
**Session:** Int January, Int July  
**Classes:** overseas short-course  
**Prerequisites:**  
Permission from faculty and school.  
**Assessment:**  
Through semester assessment (100%)  
**Campus:** Camperdown/Darlington  
**Mode of delivery:** Normal (lecture/lab/tutorial) Day  

**Note:** Department permission required for enrolment.  

**Associated degrees:** M E, M Inf Tech, M Inf Tech Man, M P E, M P L, M P M.  

For more information on units of study visit CUSP.
Course overview
The MPE 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 MPE 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 students achieving distinction average results.

Accreditation
The MPE programs in Chemical and Biomolecular, Civil, Electrical, Mechanical, Power and Structural Engineering have been awarded full accreditation from 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

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

<table>
<thead>
<tr>
<th>Code</th>
<th>Course title</th>
</tr>
</thead>
<tbody>
<tr>
<td>HC088</td>
<td>Master of Professional Engineering</td>
</tr>
</tbody>
</table>

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

(2) Candidates are required to have a WAM >= 65% based on the results of all units of study once a minimum of 48 credit points have been first attempted. Candidates who do not meet this WAM requirement will have their enrolment transferred to the Graduate Diploma in Engineering (Professional Engineering).
Transitional provisions

(1) These resolutions apply to students who commenced their candidature after 1 January, 2013 and students who commenced their candidature prior to 1 January, 2013 who elect to proceed under these resolutions.

(2) Candidates who commenced prior to 1 January, 2013 may complete the requirements in accordance with the resolutions in force at the time of their commencement.
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 http://www.engineersaustralia.org.au/.

Course requirements
Candidates for the Master of Professional Engineering (Aerospace) 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

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

<table>
<thead>
<tr>
<th>Unit of study</th>
<th>Credit points</th>
<th>A: Assumed knowledge</th>
<th>P: Prerequisites</th>
<th>C: Corequisites</th>
<th>N: Prohibition</th>
<th>Session</th>
</tr>
</thead>
<tbody>
<tr>
<td>AMME5302 Foundations of Materials 1</td>
<td>6</td>
<td></td>
<td>N CIVL2110</td>
<td></td>
<td></td>
<td>Semester 1</td>
</tr>
<tr>
<td>AMME5500 Foundations of Engineering Dynamics</td>
<td>6</td>
<td>A Physics, statics, Particle dynamics, Differential Calculus, Linear Algebra, Integral Calculus and Modelling</td>
<td></td>
<td></td>
<td></td>
<td>Semester 1</td>
</tr>
<tr>
<td>AMME5700 Foundations of Instrumentation</td>
<td>6</td>
<td>A ENGG1801. Programming Skills, 1st Year maths skills, familiarity with fundamental Aerospace concepts. P AERO1560 OR MECH1560 OR MTRX1701 OR ENGG1800</td>
<td></td>
<td></td>
<td></td>
<td>Semester 1</td>
</tr>
<tr>
<td>ENGG5801 Foundations of Engineering Computing</td>
<td>6</td>
<td></td>
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<td>Semester 1</td>
</tr>
</tbody>
</table>

Year One - Semester Two

<table>
<thead>
<tr>
<th>Unit of study</th>
<th>Credit points</th>
<th>A: Assumed knowledge</th>
<th>P: Prerequisites</th>
<th>C: Corequisites</th>
<th>N: Prohibition</th>
<th>Session</th>
</tr>
</thead>
<tbody>
<tr>
<td>AMME5200 Foundations of Thermodynamics and Fluids</td>
<td>6</td>
<td>A Students are expected to be familiar with basic, first year, integral calculus, differential calculus and linear algebra.</td>
<td></td>
<td></td>
<td></td>
<td>Semester 2</td>
</tr>
<tr>
<td>ENGG5802 Foundations of Engineering Mechanics</td>
<td>6</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Semester 2, Summer Main</td>
</tr>
<tr>
<td>MECH5400 Foundations of Mechanical Design 1</td>
<td>6</td>
<td>A Knowledge of programming in MATLAB and a knowledge of Engineering Mechanics (statics) P MECH4200</td>
<td></td>
<td></td>
<td></td>
<td>Semester 2</td>
</tr>
</tbody>
</table>

Year Two - Semester One

<table>
<thead>
<tr>
<th>Unit of study</th>
<th>Credit points</th>
<th>A: Assumed knowledge</th>
<th>P: Prerequisites</th>
<th>C: Corequisites</th>
<th>N: Prohibition</th>
<th>Session</th>
</tr>
</thead>
<tbody>
<tr>
<td>AERO5310 Foundations of Aerospace Structures</td>
<td>6</td>
<td>A Mathematics and Physics to a level of Bachelor of Science or equivalent. Linear Mathematics, Vector Calculus, Differential Equations and Fourier Series. P AMME5301</td>
<td></td>
<td></td>
<td></td>
<td>Semester 1</td>
</tr>
<tr>
<td>AERO5410 Foundations of Aerodynamics</td>
<td>6</td>
<td>A Mathematics, Physics and Solid Mechanics assumed knowledge at the level of Bachelor of Engineering, Science or equivalent.</td>
<td></td>
<td></td>
<td></td>
<td>Semester 1</td>
</tr>
<tr>
<td>AERO5510 Foundations of Flight Mechanics</td>
<td>6</td>
<td>A Mathematics, Physics and Dynamics assumed knowledge at the level of Bachelor of Science or equivalent.</td>
<td></td>
<td></td>
<td></td>
<td>Semester 1</td>
</tr>
<tr>
<td>AMME5501 Foundations: System Dynamics and Control</td>
<td>6</td>
<td>A AMME5500</td>
<td></td>
<td></td>
<td></td>
<td>Semester 1</td>
</tr>
</tbody>
</table>

Year Two - Semester Two

<table>
<thead>
<tr>
<th>Unit of study</th>
<th>Credit points</th>
<th>A: Assumed knowledge</th>
<th>P: Prerequisites</th>
<th>C: Corequisites</th>
<th>N: Prohibition</th>
<th>Session</th>
</tr>
</thead>
<tbody>
<tr>
<td>AERO5210 Foundations of Aerodynamics</td>
<td>6</td>
<td>A Mathematics and Physics to a level of Bachelor of Science or equivalent. Linear Mathematics and Vector Calculus, Partial Differential Equations (Intro).</td>
<td></td>
<td></td>
<td></td>
<td>Semester 2</td>
</tr>
<tr>
<td>AERO5211 Foundations of Propulsion Systems</td>
<td>6</td>
<td>A Mathematics and Physics to a level of Bachelor of Science or equivalent.</td>
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<td>Semester 2</td>
</tr>
</tbody>
</table>

Select 12 credit points from Aerospace recommended electives block.

Year Three - Semester One

<table>
<thead>
<tr>
<th>Unit of study</th>
<th>Credit points</th>
<th>A: Assumed knowledge</th>
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<th>N: Prohibition</th>
<th>Session</th>
</tr>
</thead>
<tbody>
<tr>
<td>AERO5301 Applied Finite Element Analysis</td>
<td>6</td>
<td>A AMME5301 or BE in area of Aerospace Engineering or related Engineering field. P AERO5310 OR MECH5361</td>
<td></td>
<td></td>
<td></td>
<td>Semester 1</td>
</tr>
<tr>
<td>AMME5601 Professional Engineering</td>
<td>6</td>
<td>A Experience in a professional engineering related field is desirable to aid in group tutorial discussion.</td>
<td></td>
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<td>Semester 1</td>
</tr>
<tr>
<td>ENGG5517 Practical Experience</td>
<td>6</td>
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<td></td>
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<td></td>
<td>Semester 2</td>
</tr>
</tbody>
</table>
## Unit of study table

<table>
<thead>
<tr>
<th>Unit of study</th>
<th>Credit points</th>
<th>A: Assumed knowledge</th>
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<th>C: Corequisites</th>
<th>N: Prohibition</th>
<th>Session</th>
</tr>
</thead>
<tbody>
<tr>
<td>AMME5020 Capstone Project A</td>
<td>6</td>
<td>P 48 cp from MPE degree program or 24 cp from the ME program. Note: Department permission required for enrolment</td>
<td>Semester 1</td>
<td>Semester 2</td>
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<tr>
<td></td>
<td></td>
<td>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.</td>
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<tr>
<td></td>
<td></td>
<td>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.</td>
<td></td>
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</tbody>
</table>

### Select 6 credit points from Aerospace recommended electives block.

#### Year Three - Semester Two

<table>
<thead>
<tr>
<th>Unit of study</th>
<th>Credit points</th>
<th>A: Assumed knowledge</th>
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<th>C: Corequisites</th>
<th>N: Prohibition</th>
<th>Session</th>
</tr>
</thead>
<tbody>
<tr>
<td>AEROS400 Advanced Aircraft Design Analysis</td>
<td>6</td>
<td>A BE in area of Aerospace Engineering or related Engineering field with familiarity in aircraft design.</td>
<td>Semester 2</td>
<td></td>
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<tr>
<td>ENGS5103 Safety Systems and Risk Analysis</td>
<td>6</td>
<td></td>
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<td></td>
<td></td>
<td>Semester 2</td>
</tr>
<tr>
<td>AMME5021 Capstone Project B</td>
<td>6</td>
<td>C AMME5020 Note: Department permission required for enrolment</td>
<td>Semester 1</td>
<td>Semester 2</td>
<td></td>
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<td></td>
<td></td>
<td>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.</td>
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<tr>
<td></td>
<td></td>
<td>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.</td>
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</tbody>
</table>

### Select 6 credit points from Aerospace recommended electives block.

#### Elective units

Candidates must complete 24 credit points from the following Aerospace elective units.

<table>
<thead>
<tr>
<th>Unit of study</th>
<th>Credit points</th>
<th>A: Assumed knowledge</th>
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<th>N: Prohibition</th>
<th>Session</th>
</tr>
</thead>
<tbody>
<tr>
<td>AERO0510 Optimisation Methods in Engineering</td>
<td>6</td>
<td>A BE in the area of Aerospace or related Engineering field. Note: Department permission required for enrolment</td>
<td>Semester 2</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>AERO0520 Advanced Aerodynamics</td>
<td>6</td>
<td>A BE in the area of Aerospace Engineering or related Engineering field. P AEROS5210 or AERO3289 Note: Department permission required for enrolment</td>
<td>Semester 1</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>AERO0550 Flight Mechanics Test and Evaluation Adv</td>
<td>6</td>
<td>A BE in area of Aerospace Engineering or related Engineering Field. P AERO5510 OR AERO3560. All MPE and ME students are required to do AERO0550 unless they have already completed an equivalent to AERO5510/AERO3560. This UoS can then be taken as an advanced elective.</td>
<td>Semester 2</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>AERO5520 Aircraft Avionics and Systems</td>
<td>6</td>
<td>P AERO5510 OR AERO3560</td>
<td>Semester 2</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>AERO5700 Space Engineering (Advanced)</td>
<td>6</td>
<td>A AERO3760</td>
<td>Semester 2</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>AERO5760 Spacecraft and Satellite Design</td>
<td>6</td>
<td>Note: Department permission required for enrolment</td>
<td>Semester 2</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>AMME5202 Advanced Computational Fluid Dynamics</td>
<td>6</td>
<td>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.</td>
<td>Semester 1</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>AMME5310 Engineering Tribology</td>
<td>6</td>
<td>A (AMME2302 OR AMME5302) AND (AMME2301 OR AMME5301) AND (MECH3261 OR MECH5261)</td>
<td>Semester 1</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>AMME5510 Vibration and Acoustics</td>
<td>6</td>
<td>A (AMME2301 OR AMME5301) AND (AMME2200 OR AMME5200) AND (AMME2500 OR AMME5500) Note: Department permission required for enrolment</td>
<td>Semester 2</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>AMME5520 Advanced Control and Optimisation</td>
<td>6</td>
<td>P AMME3500 OR AMME5501.</td>
<td>Semester 1</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>ENGG5202 Sustainable Design, Eng and Mgt</td>
<td>6</td>
<td>A General knowledge in science and calculus and understanding of basic principles of chemistry, physics and mechanics</td>
<td>Semester 1</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>MECH5275 Advanced Renewable Energy</td>
<td>6</td>
<td>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, convective and conductive heat transfer. P MECH5262 or MECH3260</td>
<td>Semester 2</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>MECH5304 Materials Failure</td>
<td>6</td>
<td>A Fundamental knowledge in materials science and engineering: 1) atomic and crystal structures 2) metallurgy 3) structure-property relationship 4) mechanics of engineering materials 5) solid mechanics An elective unit of study for the degree of Master of Engineering</td>
<td>Semester 2</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>MECH5305 Smart Materials</td>
<td>6</td>
<td>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</td>
<td>Semester 2</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>MECH5310 Advanced Engineering Materials</td>
<td>6</td>
<td>N MECH4310</td>
<td>Semester 1</td>
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</tr>
</tbody>
</table>

### 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.

<table>
<thead>
<tr>
<th>Unit of study</th>
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<th>N: Prohibition</th>
<th>Session</th>
</tr>
</thead>
<tbody>
<tr>
<td>AMME5020 Capstone Project A</td>
<td>6</td>
<td>P 48 cp from MPE degree program or 24 cp from the ME program. Note: Department permission required for enrolment</td>
<td>Semester 1</td>
<td>Semester 2</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

178
<table>
<thead>
<tr>
<th>Unit of study</th>
<th>Credit points</th>
<th>A: Assumed knowledge</th>
<th>P: Prerequisites</th>
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<th>N: Prohibition</th>
<th>Session</th>
</tr>
</thead>
<tbody>
<tr>
<td>AMME5021 Capstone Project B</td>
<td>6</td>
<td>C AMME5020</td>
<td></td>
<td></td>
<td></td>
<td>Semester 1 Semester 2</td>
</tr>
<tr>
<td>AMME5022 Capstone Project B Extended</td>
<td>12</td>
<td>P 42 credit points in the Master of Engineering and WAM &gt;70, or 66 credit points in the Master of Professional Engineering and WAM &gt;70 or exemption</td>
<td></td>
<td></td>
<td></td>
<td>Semester 1 Semester 2</td>
</tr>
</tbody>
</table>

**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            | N AMME5020, AMME5021, ENGG5220, ENGG5221 |                  |                |                | Semester 1 Semester 2  |
| AMME5223 Dissertation B               | 12            | N AMME5020, AMME5021, ENGG5220, ENGG5221 |                  |                |                | 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       | P Permission from faculty and school. |                  |                |                | Int January Int July  |
| ENGG5232 Engineering Graduate Exchange B | 6       | P Permission from faculty and school. |                  |                |                | Int January Int July  |

For more information on degree program requirements visit CUSP.
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

AMME5302 Foundations of Materials 1 Engineering and Information Technologies

Credit points: 6 Session: Semester 1 Classes: Lectures: 3 hours per week; Tutorials: 2 hour per week. Prohibitions: CIVL2110 Assessment: Through semester assessment (45%), Final Exam (55%) Campus: Camperdown/Darlington Mode of delivery: Normal (lecture/lab/tutorial) Day

Associated degrees: Grad Dip E (Prof Eng), M P E.

This UoS 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.

AMME5500 Foundations of Engineering Dynamics Engineering and Information Technologies

Credit points: 6 Session: Semester 1 Classes: Lectures: 3 hours per week; Tutorials: 2 hours per week; Lab Sessions 6 hours per semester. Assumed knowledge: Physics, statics, Particle dynamics, Differential Calculus, Linear Algebra, Integral Calculus and Modeling Assessment: Through semester assessment (40%), Final Exam (60%) Campus: Camperdown/Darlington Mode of delivery: Normal (lecture/lab/tutorial) Day

Associated degrees: Grad Dip E (Prof Eng), M P E.

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.

AMME5700 Foundations of Instrumentation Engineering and Information Technologies

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. Prerequisites: AERO1560 OR MECH1560 OR MTRX1701 OR ENGG1800 Assumed knowledge: ENGG1801. Programming Skills, 1st Year maths skills, familiarity with fundamental Aerospace concepts. Assessment: Through semester assessment (40%) Final Exam (60%) Campus: Camperdown/Darlington Mode of delivery: Normal (lecture/lab/tutorial) Day

Associated degrees: M P E.

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.

ENGG5801 Foundations of Engineering Computing Engineering and Information Technologies

Credit points: 6 Session: Semester 1 Classes: 2hrs Lectures per week, 2hrs of Lab session per week. Assessment: Through semester assessment (50%), Final Exam (50%) Campus: Camperdown/Darlington Mode of delivery: Normal (lecture/lab/tutorial) Day

Associated degrees: M P E.

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

AMME5200 Foundations of Thermodynamics and Fluids Engineering and Information Technologies

Credit points: 6 Session: Semester 2 Classes: Lectures: 3hr per week; Tutorials: 2 hours per week. Assumed knowledge: Students are expected to be familiar with basic, first year, integral calculus, differential calculus and linear algebra. Assessment: Through semester assessment (35%), Final Exam (65%) Campus: Camperdown/Darlington Mode of delivery: Normal (lecture/lab/tutorial) Day

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

AMME5301 Foundations of Mechanics of Solids 1 Engineering and Information Technologies

Credit points: 6 Session: Semester 2 Classes: 3hrs of lectures per week and 2hrs tutorial per week. Prerequisites: AMME5301 Assumed knowledge: Mathematics and Physics to a level of Bachelor of Science or equivalent. Linear Mathematics, Vector Calculus, Differential Equations and Fourier Series. Assessment: Through semester assessment (45%), final exam (55%) Campus: Camperdown/Darlington Mode of delivery: Normal (lecture/lab/tutorial) Day

Associated degrees: Grad Dip E (Prof Eng), M P E.

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 unit aims to teach the fundamental laws of thermodynamics 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 the basic principals behind stressed-skin aircraft construction and the practical analysis of typical aircraft components, including the limitations of such techniques.

ENGS5802 Foundations of Engineering Mechanics Engineering and Information Technologies

Credit points: 6 Session: Semester 2. Summer Main Classes: 2 hrs Lectures per week, 3hrs tutorial per week. Assessment: Through semester assessment (100%) Campus: Camperdown/Darlington Mode of delivery: Normal (lecture/lab/tutorial) Day

Associated degrees: M P E.

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.

MECH5400 Foundations of Mechanical Design 1 Engineering and Information Technologies

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

Associated degrees: M P E.

This 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.

AERO5310 Foundations of Aerospace Structures Engineering and Information Technologies

Credit points: 6 Session: Semester 1 Classes: 3hrs of lectures per week and 2hrs tutorial per week. Prerequisites: AMME5301 Assumed knowledge: Mathematics and Physics to a level of Bachelor of Science or equivalent. Linear Mathematics, Vector Calculus, Differential Equations and Fourier Series. Assessment: Through semester assessment (45%), final exam (55%) Campus: Camperdown/Darlington Mode of delivery: Normal (lecture/lab/tutorial) Day

Associated degrees: M P E.

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 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.

AERO5410 Foundations of Aerospace Design Engineering and Information Technologies

Credit points: 6 Session: Semester 1 Classes: Two 1hr lectures and one 3hr project class per week. Prerequisites: AMME5301 Assumed knowledge: Mathematics, Physics and Solid Mechanics assumed knowledge at the level of Bachelor of Engineering, Science or equivalent. Assessment: Through semester assessment (100%) Campus: Camperdown/Darlington Mode of delivery: Normal (lecture/lab/tutorial) Day

Associated degrees: M P E.
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.

AERO5510
Foundations of Flight Mechanics

Engineering and Information Technologies

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), 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%) Campus: Camperdown/Darlington Mode of delivery: Normal (lecture/lab/tutorial) Day

Associated degrees: M P E.

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 maneuvring 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.

AMME5501
Foundations: System Dynamics and Control

Engineering and Information Technologies

Credit points: 6 Session: Semester 1 Classes: Lectures : 2 hours per week; Tutorials - 3 hours per week Assumed knowledge: AmME5500 Assessment: Through semester assessment (40%), Final Exam (60%) Campus: Camperdown/Darlington Mode of delivery: Normal (lecture/lab/tutorial) Day

Associated degrees: M P E.

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

AERO5210
Foundations of Aerodynamics

Engineering and Information Technologies

Credit points: 6 Session: Semester 2 Classes: Lectures, 3hr per week, 2hr Tut/Lab/Demo per week and three 3 hour Laboratory sessions per semester Assumed knowledge: Mathematics and Physics to the level of Bachelor of Science or equivalent. Linear Mathematics and Vector Calculus, Partial Differential Equations (Intro.), Assessment: Through semester assessment(40%), Final Exam (60%) Campus: Camperdown/Darlington Mode of delivery: Normal (lecture/lab/tutorial) Day

Associated degrees: M P E.

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 aerolfoil; Joukowsky transformation theory; thin aerofoil theory; linear lift properties for sections; limiting effects such as stall; calculation of pitching moment coefficient; methods for estimation of boundary flow and friction drag calculations; viscous-inviscid panel method numerical solutions; modelling of three dimension wing flows; lifting line theory and vortex lattice method.; effects of downwash, aspect ratio, sweep angle and asymmetry.

AERO5211
Foundations of Propulsion Systems

Engineering and Information Technologies

Credit points: 6 Session: Semester 2 Classes: Three 1hr lectures and one 2hr tutorial per week Prerequisites: AERO5200 Assumed knowledge: Mathematics and Physics to a level of Bachelor of Science or equivalent. Assessment: Through semester assessment (40%), Final Exam (60%) Campus: Camperdown/Darlington Mode of delivery: Normal (lecture/lab/tutorial) Day

Associated degrees: M P E.

This unit aims to develop an understanding of the modern techniques used for aircraft propulsion. Students will gain skills in problem solving for aircraft propulsion systems ranging from propellers, gas-turbine engines to rockets. This unit of study teaches the students the
techniques used to propel aircraft and rockets. The students will learn to analyse various propulsion systems in use; propellers, gas turbines, rocket motors. Course content will include: Propulsion unit requirements subsonic and supersonic flight; thrust components, efficiency, additive drag of intakes; Piston engine components and operation; Propeller theory; Operation, components and cycle analysis of gas turbine engines, turbojets, turbofans, turboprops, ramjets; Components: compressor; fan; burner; turbine; nozzle, efficiency of components; off-design considerations; Operation, components and thermodynamics of rocket motors; Dynamics of rocket flight, orbital velocity; staging; Future directions; minimisation of noise and pollution; sub-orbital propulsion systems; scram-jets; hybrid engines.

Select 12 credit points from Aerospace recommended electives block.

Year Three - Semester One

AERO5301
Applied Finite Element Analysis
Engineering and Information Technologies

Credit points: 6 Session: Semester 1 Classes: 2.5 hours of lectures and 3 hours of workgroup session per week Prerequisites: AERO5310 OR MECH5361 Assumed knowledge: AMME5301 or BE in area of Aerospace Engineering or related Engineering field. Assessment: Through semester assessment (55%), Final Exam (45%) Campus: Camperdown/Darlington Mode of delivery: Normal (lecture/lab/tutorial) Day

Associated degrees: B E, Grad Cert E, M P E.


AMME5601
Professional Engineering
Engineering and Information Technologies

Credit points: 6 Session: Semester 1 Classes: Lectures 2 hrs per week and tutorials 2 hrs per week Assumed knowledge: Experience in a professional engineering related field is desirable to aid in group tutorial discussion. Assessment: Through semester assessment (100%). Campus: Camperdown/Darlington Mode of delivery: Normal (lecture/lab/tutorial) Day

Associated degrees: M E, M P E.

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
Engineering and Information Technologies

Session: Semester 1, Semester 2 Classes: no formal classes Assessment: Students will write reports on their industrial experiences and maintain a portfolio of work. Portfolio (100%) Campus: Camperdown/Darlington Mode of delivery: Professional Practice

Note: Students should have completed one year of their MPE program before enrolling in this unit.

AMME5202
Capstone Project A
Engineering and Information Technologies

Credit points: 6 Session: Semester 1, Semester 2 Classes: Independent project work. Prerequisites: 48 cp from MPE degree program or 24 cp from the ME program. Assessment: Through semester assessment (100%). Campus: Camperdown/Darlington Mode of delivery: Supervision Note: Department permission required for enrolment.

Associated degrees: M E, M P E.

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 thesis itself. The final thesis must be the student's individual work, although research is sometimes conducted in the framework of a group project shared with others. Students undertaking research on this basis will need to take care in ensuring the individual quality of their own research work and the final thesis submission. The thesis will be judged on the extent and quality of the student's original work and particularly how critical, perceptive and constructive he or she has been in assessing his/her work and that of others. Students will also be required to present the results of their findings to their peers and supervisors as part of a seminar program.

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

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
Engineering and Information Technologies

Credit points: 6 Session: Semester 2 Classes: 4 hours of lectures per week. Assumed knowledge: BE in area of Aerospace Engineering or related Engineering field with familiarity in aircraft design. Assessment: Through semester assessment (100%) Campus: Camperdown/Darlington Mode of delivery: Normal (lecture/lab/tutorial) Day


This Unit aims to provide familiarity and understanding with practical aircraft design processes expected in industry, including the evaluation and case studies of existing aircraft designs. Students will gain a better understanding of relevant issues particularly related to the design of aircraft with a level of confidence to lead them to develop new designs or modifications, having a good balance between theory and real-world applications. Good familiarity with unique and stringent international aviation regulations and certification processes will be expected with respect to the design of aircraft. Topics covered 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 DARcorps Advanced Aircraft Analysis (AAA); and introduction to multidisciplinary design optimisation methods. Projects will be based on case study analyses and evaluation of aircraft types to operational specifications and requirements.

ENNG5103
Safety Systems and Risk Analysis
Engineering and Information Technologies

Credit points: 6 Session: Semester 2 Classes: 2hrs of Lectures per week, 2hrs of Tutorials per week. Assessment: Through semester assessment (100%) Campus: Camperdown/Darlington Mode of delivery: Normal (lecture/lab/tutorial) Day

Associated degrees: Grad Cert E, M.P.E.

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.

AMME5021
Capstone Project B
Engineering and Information Technologies

Credit points: 6 Session: Semester 1, Semester 2 Classes: Independent project work. Corequisites: AMME5020 Assessment: Through semester assessment (100%) Campus: Camperdown/Darlington Mode of delivery: Supervision

Note: Department permission required for enrolment.

Associated degrees: M.E, M.P.E.

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 stage of writing up and presenting the research results.

Students are asked to write a thesis based on a research project, which is very often related to some aspect of a staff member's research interests. Some projects will be experimental in nature, others may involve computer-based simulation, feasibility studies or the design, construction and testing of equipment. Direction of thesis work may be determined by the supervisor or be of an original nature, but in either case the student is responsible for the execution of the practical work and the general layout and content of the thesis itself. The final thesis must be the student's individual work, although research is sometimes conducted in the framework of a group project shared with others. Students undertaking research on this basis will need to take care in ensuring the individual quality of their own research work and the final thesis submission. The thesis will be judged on the extent and quality of the student's original work and particularly how critical, perceptive and constructive he or she has been in assessing his/her work and that of others. Students will also be required to present the results of their findings to their peers and supervisors as part of a seminar program.

It is not expected that a thesis at this level will represent a significant contribution to new knowledge; nor is it expected that theses will resolve great intellectual problems. The timeframe available for the thesis is simply too short to permit students to tackle complex or difficult problems. Indeed, a key aim of the thesis is to specify a research topic that arouses sufficient intellectual curiosity, and presents an appropriate range and diversity of technical and conceptual challenges, while remaining manageable and allowing achievable outcomes within the time and resources available. It is important that the thesis 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.

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
Engineering and Information Technologies

Credit points: 6 Session: Semester 2 Classes: Project work - own time. Assumed knowledge: BE in the area of Aerospace or related Engineering field. Assessment: Through semester assessment (100%) Campus: Camperdown/Darlington Mode of delivery: Normal (lecture/lab/tutorial) Day

Note: Department permission required for enrolment.

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AERO5200
Advanced Aerodynamics
Engineering and Information Technologies
Credit points: 6
Session: Semester 1 Classes: 2 hours of lectures and 2 hours of tutorials per week.
Prerequisites: AEROS210 or AERO3260
Assumed knowledge: BE in the area of Aerospace Engineering or related Engineering field.
Assessment: Through semester assessment (100%) Campus: Camperdown/Darlington Mode of delivery: Normal (lecture/lab/tutorial) Day
Note: Department permission required for enrolment.
Associated degrees: B E, Grad Cert E, M P E, PG Coursework Exchange.

AERO5520
Aircraft Avionics and Systems
Engineering and Information Technologies
Credit points: 6
Session: Semester 1 Classes: 3hrs per week of lectures . Workgroups, site visits and demonstrations through semester.
Prerequisites: AEROS5510 or AERO3560
Assessment: Through semester assessment (100%) Campus: Camperdown/Darlington Mode of delivery: Normal (lecture/lab/tutorial) Day
Note: All MPE and ME students are required to do AEROS5510 unless they have already completed an equivalent to AEROS5510/AERO3560. This unit can then be taken as an advanced elective.
Associated degrees: B E, Grad Cert E, M P E, PG Coursework Exchange.

AMME5202
Advanced Computational Fluid Dynamics
Engineering and Information Technologies
Credit points: 6
Session: Semester 1 Classes: Lectures: 1 hour per week. Tutorials: 1 hour per week. Laboratory Sessions: 2 hours per week.
Assumed knowledge: Partial differential equations; Finite difference methods; Taylor series; Basic fluid mechanics including pressure, velocity, boundary layers, separated and recirculating flows. Basic computer programming skills.
Assessment: Through semester assessment (100%) Campus: Camperdown/Darlington Mode of delivery: Normal (lecture/lab/tutorial) Day
Note: Department permission required for enrolment.
Associated degrees: B E, Grad Cert E, M P E, PG Coursework Exchange.

AERO5500
Flight Mechanics Test and Evaluation Adv
Engineering and Information Technologies
Credit points: 6
Session: Semester 2 Classes: 3 hours of lectures and 2 hours of tutorials per week. 2hrs of laboratory per semester.
Prerequisites: AEROS5510 OR AERO3560. Assumed knowledge: BE in area of Aerospace Engineering or related Engineering Field. Assessment: Through semester assessment (100%) Campus: Camperdown/Darlington Mode of delivery: Normal (lecture/lab/tutorial) Day
Note: Department permission required for enrolment.
Associated degrees: B E, Grad Cert E, M P E.

AMME5202
Advanced Computational Fluid Dynamics
Engineering and Information Technologies
Credit points: 6
Session: Semester 2 Classes: Lectures: 1 hour per week. Tutorials: 1 hour per week. Laboratory Sessions: 2 hours per week.
Assumed knowledge: Partial differential equations; Finite difference methods; Taylor series; Basic fluid mechanics including pressure, velocity, boundary layers, separated and recirculating flows. Basic computer programming skills.
Assessment: Through semester assessment (100%) Campus: Camperdown/Darlington Mode of delivery: Normal (lecture/lab/tutorial) Day
Note: Department permission required for enrolment.
Associated degrees: B E, Grad Cert E, M P E, PG Coursework Exchange.

AERO5760
Spacecraft and Satellite Design
Engineering and Information Technologies
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%) Campus: Camperdown/Darlington Mode of delivery: Normal (lecture/lab/tutorial) Day
Note: Department permission required for enrolment.
Associated degrees: B E, Grad Cert E, M P E.
optimization frameworks including linear and quadratic programming. 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.

Noise-corrupted measurements; a feedback control system must find the fastest route between two locations. This unit introduces engineering design via optimization, i.e., finding the most accurate estimate of important physiological parameters from measurements; a feedback control system must find the fastest route between two locations. The acoustics component will include: basic acoustics theory, sound generation and propagation, impedance, absorbing materials, industrial, and modern applications. Examples of these systems are lubrication of internal combustion engines, gearboxes, artificial hip/knee joints, and micro/nano electromechanical systems.

**AMME5310 Engineering Tribology and Information Technologies**

- **Credit points:** 6  
- **Session:** Semester 1 Classes: 2hrs of Lectures per week, 3hrs of Tutorials per week, 12 hours or laboratory work per semester. Assumed knowledge: (AMME2302 OR AMMES302) AND (AMME2301 OR AMMES301) AND (MECH5261 OR MECH5261). Assessment: Through semester assessment (100%)  
- **Campus:** Camperdown/Darlington  
- **Mode of delivery:** Normal (lecture/lab/tutorial) Day

**Associated degrees:** B E, Grad Cert E, M P E.

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**

- **Engineering and Information Technologies**

**Credit points:** 6  
- **Session:** Semester 2 Classes: 2 hrs of lectures per week, 2 hrs of tutorials per week, 8 hours of laboratory work per semester. Assumed knowledge: (AMME3501 OR AMMES3501) AND (AMME2200 OR AMMES2200) AND (AMME2500 OR AMME5500). Assessment: Through semester assessment (35%), Final Exam (65%)  
- **Campus:** Camperdown/Darlington  
- **Mode of delivery:** Normal (lecture/lab/tutorial) Day

**Note:** Department permission required for enrolment.

**Associated degrees:** B E, Grad Cert E, M P E.

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**

- **Engineering and Information Technologies**

**Credit points:** 6  
- **Session:** Semester 2 Classes: 2hr lectures per week; 2th tutorial per week. Prerequisites: AMME3500 OR AMMES5501. Assessment: Through semester assessment (50%), Final exam (50%)  
- **Campus:** Camperdown/Darlington  
- **Mode of delivery:** Normal (lecture/lab/tutorial) Day

**Associated degrees:** B E, Grad Cert E, M P E.

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 OP), 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**

- **Engineering and Information Technologies**

**Credit points:** 6  
- **Session:** Semester 1 Classes: 2 lectures per week, tutorials 2 hours per week and projects and self-assisted learning (4 hours per 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%)  
- **Campus:** Camperdown/Darlington  
- **Mode of delivery:** Normal (lecture/lab/tutorial) Day

**Associated degrees:** Grad Cert E, M P E.

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**

- **Engineering and Information Technologies**

**Credit points:** 6  
- **Session:** Semester 2 Classes: 2 hours of lectures and 3 hours of tutorials per week. Prerequisites: MECH5262 or MECH5260  
- **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, convective and conductive heat transfer. Assessment: Through semester assessment (100%)  
- **Campus:** Camperdown/Darlington  
- **Mode of delivery:** Normal (lecture/lab/tutorial) Day

**Associated degrees:** B E, Grad Cert E, M P E.

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**

- **Engineering and Information Technologies**

**Credit points:** 6  
- **Session:** Semester 2 Classes: Lecture 1 hour per week, Tutorial 1 hour per week, Laboratory 3 hours per week. Prerequisites: MECH2600 AND (AMME2301 OR AMME2301) AND (AMME2302 OR AMME2302) AND (AMME2303 OR AMME2303) AND (AMME2304 OR AMME2304). Assessment: Through semester assessment (100%)  
- **Campus:** Camperdown/Darlington  
- **Mode of delivery:** Normal (lecture/lab/tutorial) Day

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Capstone project is undertaken across two semesters of enrolment, 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 thesis itself. The final thesis must be the student's individual work, although research is sometimes conducted in the framework of a group project shared with others. Students undertaking research on this basis will need to take care in ensuring the individual quality of their own research work and the final thesis submission. The thesis will be judged on the extent and quality of the student's original work and particularly how critical, perceptive and constructive he or she has been in assessing his/her work and that of others. Students will also be required to present the results of their findings to their peers and supervisors as part of a seminar program.

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

**AMEE5021 Capstone Project B Engineering and Information Technologies**

Credit points: 6 Session: Semester 1, Semester 2 Classes: Independent project work. Corequisites: AMME5020 Assessment: Through semester assessment (100%) Course: Semester 1, Semester 2 Mode of delivery: Supervision Note: Department permission required for enrolment.

Associated degrees: M E, M P E.

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 thesis itself. The final thesis must be the student's individual work, although research is sometimes conducted in the framework of a group project shared with others. Students undertaking research on this basis will need to take care in ensuring the individual quality of their own research work and the final thesis submission. The thesis will be judged on the extent and quality of the student's original work and particularly how critical, perceptive and constructive he or she has been in assessing his/her work and that of others. Students will also be required to present the results of their findings to their peers and supervisors as part of a seminar program.

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

**AMEE5020 Capstone Project A Engineering and Information Technologies**

Credit points: 6 Session: Semester 1, Semester 2 Classes: Independent project work. Corequisites: 48 cp from MPE degree program or 24 cp from the ME program. Assessment: Through semester assessment (100%) Course: Semester 1, Semester 2 Mode of delivery: Supervision Note: Department permission required for enrolment.

Associated degrees: M E, M P E.

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 thesis itself. The final thesis must be the student's individual work, although research is sometimes conducted in the framework of a group project shared with others. Students undertaking research on this basis will need to take care in ensuring the individual quality of their own research work and the final thesis submission. The thesis will be judged on the extent and quality of the student's original work and particularly how critical, perceptive and constructive he or she has been in assessing his/her work and that of others. Students will also be required to present the results of their findings to their peers and supervisors as part of a seminar program.

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

**MECH5305 Smart Materials Engineering and Information Technologies**

Credit points: 6 Session: Semester 2 Classes: 1 hour of lectures, 1 hour of tutorials and 3 hours of laboratory work per week. Assumed knowledge: Fundamental knowledge in materials science and engineering; 1) atomic and crystal structures 2) metallurgy 3) structure-property relationship 4) mechanics of engineering materials 5) solid mechanics. Assessment: Through semester assessment (100%) Course: Campberdown/Darlington Mode of delivery: Normal (lecture/lab/tutorial) Day

Associated degrees: B E, Engineering PG Non-Degree, Grad Cert E, M P E, PG Coursework Exchange.

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 Engineering and Information Technologies**

Credit points: 6 Session: Semester 1 Classes: 2 hours of lectures and 3 hours of tutorials per week. Prohibitions: MECH4310 Assessment: Through semester assessment (100%) Course: Campberdown/Darlington Mode of delivery: Normal (lecture/lab/tutorial) Day

Associated degrees: B E, Grad Cert E, M P E.

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.
important that the topic be of sufficient scope and complexity to allow
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.

AMME5022
Capstone Project B Extended
Engineering and Information Technologies

Credit points: 12 Session: Semester 1, Semester 2 Classes: Self paced
Prerequisites: Professor of Engineering and Information Technologies
Assumptions: Designed for students wishing to complete a project
Campus: Camperdown/Darlington Mode of delivery: Supervision
Note: Department permission required for enrolment.

Associated degrees: M E, M P E.

The Capstone Project aims to provide students with the opportunity to
carry out a detailed 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 the thesis research starting with development
of research proposal. Capstone Project B extends the second 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 the project and topic 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 question 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

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
Engineering and Information Technologies

Credit points: 12 Session: Semester 1, Semester 2 Classes: no formal
classwork Prohibitions: AMME5020, AMME5021, ENGG5220, ENGG5221
Assessment: Through semester assessment (100%) Campus:
Camperdown/Darlington Mode of delivery: Supervision
Note: Department permission required for enrolment.

Associated degrees: M E, M P E.

Aim: 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.

AMME5223
Dissertation B
Engineering and Information Technologies

Credit points: 12 Session: Semester 1, Semester 2 Classes: no formal
classwork Prohibitions: AMME5020, AMME5021, ENGG5220, ENGG5221
Assessment: Through semester assessment (100%) Campus:
Camperdown/Darlington Mode of delivery: Supervision
Note: Department permission required for enrolment.

Associated degrees: M E, M P E.

Aim: To complete a substantial research project and successfully
analyze a problem, devise appropriate experiments, analyze the results
and produce a well-argued, in-depth thesis.

Exchange units

Exchange units require the approval of the Program Director. With
approval, up to 12 credit points of Exchange units may be taken in place
of other units, towards the requirements of the degree.

ENGG5231
Engineering Graduate Exchange A
Engineering and Information Technologies

Prerequisites: Permission from faculty and school. Assessment: Through
semester assessment (100%) Campus: Camperdown/Darlington Mode of
delivery: Normal (lecture/lab/tutorial) Day
Note: Department permission required for enrolment.

Associated degrees: M E, M P E, M Tech, M Tech Man, M P E, M P L, M P M.

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
Engineering and Information Technologies

Credit points: 6 Session: Int January, Int July Classes: overseas short-course
Prerequisites: Permission from faculty and school. Assessment: Through

189
semester assessment (100%)  **Campus:** Camperdown/Darlington  **Mode of delivery:** Normal (lecture/lab/tutorial) Day
**Note:** Department permission required for enrolment.

**Associated degrees:** M E, M Inf Tech, M Inf Tech Man, M P E, M P L, M P M.

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 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 [http://www.engineersaustralia.org.au/].

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).
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**

<table>
<thead>
<tr>
<th>Unit of study</th>
<th>Credit points</th>
<th>A: Assumed knowledge</th>
<th>P: Prerequisites</th>
<th>C: Corequisites</th>
<th>N: Prohibition</th>
<th>Session</th>
</tr>
</thead>
<tbody>
<tr>
<td>AMME5302 Foundations of Materials 1</td>
<td>6</td>
<td>N CIVL2110</td>
<td></td>
<td></td>
<td></td>
<td>Semester 1</td>
</tr>
<tr>
<td>AMME5500 Foundations of Engineering Dynamics</td>
<td>6</td>
<td>A Physics, statics, Particle dynamics, Differential Calculus, Linear Algebra, Integral Calculus and Modelling</td>
<td>Semester 1</td>
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<tr>
<td>AMME5700 Foundations of Instrumentation</td>
<td>6</td>
<td>A ENGG1801. Programming Skills, 1st Year maths skills, familiarity with fundamental Aerospace concepts, P AERO1560 OR MECH1560 OR MTRX1701 OR ENGG1800</td>
<td>Semester 1</td>
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<tr>
<td>ENGG5801 Foundations of Engineering Computing</td>
<td>6</td>
<td></td>
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<td>Semester 1</td>
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</tbody>
</table>

**Year One - Semester Two**

<table>
<thead>
<tr>
<th>Unit of study</th>
<th>Credit points</th>
<th>A: Assumed knowledge</th>
<th>P: Prerequisites</th>
<th>C: Corequisites</th>
<th>N: Prohibition</th>
<th>Session</th>
</tr>
</thead>
<tbody>
<tr>
<td>AMME5200 Foundations of Thermodynamics and Fluids</td>
<td>6</td>
<td>A Students are expected to be familiar with basic, first year, integral calculus, differential calculus and linear algebra.</td>
<td>Semester 2</td>
<td></td>
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<tr>
<td>AMME5901 Anatomy and Physiology for Engineers</td>
<td>6</td>
<td>A Biology</td>
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<td>Semester 2</td>
</tr>
<tr>
<td>MECH5400 Foundations of Mechanical Design 1</td>
<td>6</td>
<td>A Knowledge of programming in MATLAB and a knowledge of Engineering Mechanics (statics) N MECH400</td>
<td>Semester 2</td>
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</tbody>
</table>

**Year Two - Semester One**

<table>
<thead>
<tr>
<th>Unit of study</th>
<th>Credit points</th>
<th>A: Assumed knowledge</th>
<th>P: Prerequisites</th>
<th>C: Corequisites</th>
<th>N: Prohibition</th>
<th>Session</th>
</tr>
</thead>
<tbody>
<tr>
<td>AMME5501 Foundations: System Dynamics and Control</td>
<td>6</td>
<td>A AMME5500</td>
<td></td>
<td></td>
<td></td>
<td>Semester 1</td>
</tr>
<tr>
<td>MECH5261 Foundations of Fluid Mechanics</td>
<td>6</td>
<td>A Linear Mathematics, Vector Calculus, Differential Equations and Fourier Series, Thermo Fluids fundamentals N MECH351</td>
<td>Semester 1</td>
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<tr>
<td>MECH5362 Foundations of Materials 2</td>
<td>6</td>
<td>A Mechanics of solids: statics, stress, strain P AMME5302 N MECH362</td>
<td>Semester 1</td>
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<tr>
<td>MECH5660 Foundations of Manufacturing Engineering</td>
<td>6</td>
<td>P MECH5400</td>
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<td>Semester 1</td>
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**Year Two - Semester Two**

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<tr>
<th>Unit of study</th>
<th>Credit points</th>
<th>A: Assumed knowledge</th>
<th>P: Prerequisites</th>
<th>C: Corequisites</th>
<th>N: Prohibition</th>
<th>Session</th>
</tr>
</thead>
<tbody>
<tr>
<td>AMME5921 Biomedical Engineering Tech 2</td>
<td>6</td>
<td>A This is an introductory Masters of Engineering unit. A bachelor's degree, ideally in the engineering or science field, is advisory, but not essential.</td>
<td>Semester 2</td>
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<tr>
<td>AMME5971 Applied Tissue Engineering</td>
<td>6</td>
<td>A 6 credit points of junior biology, 5 credit points of junior chemistry and 6 credit points of intermediate physiology or equivalent.</td>
<td>Semester 1</td>
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<tr>
<td>ENGG5214 Management of Technology</td>
<td>6</td>
<td>A Sound competence in all aspects of engineering, and some understanding of issues of engineering management</td>
<td>Semester 2 Winter Main</td>
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<tr>
<td>Unit of study</td>
<td>Credit points</td>
<td>A: Assumed knowledge</td>
<td>P: Prerequisites</td>
<td>C: Corequisites</td>
<td>N: Prohibitions</td>
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<td><strong>Year Three - Semester One</strong></td>
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<tr>
<td>AMME5961 Computational Biomedical Engineering</td>
<td>6</td>
<td>A AMME5301 and AMME5302 and AMME5500 and MECH5361 and MECH3921</td>
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<td>Semester 1</td>
</tr>
<tr>
<td>AMME5990 Biomedical Engineering Tech 1</td>
<td>6</td>
<td>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.</td>
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<td>Semester 1</td>
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<tr>
<td>ENGG5217 Practical Experience</td>
<td></td>
<td>Students should have completed one year of their MPE program before enrolling in this unit.</td>
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<td>Semester 1 Semester 2</td>
</tr>
<tr>
<td>AMME5020 Capstone Project A</td>
<td>6</td>
<td>P 48 cp from MPE degree program or 24 cp from the ME program. Note: Department permission required for enrolment</td>
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<td>Semester 1 Semester 2</td>
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<td></td>
<td>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.</td>
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<td>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.</td>
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<tr>
<td><strong>Select 6 credit points from Biomedical recommended electives block.</strong></td>
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<td><strong>Year Three - Semester Two</strong></td>
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<tr>
<td>AMME5961 Biomedical Engineering</td>
<td>6</td>
<td>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 Assumed Knowledge: Chemistry, biology, materials engineering, and engineering design at least at the Junior level.</td>
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<td>Semester 2</td>
</tr>
<tr>
<td>ENGG5103 Safety Systems and Risk Analysis</td>
<td>6</td>
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<td>Semester 2</td>
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<tr>
<td>AMME5021 Capstone Project B</td>
<td>6</td>
<td>C AMME5020 Note: Department permission required for enrolment</td>
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<td>Semester 1 Semester 2</td>
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<td>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.</td>
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<td></td>
<td>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 AMME5222 Dissertation B.</td>
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<tr>
<td><strong>Select 6 credit points from Biomedical recommended electives block.</strong></td>
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<tr>
<td>Elective units</td>
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<tr>
<td>Candidates must complete 12 credit points from the following Biomedical elective units.</td>
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<tr>
<td>AERO5010 Optimisation Methods in Engineering</td>
<td>6</td>
<td>A BE in the area of Aerospace or related Engineering field. Note: Department permission required for enrolment</td>
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<td></td>
<td>Semester 2</td>
</tr>
<tr>
<td>AERO5301 Applied Finite Element Analysis</td>
<td>6</td>
<td>A AMME5301 or BE in area of Aerospace Engineering or related Engineering field. P AERO5310 OR MECH5361</td>
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<td>Semester 1</td>
</tr>
<tr>
<td>AMME5202 Advanced Computational Fluid Dynamics</td>
<td>6</td>
<td>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.</td>
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<td></td>
<td>Semester 1</td>
</tr>
<tr>
<td>AMME5271 Computational Nanotechnology</td>
<td>6</td>
<td>A Students are required to have an understanding of basic principles of Newtonian mechanics, physics and chemistry, fluid mechanics and solid mechanics. General knowledge of how to operate a computer and work with different software is also required. Note: Department permission required for enrolment</td>
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<td>Semester 2</td>
</tr>
<tr>
<td>AMME5310 Engineering Tribology</td>
<td>6</td>
<td>A AMME3202 OR AMME5302 AND (AMME2301 OR AMME3301) AND (MECH3261 OR MECH5261).</td>
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<td>Semester 1</td>
</tr>
<tr>
<td>AMME5520 Advanced Control and Optimisation</td>
<td>6</td>
<td>P AMME3500 OR AMME5501.</td>
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<td>Semester 1</td>
</tr>
<tr>
<td>AMME5912 Crash Analysis and Design</td>
<td>6</td>
<td>A Computer Aided Drafting, Basic FEA principles and Solid Mechanics</td>
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<td>Semester 1</td>
</tr>
<tr>
<td>AMME5951 Fundamentals of Neuroumodulation</td>
<td>6</td>
<td>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:</td>
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<td></td>
<td>Semester 1</td>
</tr>
<tr>
<td>CHNG5602 Cellular Biophysics</td>
<td>6</td>
<td>Note: Department permission required for enrolment</td>
<td></td>
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<td></td>
<td>Semester 1</td>
</tr>
<tr>
<td>ELEC5003 Advanced Bioelectronics</td>
<td>6</td>
<td>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 AND ELEC2802. Familiarity with transistor operations, basic electrical circuits, embedded programming is required. Note: Department permission required for enrolment</td>
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<td>Semester 1</td>
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<tr>
<td>ENGG5202 Sustainable Design, Eng and Mgt</td>
<td>6</td>
<td>A General knowledge in science and calculus and understanding of basic principles of chemistry, physics and mechanics</td>
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<td>Semester 1</td>
</tr>
<tr>
<td>MECH5255 Air Conditioning and Refrigeration (Adv)</td>
<td>6</td>
<td>A Students are expected to be familiar with the basic laws of thermodynamics, fluid mechanics and heat transfer. P MECH3260 or MECH5262 N MECH4255</td>
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<td>Semester 2</td>
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<tr>
<td>MECH5275 Advanced Renewable Energy</td>
<td>6</td>
<td>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 MECH5262 or MECH3260</td>
<td></td>
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<td></td>
<td>Semester 2</td>
</tr>
<tr>
<td>MECH5304 Materials Failure</td>
<td>6</td>
<td>A Fundamental knowledge in materials science and engineering: 1) atomic and crystal structures 2) metallurgy 3) structure-property relationship 4) mechanics of engineering materials 5) solid mechanics An elective unit of study for the degree of Master of Engineering</td>
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<td>Semester 2</td>
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</tbody>
</table>
### 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.

### 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.

### 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.

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### Unit of study table

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<th>Unit of study</th>
<th>Credit points</th>
<th>A: Assumed knowledge</th>
<th>P: Prerequisites</th>
<th>C: Corequisites</th>
<th>N: Prohibition</th>
<th>Session</th>
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<tbody>
<tr>
<td>MECH5310 Advanced Engineering Materials</td>
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<tr>
<td>MECH5416 Advanced Design and Analysis</td>
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<tr>
<td>MECH5720 Sensors and Signals</td>
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<tr>
<td>MTRX5700 Experimental Robotics</td>
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<tr>
<td>AMME5020 Capstone Project A</td>
<td>6</td>
<td></td>
<td>P 48 cp from MPE degree program or 24 cp from the ME program. Note: Department permission required for enrolment</td>
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<tr>
<td>AMME5021 Capstone Project B</td>
<td>6</td>
<td></td>
<td>C AMME5020 Note: Department permission required for enrolment</td>
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<td></td>
<td>Semester 2</td>
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<tr>
<td>AMME5022 Capstone Project B Extended</td>
<td>12</td>
<td></td>
<td>P 42 credit points in the Master of Engineering and WAM &gt;70, or 66 credit points in the Master of Professional Engineering and WAM &gt;70 or exemption Note: Department permission required for enrolment</td>
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<td>Semester 1</td>
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<tr>
<td>AMME5222 Dissertation A</td>
<td>12</td>
<td></td>
<td>N AMME5020, AMME5021, ENGG5220, ENGG5221 Note: Department permission required for enrolment</td>
<td></td>
<td></td>
<td>Semester 1</td>
</tr>
<tr>
<td>AMME5223 Dissertation B</td>
<td>12</td>
<td></td>
<td>N AMME5020, AMME5021, ENGG5220, ENGG5221 Note: Department permission required for enrolment</td>
<td></td>
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<tr>
<td>ENGG5231 Engineering Graduate Exchange A</td>
<td>6</td>
<td></td>
<td>P Permission from faculty and school. Note: Department permission required for enrolment</td>
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<td>Int January</td>
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<tr>
<td>ENGG5232 Engineering Graduate Exchange B</td>
<td>6</td>
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<td>P Permission from faculty and school. Note: Department permission required for enrolment</td>
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<td>Int January</td>
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</table>

For more information on degree program requirements visit CUSP.
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

AMME5302 Foundations of Materials 1 Engineering and Information Technologies

Credit points: 6 Session: Semester 1 Classes: Lectures: 3 hours per week; Tutorials: 2 hour per week. Prohibitions: CIVL2110 Assessment: Through semester assessment (45%), Final Exam (55%) Campus: Camperdown/Darlington Mode of delivery: Normal (lecture/lab/tutorial) Day

Associated degrees: Grad Dip E (Prof Eng), M P E.

This UoS 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.

AMME5500 Foundations of Engineering Dynamics Engineering and Information Technologies

Credit points: 6 Session: Semester 1 Classes: Lectures: 3 hours per week; Tutorials: 2 hours per week; Lab Sessions: 6 hours per semester. Assumed knowledge: Physics, statics, Particle dynamics, Differential Calculus, Linear Algebra, Integral Calculus and Modeling. Assessment: Through semester assessment (40%), Final Exam (60%) Campus: Camperdown/Darlington Mode of delivery: Normal (lecture/lab/tutorial) Day

Associated degrees: Grad Dip E (Prof Eng), M P E.

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.

AMME5700 Foundations of Instrumentation Engineering and Information Technologies

Credit points: 6 Session: Semester 1 Classes: 2hrs Lectures per week, 1hr of tutorials per week, 6 hrs of laboratory work per semester. Prerequisites: AER01560 OR MECH1560 OR MTRX1701 OR ENGG31800 Assumed knowledge: ENGG1801. Programming Skills, 1st Year maths skills, familiarity with fundamental Aerospace concepts. Assessment: Through semester assessment (40%); Final Exam (60%) Campus: Camperdown/Darlington Mode of delivery: Normal (lecture/lab/tutorial) Day

Associated degrees: M P E.

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.

ENGG5801 Foundations of Engineering Computing Engineering and Information Technologies

Credit points: 6 Session: Semester 1 Classes: Lectures: 3hr per week; Assumed knowledge: Programming Skills, 1st Year maths skills, familiarity with fundamental Aerospace concepts. Assessment: Through semester assessment (50%), Final Exam (50%) Campus: Camperdown/Darlington Mode of delivery: Normal (lecture/lab/tutorial) Day

Associated degrees: M P E.

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

AMME5202 Foundations of Thermodynamics and Fluids Engineering and Information Technologies

Credit points: 6 Session: Semester 2 Classes: Lectures: 3hr per week; Tutorials: 2 hours per week. Assumed knowledge: Students are expected to be familiar with basic, first year, integral calculus, differential calculus and linear algebra. Assessment: Through semester assessment (35%), Final Exam (65%) Campus: Camperdown/Darlington Mode of delivery: Normal (lecture/lab/tutorial) Day

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

AMME5301 Foundations of Mechanics of Solids 1
Engineering and Information Technologies
Credit points: 6 Session: Semester 2 Classes: Lectures: 3 hours per week; Tutorials: 2 hours per week. Assumed knowledge: Physics, statics, Differential Calculus, Linear Algebra, Integral Calculus and Modelling. Assessment: Through semester assessment (35%), Final Exam (65%) Campus: Camperdown/Darlington Mode of delivery: Normal (lecture/lab/tutorial) Day

Associated degrees: Grad Dip E (Prof Eng), M P E.
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.

AMME5901 Anatomy and Physiology for Engineers Engineering and Information Technologies
Credit points: 6 Session: Semester 2 Classes: Lectures: 2.5 hours per week; Laboratory: 2 hours per week. Assumed knowledge: Biology. Assessment: Through semester assessment (40%); Final Exam (60%) Campus: Cumberland Mode of delivery: Normal (lecture/lab/tutorial) Day

Associated degrees: Grad Dip E (Prof Eng), M P E.
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.

MECH5400 Foundations of Mechanical Design 1
Engineering and Information Technologies
Credit points: 6 Session: Semester 2 Classes: 2 hours of lectures, 2 hours of tutorials and 1 hour of computer lab per week. Assumed knowledge: MECH2400. Assessment: Through semester assessment (100%) Campus: Camperdown/Darlington Mode of delivery: Normal (lecture/lab/tutorial) Day

Associated degrees: Grad Dip E (Prof Eng), M P E.
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
AMME5501 Foundations: System Dynamics and Control Engineering and Information Technologies
Credit points: 6 Session: Semester 1 Classes: Lectures: 2 hours per week; Tutorials: 3 hours per week. Assumed knowledge: AMME5500. Assessment: Through semester assessment (40%); Final Exam (60%) Campus: Camperdown/Darlington Mode of delivery: Normal (lecture/lab/tutorial) Day

Associated degrees: M P E.
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.

MECH5261 Foundations of Fluid Mechanics
Engineering and Information Technologies

Credit points: 6
Session: Semester 1
Classes: 2 hours of lectures and 2 hours of tutorials per week.
Prohibitions: MECH3261
Assumed knowledge: Linear Mathematics, Vector Calculus, Differential Equations and Fourier Series;
Thermo Fluids fundamentals
Assessment: Through semester assessment (60%), Final Exam (40%)
Campus: Camperdown/Darlington
Mode of delivery: Normal (lecture/lab/tutorial) Day

Associated degrees: Grad Dip E (Prof Eng), M P E.

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.

MECH362
Foundations of Materials 2

Engineering and Information Technologies

Credit points: 6
Session: Semester 1
Classes: 3 hours of lectures and 2 hours of tutorials per week.
Prerequisites: AMME5302
Prohibitions: MECH3362
Assumed knowledge: Mechanics of solids: statics, stress, strain
Assessment: Through semester assessment (50%), Final Exam (50%)
Campus: Camperdown/Darlington
Mode of delivery: Normal (lecture/lab/tutorial) Day

Associated degrees: M P E.

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.

MECH5660
Foundations of Manufacturing Engineering

Engineering and Information Technologies

Credit points: 6
Session: Semester 1
Classes: 2 hours of lectures and 2 hours of tutorials per week.
Prerequisites: MECH5400
Assessment: Through semester assessment (100%)
Campus: Camperdown/Darlington
Mode of delivery: Normal (lecture/lab/tutorial) Day

Associated degrees: M P E.

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; material 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

Engineering and Information Technologies

Credit points: 6
Session: Semester 2
Classes: Lectures: 4 hours per week
Assumed knowledge: This is an introductory Masters of Engineering unit. A bachelor's degree, ideally in the engineering or science field, is advisory, but not essential.
Assessment: Through semester assessment (100%)
Campus: Camperdown/Darlington
Mode of delivery: Normal (lecture/lab/tutorial) Day

Associated degrees: M E, M P E.

This unit of study provides an introduction to the field of biomedical engineering, from the point of view of the engineer 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.

AMME5971
Applied Tissue Engineering

Engineering and Information Technologies

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

Associated degrees: M E, M P E.

Electic 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 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.

ENG5S214
Management of Technology

Engineering and Information Technologies

Credit points: 6
Session: Semester 2, Winter Main
Classes: 1 hour Lecture per week, 1 hr Tutorial per week, 2hr Project work in class per week.
Assumed knowledge: Sound competence in all aspects of engineering, and some understanding of issues of engineering management.
Assessment: Through
semiconductor devices and fabrication processes.

AMME5990 Biomedical Engineering Tech 1

Engineering and Information Technologies

Credit points: 6

Session: Semester 1

Classes: Lectures: 2 hours per week; Tutorials: 2 hours per week

Assumed knowledge: Linear Algebra, Calculus, Physics

Mode of delivery: Normal (lecture/lab/tutorial) Day

Associated degrees: M E, M P E

Elective Unit of Study: Product development in the biomedical area presents unique challenges that need to be addressed efficiently. Students are expected to know the fundamentals of solving engineering problems by comprehensively using the theories and why so; how and why to do stress analysis; how and why to do strain analysis; how and why to do 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 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. Students will get familiar with finite element analysis as a research and analysis tool for various real-life problems.

Year Three - Semester One

AMME5981 Computational Biomedical Engineering

Engineering and Information Technologies

Credit points: 6

Session: Semester 2

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

Associated degrees: B E, M E, M P E

This UoS will give students a comprehensive understanding of finite element method, material constitutive modelling, CT/MRI based solid modelling, design analysis and optimisation, and their applications in biomedical engineering. The students are expected to expand their research and development skills in relevant topics, and gain experience and skills in finite element software for the solution to sophisticated problems associated with biomedical engineering.

The objectives are:

1. Understanding of the nature of biomedical engineering problems;
2. Exploring CT/MRI image processing, solid modelling etc;
3. Understanding of finite element methods and developing FE models for biomedical engineering analysis;
4. Understanding biomaterials constitutive modelling;
5. Understanding bone remodelling simulation, fracture mechanics;
6. Developing prosthetic design optimisation;

AMME5990 Biomedical Engineering Tech 1

Engineering and Information Technologies

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%)

Campus: Camperdown/Darlington

Mode of delivery: Normal (lecture/lab/tutorial) Day

Associated degrees: M E, M P E

Elective Unit of Study: Product development in the biomedical area presents unique challenges that need to be addressed efficiently. Students are expected to know the fundamentals of solving engineering problems by comprehensively using the theories and why so; how and why to do stress analysis; how and why to do strain analysis; how and why to do 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 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. Students will get familiar with finite element analysis as a research and analysis tool for various real-life problems.
AMME5020
Capstone Project A
Engineering and Information Technologies
Credit points: 6  Session: Semester 1, Semester 2  Classes: Independent project work  Prerequisites: 48 cp from MPE degree program or 24 cp from the ME program  Assessment: Through semester assessment (100%)  Campus: Camperdown/Darlington  Mode of delivery: Supervision  Note: Department permission required for enrolment  Associated degrees: M E, M P E.

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 thesis itself. The final thesis must be the student's individual work, although research is sometimes conducted in the framework of a group project shared with others. Students undertaking research on this basis will need to take care in ensuring the individual quality of their own research work and the final thesis submission. The thesis will be judged on the extent and quality of the student's original work and particularly how critical, perceptive and constructive he or she has been in assessing his/her work and that of others. Students will also be required to present the results of their findings to their peers and supervisors as part of a seminar program.

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

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 Biomedical recommended electives block.

Year Three - Semester Two
AMME5961 Biomaterials Engineering
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, penetrating 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 these will resolve great intellectual problems. The timeframe available for the thesis is simply too short to permit students to tackle complex or difficult problems. Indeed, a key aim of the thesis is to specify a research topic that arouses sufficient intellectual curiosity, and presents an appropriate range and diversity of technical and conceptual challenges, while remaining manageable and allowing achievable outcomes within the time and resources available. It is important that the topic be of sufficient scope and complexity to allow a student to learn their craft and demonstrate their research skills. Equally imperative is that the task not be so demanding as to elude completion.

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
Engineering and Information Technologies
Credit points: 6 Session: Semester 2 Classes: Project work - own time. Assumed knowledge: BE in the area of Aerospace or related Engineering field. Assessment: Through semester assessment (100%) Campus: Camperdown/Darlington Mode of delivery: Normal (lecture/lab/tutorial) Day Note: Department permission required for enrolment.

Associated degrees: Grad Cert E, M P E, PG Coursework Exchange.

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.

AERO5301
Applied Finite Element Analysis
Engineering and Information Technologies
Credit points: 6 Session: Semester 1 Classes: 2.5 hours of lectures and 3 hours of workgroup session per week. Prerequisites: AERO310 OR MECH3361 Assumed knowledge: AMME5301 or BE in area of Aerospace Engineering or related Engineering field. Assessment: Through semester assessment (55%), Final Exam (45%) Campus: Camperdown/Darlington Mode of delivery: Normal (lecture/lab/tutorial) Day

Associated degrees: B E, Grad Cert E, M P E.


AMME5202
Advanced Computational Fluid Dynamics
Engineering and Information Technologies
Credit points: 6 Session: Semester 1 Classes: Lectures: 1 hour per week; Tutorials: 1 hour per week; Laboratory Sessions: 2 hours per week Assumed knowledge: Partial differential equations; Finite difference methods; Taylor series; Basic fluid mechanics including pressure, velocity, boundary layers, separated and recirculating flows. Basic computer programming skills. Assessment: Through semester assessment (100%) Campus: Camperdown/Darlington Mode of delivery: Normal (lecture/lab/tutorial) Day

Associated degrees: B E, Grad Cert E, M P E, PG Coursework Exchange.

Objectives: To provide students with the necessary skills to use commercial Computational Fluid Dynamics packages and to carry out research in the area of Computational Fluid Dynamics. Expected outcomes: Students will have a good understanding of the basic theory of Computational Fluid Dynamics, including discretisation, accuracy and stability. They will be capable of writing a simple solver and using a sophisticated commercial CFD package. Syllabus summary: A course of lectures, tutorials and laboratories designed to provide the student with the necessary tools for using a sophisticated commercial CFD package. A set of laboratory tasks will take the student through a series of increasingly complex flow simulations, requiring an understanding of the basic theory of computational fluid dynamics (CFD). The laboratory tasks will be complemented by a series of lectures in which the basic theory is covered, including: governing equations; finite difference methods accuracy and stability for the advection equation, diffusion equation; direct and iterative solution techniques; solution of the full Navier-Stokes equations; turbulent flow; Cartesian tensors; turbulence models.

AMME5271
Computational Nanotechnology
Engineering and Information Technologies
Credit points: 6 Session: Semester 2 Classes: Lectures: 2 hours per week; Tutorials: 3 hours per week Assumed knowledge: Students are required to have an understanding of basic principles of Newtonian mechanics, physics and chemistry, fluid mechanics and solid mechanics. General knowledge of how to operate a computer and work with different software is also required. Assessment: Through semester assessment (100%) Campus: Camperdown/Darlington Mode of delivery: Normal (lecture/lab/tutorial) Day Note: Department permission required for enrolment.

Associated degrees: B E, M E, M P E.

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, nanobiology 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
Engineering and Information Technologies
Credit points: 6 Session: Semester 1 Classes: 2hrs of Lectures per week, 3hr of Tutorials per week, 12 hours or laboratory work per semester Assumed knowledge: (AMME2302 OR AMME5302) AND (AMME2301 OR AMMES301)
AND (MECH3251 OR MECH5261). Assessment: Through semester assessment (100%). Campus: Camperdown/Darlington Mode of delivery: Normal (lecture/lab/tutorial) Day

Assessed degrees: B E, Grad Cert E, M P E.

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 Engineering and Information Technologies Credit points: 6 Session: Semester 1 Classes: 2hr lectures per week; 2hr tutorial per week Prerequisites: AMME3500 OR AMME5501. Assessment: Through semester assessment (50%), Final exam (50%) Campus: Camperdown/Darlington Mode of delivery: Normal (lecture/lab/tutorial) Day

Assessed degrees: B E, Grad Cert E, M P E.

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.


Assessed degrees: B E, Grad Cert E, M P E.

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, Elementary 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 Engineering and Information Technologies Credit points: 6 Session: Semester 1 Classes: 3hrs of lecture/tutorial per 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: Assessment: Through semester assessment (100%) Campus: Camperdown/Darlington Mode of delivery: Normal (lecture/lab/tutorial) Day

Assessed degrees: B E, Grad Cert E.

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 Engineering and Information Technologies Credit points: 6 Session: Semester 1 Classes: 4 hours of lectures/ project work classes per week. Assessment: Through semester assessment (50%), Final Exam (50%) Campus: Camperdown/Darlington Mode of delivery: Normal (lecture/lab/tutorial) Day

Note: Department permission required for enrolment.

Assessed degrees: B E, Grad Cert E, M P E.

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 Engineering and Information Technologies Credit points: 6 Session: Semester 1 Classes: 2hr Lectures per week, 2hr Lab/Tutorial per week. Prerequisites: ELEC2104 AND ELEC2602. Familiarity with transistor operations, basic electrical circuits, embedded programming is required. 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%) Campus: Camperdown/Darlington Mode of delivery: Normal (lecture/lab/tutorial) Day

Note: Department permission required for enrolment.

Assessed degrees: B E, Grad Cert E.

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.

ENG55202 Sustainable Design, Eng and Mgt Engineering and Information Technologies Credit points: 6 Session: Semester 1 Classes: 2 lectures per week, tutorials 2 hour per week and projects and self assisted learning (4 hours per week). Assumed knowledge: General knowledge in science and calculus and understanding of basic principles of chemistry, physics and mechanics. Assessment: Through semester assessment (70%), Final Exam (30%) Campus: Camperdown/Darlington Mode of delivery: Normal (lecture/lab/tutorial) Day

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The aim of this Unit of Study (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)**  
**Engineering and Information Technologies**

**Credit points:** 6  
**Session:** Semester 2  
**Classes:** 2 hours of lectures and 1 hour of tutorials per week.  
**Prerequisites:** MECH3260 or MECH5262  
**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%)  
**Campus:** Camperdown/Darlington  
**Mode of delivery:** Normal (lecture/lab/tutorial) Day

**Associated degrees:** B E, Grad Cert E, M P E.

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**  
**Engineering and Information Technologies**

**Credit points:** 6  
**Session:** Semester 2  
**Classes:** 2 hours of lectures and 3 hours of tutorials per week.  
**Prerequisites:** MECH5262 or MECH3260  
**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%)  
**Campus:** Camperdown/Darlington  
**Mode of delivery:** Normal (lecture/lab/tutorial) Day

**Associated degrees:** B E, Grad Cert E, M P E.

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**  
**Engineering and Information Technologies**

**Credit points:** 6  
**Session:** Semester 2  
**Classes:** Lecture 1 hour per week, Tutorial 1 hour per week, Laboratory 3 hours per week.  
**Assumed knowledge:** Fundamental knowledge in materials science and engineering: 1) atomic and crystal structures 2) metallurgy 3) structure-property relationship 4) mechanics of engineering materials 5) solid mechanics  
**Assessment:** Through semester assessment (100%).  
**Campus:** Camperdown/Darlington  
**Mode of delivery:** Normal (lecture/lab/tutorial) Day

**Note:** An elective unit of study for the degree of Master of Engineering

**Associated degrees:** Engineering PG Non-Degree, Grad Cert E, M P E, PG Coursework Exchange.

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**  
**Engineering and Information Technologies**

**Credit points:** 6  
**Session:** Semester 1  
**Classes:** 2 hours of lectures and 3 hours of tutorials per week.  
**Prohibitions:** MECH4310  
**Assessment:** Through semester assessment (100%).  
**Campus:** Camperdown/Darlington  
**Mode of delivery:** Normal (lecture/lab/tutorial) Day

**Associated degrees:** B E, Grad Cert E, M P E.

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**  
**Engineering and Information Technologies**

**Credit points:** 6  
**Session:** Semester 2  
**Classes:** 2 hrs of lectures, 2hrs of tutorial per week.  
**Assumed knowledge:** Eng Mechanics, balance of forces and moments Mechanics of Solids, 2 and 3 dimensional stress and strain Engineering Dynamics - dynamic forces and moments. Mechanical Design, approach to design problems and report writing, and preparation of engineering drawing Mechanical design intermediate, means of applying fatigue analysis to a wide range of machine components  
**Assessment:** Through semester assessment (100%).  
**Campus:** Camperdown/Darlington  
**Mode of delivery:** Normal (lecture/lab/tutorial) Day

**Associated degrees:** B E, Grad Cert E, M P E.

This UoS utilises assumed theoretical knowledge and skills to elucidate the stresses and strains that exit in the different categories of machine parts. It sets out to make the students familiar with the simplifications that are applied to arrive at the analytic expressions commonly used to analyse each individual categories parts. These simplifications usually begin by assuming that only particular types of loads are carried by teh parts in that category. The resulting analyses provide approximations to the actual stresses. It is possible to have different degrees of simplifications, requiring more or less work, giving better or poorer approximations. Should a part be used to carry loads that were not allowed for in the traditional method then some more appropriate method must be found or developed. An important aspect is to make the student practiced in a range of modern concepts, techniques and tools, and to be made aware of their strengths and limitations.

This UoS teaches the student how to recognise where and how their theoretical skills can be applied to the practical situations that they may encounter in this field of design. Options may be provided in the choice of design assignments. Biomedical engineering and vehicle design problems may be provided as options to more general machine design problems.
MECH5720
Sensors and Signals

Engineering and Information Technologies

Credit points: 6
Session: Semester 2
Classes: 3 hours of lectures and 2 hours of tutorials per week
Prohibitions: MEC4720
Assumed knowledge: Strong MATLAB skills
Assessment: Through semester assessment (70%), Final Exam (30%)
Campus: Camperdown/Darlington
Mode of delivery: Normal (lecture/lab/tutorial) Day

Associated degrees: B E, Grad Cert E, M P E.

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
d) SENSORS AND THE ENVIRONMENT: Atmospheric Effects, Target Characteristics, Clutter Characteristics, Multipath

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

Engineering and Information Technologies

Credit points: 6
Session: Semester 1
Classes: 2hrs lectures and 3hrs of laboratory work per week
Prohibitions: MTRX4700
Assumed knowledge: Knowledge of statics and dynamics, rotation matrices, programming and some electronics and mechanical design experience is assumed.
Assessment: Through semester assessment (70%), Final Exam (30%)
Campus: Camperdown/Darlington
Mode of delivery: Normal (lecture/lab/tutorial) Day

Associated degrees: B E, Grad Cert E, M P E.

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

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

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

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 AMMES5020 and AMMES5022 (total 18 cp) in place of Capstone Project AMMES5021 and 6 cp of elective units.

AMMES5020
Capstone Project A

Engineering and Information Technologies

Credit points: 6
Session: Semester 1, Semester 2
Classes: Independent project work.
Prerequisites: 48 cp from MPE degree program or 24 cp from the ME program.
Assessment: Through semester assessment (100%)
Campus: Camperdown/Darlington
Mode of delivery: Supervision
Note: Department permission required for enrolment.

Associated degrees: M E, M P E.

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 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 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 these will resolve great intellectual problems. The timeframe available for the thesis is simply too short to permit students to tackle complex or difficult problems. Indeed, a key aim of the thesis is to specify a research topic that arouses sufficient intellectual curiosity, and presents an appropriate range and diversity of technical and conceptual challenges, while remaining manageable and allowing achievable outcomes within the time and resources available. It is important that the topic be of sufficient scope and complexity to allow a student to learn their craft and demonstrate their research skills. Equally imperative is that the task not be so demanding as to elude completion.
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**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**

Engineering and Information Technologies

Credit points: 12
Session: Semester 1, Semester 2
Classes: no formal coursework
Prerequisites: AMME5020, AMME5021, ENGG5220, ENGG5221
Assessment: Through semester assessment (100%)
Campus: Camperdown/Darlington
Mode of delivery: Supervision
Note: Department permission required for enrolment.

Associated degrees: M E, M P E.

Aim: 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.

**AMME5223**

Dissertation B

Engineering and Information Technologies

Credit points: 12
Session: Semester 1, Semester 2
Classes: no formal coursework
Prerequisites: AMME5020, AMME5021, ENGG5220, ENGG5221
Assessment: Through semester assessment (100%)
Campus: Camperdown/Darlington
Mode of delivery: Supervision
Note: Department permission required for enrolment.

Associated degrees: M E, M P E.
Aim: 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.

Exchange units

Exchange units require the approval of the Program Director. With approval, up to 12 credit points of Exchange units may be taken in place of other units, towards the requirements of the degree.

ENGG5231

Engineering Graduate Exchange A
Engineering and Information Technologies

Credit points: 6
Session: Int January, Int July
Classes: overseas short-course
Prerequisites: Permission from faculty and school.
Assessment: Through semester assessment (100%)
Campus: Camperdown/Darlington
Mode of delivery: Normal (lecture/lab/tutorial) Day
Note: Department permission required for enrolment.

Associated degrees: M E, M Inf Tech, M Inf Tech Man, M P E, M P L, M P M.

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
Engineering and Information Technologies

Credit points: 6
Session: Int January, Int July
Classes: overseas short-course
Prerequisites: Permission from faculty and school.
Assessment: Through semester assessment (100%)
Campus: Camperdown/Darlington
Mode of delivery: Normal (lecture/lab/tutorial) Day
Note: Department permission required for enrolment.

Associated degrees: M E, M Inf Tech, M Inf Tech Man, M P E, M P L, M P M.

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.
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 including 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 http://www.engineersaustralia.org.au/.

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

### 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.

<table>
<thead>
<tr>
<th>Unit of study</th>
<th>Credit points</th>
<th>A: Assumed knowledge</th>
<th>P: Prerequisites</th>
<th>C: Corequisites</th>
<th>N: Prohibition</th>
<th>Session</th>
</tr>
</thead>
<tbody>
<tr>
<td>CHNG5701 Found of Conservation &amp; Transport Proc</td>
<td>6</td>
<td>A</td>
<td></td>
<td></td>
<td></td>
<td>Semester 1</td>
</tr>
<tr>
<td>CHNG5702 Found of Applied Maths for Chem Eng</td>
<td>6</td>
<td>A</td>
<td></td>
<td></td>
<td></td>
<td>Semester 1</td>
</tr>
<tr>
<td>CHNG5703 Found of Energy and Fluid Systems</td>
<td>6</td>
<td>A</td>
<td></td>
<td></td>
<td></td>
<td>Semester 1</td>
</tr>
<tr>
<td>ENGG5011 Foundation Engineering Studies A</td>
<td>6</td>
<td></td>
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<td></td>
<td>Semester 1</td>
</tr>
</tbody>
</table>

#### Year One - Semester Two

<table>
<thead>
<tr>
<th>Unit of study</th>
<th>Credit points</th>
<th>A: Assumed knowledge</th>
<th>P: Prerequisites</th>
<th>C: Corequisites</th>
<th>N: Prohibition</th>
<th>Session</th>
</tr>
</thead>
<tbody>
<tr>
<td>CHNG5704 Found: Chem &amp; Biological Syst Behaviour</td>
<td>6</td>
<td>A</td>
<td></td>
<td></td>
<td></td>
<td>Semester 2</td>
</tr>
<tr>
<td>CHNG5706 Materials Purification &amp; Recovery (Fund)</td>
<td>6</td>
<td>A</td>
<td></td>
<td></td>
<td></td>
<td>Semester 2</td>
</tr>
<tr>
<td>CHNG5707 Material &amp; Energy Transformation (Fund)</td>
<td>6</td>
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<td></td>
<td>Semester 2</td>
</tr>
<tr>
<td>CHNG5804 Found of Biochemical Eng</td>
<td>6</td>
<td>N</td>
<td>CHNG3804</td>
<td></td>
<td></td>
<td>Semester 2</td>
</tr>
</tbody>
</table>

#### Year Two - Semester One

<table>
<thead>
<tr>
<th>Unit of study</th>
<th>Credit points</th>
<th>A: Assumed knowledge</th>
<th>P: Prerequisites</th>
<th>C: Corequisites</th>
<th>N: Prohibition</th>
<th>Session</th>
</tr>
</thead>
<tbody>
<tr>
<td>CHNG5801 Foundations of Process Design</td>
<td>6</td>
<td>A</td>
<td></td>
<td></td>
<td></td>
<td>Semester 1</td>
</tr>
<tr>
<td>CHNG5802 Found: Operation &amp; Improving Ind Systems</td>
<td>6</td>
<td>A</td>
<td></td>
<td></td>
<td></td>
<td>Semester 1</td>
</tr>
<tr>
<td>CHNG5803 Found of Chem &amp; Biological Processes</td>
<td>6</td>
<td>A</td>
<td></td>
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<td>Semester 1</td>
</tr>
</tbody>
</table>
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

CHNG5112
Found of Chemical Eng Design A
6
A Enrolment in this unit of study assumes that all core chemical engineering UoS in second and third years, or their equivalent, have been successfully completed. 
P CHNG5801, CHNG5802, CHNG5805, CHNG5806
Note: Department permission required for enrolment

Year Three - Semester Two

CHNG5021
Capstone Project A
6
A Enrolment in this unit of study assumes that Capstone Project A has been successfully completed. 
P CHNG5020
Note: Department permission required for enrolment in the following sessions: Semester 1

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

CHNG5116
Found of Chemical Eng Design B
6
A Enrolment in this unit of study assumes that all core chemical engineering UoS in second and third years, or their equivalent, have been successfully completed. 
P CHNG5112 Chemical Engineering Design A
Note: Department permission required for enrolment

CHNG5021
Capstone Project B
6
A Enrolment in this unit of study assumes that Capstone Project A has been successfully completed. 
P CHNG5020
Note: Department permission required for enrolment

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 electives units
Candidates must complete 24 credit points from the following Chemical & Biomolecular Specialist electives 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 CHNG3805/CHNG5802 or similar courses. Students who are unsure about meeting these requirements should contact the unit coordinator for advice. This unit is for Masters students and can be selected as an elective by 4th year students.

CHNG5003
Green Engineering
6
A CHNG3801 AND CHNG3802 AND CHNG3803 AND CHNG3805 AND CHNG3806 AND CHNG3807. All core third year chemical engineering.

CHNG5004
Particles and Surfaces
6
A Enrolment in this unit of study assumes that all (six) core chemical engineering UoS in third year or their equivalent have been successfully completed. 
Note: Department permission required for enrolment

CHNG5005
Wastewater Eng - Systems and Practice
6
A Ability to conduct mass and energy balances, and the integration of these concepts to solve real chemical engineering problems. Ability to understand basic principles of physical chemistry, physics and mechanics. Ability to use basic calculus and linear algebra, and carry out such computations using Matlab and MS Excel. Ability to read widely outside of the technical literature and to synthesise arguments based on such literature. Ability to write coherent reports and essays based on information from diverse sources.

CHNG5006
Advanced Wastewater Engineering
6
A CHNG5005 OR CHNG3804.
### Unit of study table

<table>
<thead>
<tr>
<th>Unit of study</th>
<th>Credit points</th>
<th>A: Assumed knowledge</th>
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<th>N: Prohibition</th>
<th>Session</th>
</tr>
</thead>
<tbody>
<tr>
<td>CHNG5008 Chemical &amp; Biomolecular Engineering Adv</td>
<td>6</td>
<td>P CHNG5801 OR (CHNG3802 AND CHNG3805 AND CHNG3806) Note: Department permission required for enrolment</td>
<td>Semester 2</td>
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<tr>
<td>CHNG5601 Membrane Science</td>
<td>6</td>
<td>Note: Department permission required for enrolment</td>
<td>Semester 1</td>
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<tr>
<td>CHNG5602 Cellular Biophysics</td>
<td>6</td>
<td>Note: Department permission required for enrolment</td>
<td>Semester 1</td>
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<tr>
<td>CHNG5603 Analysis, Modelling, Control: BioPhy Sys</td>
<td>6</td>
<td>A It is assumed that students have a general knowledge of: MATH 1001 Differential Calculus MATH 1003 Integral Calculus and Modeling</td>
<td>Semester 1</td>
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<tr>
<td>CHNG5604 Membrane Science Laboratory</td>
<td>6</td>
<td>A CHNG5601</td>
<td>Semester 2</td>
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</tr>
<tr>
<td>CHNG5605 Bio-Products: Laboratory to Marketplace</td>
<td>6</td>
<td>This course is for Master degree students and also is offered as an elective course for fourth year students.</td>
<td>Semester 2</td>
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</tbody>
</table>

### Management elective units

Candidates must complete 6 credit points from the following Management elective units.

- **ENG5203 Quality Engineering and Management**
  - 6 Credit points
  - A First degree in Engineering or a related discipline.
  - Session: Semester 2

- **ENG5205 Professional Practice in PM**
  - 6 Credit points
  - A Basic engineering or science knowledge. At least 2-3 years of work experience preferred. 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.
  - Session: Semester 1, Semester 2

- **ENG5214 Management of Technology**
  - 6 Credit points
  - A Sound competence in all aspects of engineering, and some understanding of issues of engineering management.
  - Session: Semester 2, Winter Main

- **ENG5215 International Eng Strategy & Operations**
  - 6 Credit points
  - A Sound competence in all aspects of engineering, and some understanding of issues of engineering management and globalisation.
  - Session: Semester 2

- **ENG5216 Management of Engineering Innovation**
  - 6 Credit points
  - A Sound competence in all aspects of engineering, and some understanding of issues of engineering management.
  - Session: 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.

- **CHNG5020 Capstone Project A**
  - 6 Credit points
  - A CHNG5801 AND CHNG5802 AND CHNG5803 AND CHNG5805 AND CHNG5806. Completion of 24 credits of ME or exemption, or 42 credits of MPE.
  - Note: Department permission required for enrolment.
  - Session: Semester 1, Semester 2

- **CHNG5021 Capstone Project B**
  - 6 Credit points
  - A Enrolment in this unit of study assumes that Capstone Project A has been successfully completed.
  - P CHNG5020
  - Note: Department permission required for enrolment in the following sessions: Semester 1, Semester 2

- **CHNG5022 Capstone Project B Extended**
  - 12 Credit points
  - 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.
  - Session: 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.

- **CHNG5222 Dissertation A**
  - 12 Credit points
  - N ENGG5202, ENGG5221. 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.
  - Note: Department permission required for enrolment.
  - Session: Semester 1, Semester 2

- **CHNG5223 Dissertation B**
  - 12 Credit points
  - N ENGG5202, ENGG5221. Note: Department permission required for enrolment.
  - Session: Semester 1, Semester 2

### MIPPS pathway (Major Industrial Project Placement Scheme)

MIPPS 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 table

<table>
<thead>
<tr>
<th>Unit of study</th>
<th>Credit points</th>
<th>A: Assumed knowledge</th>
<th>P: Prerequisites</th>
<th>C: Corequisites</th>
<th>N: Prohibition</th>
<th>Session</th>
</tr>
</thead>
<tbody>
<tr>
<td>CHNG5205 Major Industrial Placement Project</td>
<td>24</td>
<td>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.</td>
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<td></td>
<td>Semester 1</td>
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<tr>
<td></td>
<td></td>
<td>C MIPPS students are required to enroll in Foundation of Chemical Engineering Design B in the second semester (second year). These students need to acquire several of the skills, which the students at University will acquire in Design A. Students undertaking MIPPS are consequently encouraged to make the most of this learning opportunity by the Case Study component, which provides some requirements to look outside the confines of their immediate project. This course will give a unique opportunity to high performance students in Master of Professional Engineering to acquire practical experience.</td>
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<tr>
<td></td>
<td></td>
<td>N CHNG5112, ENGG5219, ENGG5220, ENGG5221</td>
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<td>Note: Department permission required for enrolment</td>
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<tr>
<td></td>
<td></td>
<td>Enrolment by permission only. The students enrolled in this subject should complete the first year Master of Professional Engineering with specialisation in Chemical and Biomolecular Engineering and a minimum credit average. The candidate will be selected by interview and at the discretion of the Head of School. Students are exempted from completing Foundation of Chemical Engineering Design A (CHNG5112), Engineering Project (ENGG5219 or ENGG5220 and ENGG5221) 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.</td>
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</tbody>
</table>

### 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.

<table>
<thead>
<tr>
<th>Exchange unit</th>
<th>Credit points</th>
<th>P: Permission from faculty and school. Note: Department permission required for enrolment</th>
<th>Session</th>
</tr>
</thead>
<tbody>
<tr>
<td>ENGG5231 Engineering Graduate Exchange A</td>
<td>6</td>
<td></td>
<td>Int January, Int July</td>
</tr>
<tr>
<td>ENGG5232 Engineering Graduate Exchange B</td>
<td>6</td>
<td></td>
<td>Int January, Int July</td>
</tr>
</tbody>
</table>

For more information on degree program requirements visit CUSP.
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

CHNG5701
Found of Conservation & Transport Proc
Engineering and Information Technologies

Credit points: 6
Session: Semester 1
Classes: Lectures 2hrs per week, Tutorial 2hrs per week, Project Work - own time, Laboratory 2hrs per week.
Assumed knowledge: Calculus, computations (Matlab, Excel), Mass and Energy Balances
Assessment: Through semester assessment (60%), Final Exam (40%)
Campus: Camperdown/Darlington
Mode of delivery: Normal (lecture/lab/tutorial) Day

Associated degrees: Grad Dip E (Prof Eng), M P E.

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 CHNG5702. 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, CHNG5703. This integrated course structure is designed to help students become familiar with the multi-disciplinary nature of chemical engineering today.

CHNG5702
Found of Applied Maths for Chem Eng
Engineering and Information Technologies

Credit points: 6
Session: Semester 1
Classes: 2 hours of lectures and 2 hours of tutorials per week.
Prohibitions: CHNG2802
Assumed knowledge: CHEM1101 AND CHEM1102 AND CHNG1103 AND MATH1001 AND MATH1002 AND MATH1003 AND MATH1005. Enrolment in this unit of study assumes that all core science and engineering UoS in first-year (or their equivalent) have been successfully completed. Assessment: Through semester assessment (100%)
Campus: Camperdown/Darlington
Mode of delivery: Normal (lecture/lab/tutorial) Day

Associated degrees: Grad Dip E (Prof Eng), M P E.

Virtually every aspect of a chemical engineer’s professional life will involve some use of mathematical techniques. Not only is the modern chemical engineer expected to be proficient in the use of these techniques, they are also expected to be able to utilise computer-based solutions when analytical solutions are unfeasible. This UoS aims to expose students to an appropriate suite of techniques and enable them to become proficient in the use of mathematics as a tool for the solution of a diversity of chemical engineering problems.

Specifically, this unit consists of two core modules: (A) Statistical methods and (B) Numerical methods. These modules aim at furthering knowledge by extending skills in statistical analysis and Chemical Engineering computations. This unit will also enable the development of a systematic approach to solving mathematically oriented Chemical Engineering problems, which will help with making sound engineering decisions.

In addition, there will be considerable time spent during the semester on advanced topics related to mathematical analysis techniques in engineering and recent associated developments.

CHNG5703
Found of Energy and Fluid Systems
Engineering and Information Technologies

Credit points: 6
Session: Semester 1
Classes: 8 hours per week of in class project work.
Prohibitions: CHNG2803
Assumed knowledge: Knowledge: CHEM1101 AND CHEM1102 AND CHNG1103 AND MATH1001 AND MATH1002 AND MATH1003 AND MATH1005. 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%)
Campus: Camperdown/Darlington
Mode of delivery: Normal (lecture/lab/tutorial) Day

Associated degrees: Grad Dip E (Prof Eng), M P E.

To recognise that chemical engineers are involved in creation of products and processes, in manipulating complex systems, and in managing technical operations To develop an appreciation of the practical application of concepts and tools to real design problems in the process, product and service sectors in which chemical engineers are engaged. To consider this through three project-driven case studies covering a range of integrated analysis scenarios, from the domain of energy and fluid systems. In addition, there will be considerable time spent during the semester on advanced topics related to energy and fluid systems and associated technological developments.

ENGG5011
Foundation Engineering Studies A
Engineering and Information Technologies

Credit points: 6
Session: Semester 1
Classes: no formal classes.
Prohibitions: no formal classes.
Assessment: no formal classes.

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

CHNG5704
Found: Chem & Biological Syst Behaviour
Engineering and Information Technologies
Credit points: 6 Session: Semester 2 Classes: 1-2 hours of lectures and 2 hours of tutorials per week. Prohibitions: CHNG2804 Assumed knowledge: CHEM1101 AND CHEM1102 AND CHNG1103 AND MATH1001 AND MATH11002 AND MATH11003 AND MATH11005. 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%) Campus: Camperdown/Darlington Mode of delivery: Normal (lecture/lab/tutorial) Day

Associated degrees: Grad Dip E (Prof Eng), M P E.

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.

CHNG5706
Materials Purification & Recovery (Fund)
Engineering and Information Technologies
Credit points: 6 Session: Semester 2 Classes: 3 hrs lectures/tutorials per week. Assumed knowledge: Ability to conduct mass and energy balances, and the integration of these concepts to solve real chemical engineering problems. Ability to understand basic principles of physical chemistry, physics and mechanics. Ability to use 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%) Campus: Camperdown/Darlington Mode of delivery: Normal (lecture/lab/tutorial) Day

Associated degrees: M P E.

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.

CHNG5707
Material & Energy Transformation (Fund)
Engineering and Information Technologies
Credit points: 6 Session: Semester 2 Classes: 3hr lectures per week, 2hr tutorials per week. Assessment: Through semester assessment (50%), Final Exam (40%) Campus: Camperdown/Darlington Mode of delivery: Normal (lecture/lab/tutorial) Day

Associated degrees: M P E.

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.

CHNG5804
Found of Biochemical Eng
Engineering and Information Technologies
Credit points: 6 Session: Semester 2 Classes: 2 hours of lectures, 1 hour of tutorials per week, 10 hours of laboratory work per semester. Prohibitions: CHNG3804 Assessment: Through semester assessment (60%), Final Exam (40%) Campus: Camperdown/Darlington Mode of delivery: Normal (lecture/lab/tutorial) Day

Associated degrees: M P E.

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

CHNG5801
Foundations of Process Design
Engineering and Information Technologies
Credit points: 6 Session: Semester 1 Classes: 2 hours of lectures and 2 hours of tutorials per week. Prerequisites: (CHNG5701, CHNG5702, CHNG5704, CHNG5705) or (CHNG2801, CHNG2802, CHNG2803, CHNG2804, CHNG2805, CHNG2806). Prohibitions: CHNG3381 Assumed knowledge: Enrolment in this unit of study assumes that all (six) core chemical engineering
UoS in second year have been successfully completed. Assessment: Through semester assessment (40%), Final Exam (60%). Campus: Camperdown/Darlington Mode of delivery: Normal (lecture/lab/tutorial) Day

Associated degrees: M P E.

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 CHNG5802. 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, CHNG5803. This integrated course structure is designed to help students become familiar with the multi-disciplinary nature of chemical engineering today.

CHNG5802
Found: Operation & Improving Ind Systems
Engineering and Information Technologies

Credit points: 6 Session: Semester 1 Classes: 2 hours of lectures and 2 hours of tutorials per week. Prerequisites: (CHNG5701, CHNG5702, CHNG5704, CHNG5705) or (CHNG2801, CHNG2802, CHNG2803, CHNG2804, CHNG2805, CHNG2806). Prohibitions: CHNG3802 Assumed knowledge: Enrolment in this unit of study assumes that all (6u) core chemical engineering UoS in second year have been successfully completed. Assessment: Through semester assessment (50%), Final Exam (50%) Campus: Camperdown/Darlington Mode of delivery: Normal (lecture/lab/tutorial) Day

Associated degrees: M P E.

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 kinetics, 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.

CHNG5803
Found of Chem & Biological Processes
Engineering and Information Technologies

Credit points: 6 Session: Semester 1 Classes: 4 hours of in-class project work per week. Prerequisites: CHNG5701, CHNG5702, CHNG5704 and CHNG5705 Prohibitions: CHNG3803 Assumed knowledge: CHNG5701 AND CHNG5702 AND CHNG5704 AND CHNG5705. 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%) Campus: Camperdown/Darlington Mode of delivery: Normal (lecture/lab/tutorial) Day

Associated degrees: M P E.

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 project allows the students to demonstrate their knowledge 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, designing individual items of equipment and designing small flowsheets.

ENGG5202
Sustainable Design, Eng and Mgt
Engineering and Information Technologies

Credit points: 6 Session: Semester 1 Classes: 2 lectures per week, tutorials 2 hour per week and projects and self assisted learning (4 hours per week) Assumed knowledge: General knowledge in science and calculus and understanding of basic principles of chemistry, physics and mechanics Assessment: Through semester assessment (70%), Final Exam (30%) Campus: Camperdown/Darlington Mode of delivery: Normal (lecture/lab/tutorial) Day

Associated degrees: Grad Cert E, M P E.

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

CHNG5805
Foundation of Prod Formulation & Design
Engineering and Information Technologies

Credit points: 6 Session: Semester 2 Classes: 2 hours of lectures and 1 hours of tutorials per week. Prerequisites: CHNG5701, CHNG5702, CHNG5704
Year Three - Semester One

CHNG5112
Found of Chemical Eng Design A
Engineering and Information Technologies
Credit points: 6 Session: Semester 1 Classes: 2 hours of lectures and 2 hours of tutorials per week. Prerequisites: CHNG3801, CHNG5802, CHNG5805, CHNG5806. Assumed knowledge: Enrolment in this unit of study assumes that all core chemical engineering UoS in second and third years, or their equivalent, have been successfully completed. Assessment: Through semester assessment (100%) Campus: Camperdown/Darlington Mode of delivery: Normal (lecture/lab/tutorial) Day

Associated degrees: M P E.

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.

CHNG5805
Found of Manag of Industrial Syst
Engineering and Information Technologies
Credit points: 6 Session: Semester 2 Classes: 3 hours of lectures and 3 hours of tutorials per week. Prerequisites: CHNG5701, CHNG5702, CHNG5704 and CHNG5705. 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%) Campus: Camperdown/Darlington Mode of delivery: Normal (lecture/lab/tutorial) Day

Associated degrees: M P E.

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

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

CHNG5116
Found of Chemical Eng Design B
Engineering and Information Technologies

Credit points: 6  Session: Semester 2  Classes: 2 hours of lectures and 2 hours of tutorials per week, Prerequisites: CHNG5112 Chemical Engineering Design A  Assumed knowledge: Enrolment in this unit of study assumes that all core chemical engineering UoSs in second and third years, or their equivalent, have been successfully completed. Assessment: Through semester assessment (100%)  Campus: Camperdown/Darlington  Mode of delivery: Normal (lecture/lab/tutorial) Day

Associated degrees: M P E.
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 UoSs (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.

CHNG5021
Capstone Project B
Engineering and Information Technologies

Credit points: 6  Session: Semester 1, Semester 2  Classes: Independent project work, Prerequisites: CHNG5020  Assumed knowledge: Enrolment in this unit of study assumes that Capstone Project A has been successfully completed. Assessment: Through semester assessment (100%)  Campus: Camperdown/Darlington  Mode of delivery: Supervision

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

Associated degrees: M E, M P E.

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.

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
Engineering and Information Technologies

Credit points: 6  Session: Semester 2  Classes: Lectures: 1 hour per week, Tutorials: 2 hours per 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%)  Campus: Camperdown/Darlington  Mode of delivery: Normal (lecture/lab/tutorial) Day

Note: This unit of study is for Masters students and can be selected as an elective by 4th year students.

Associated degrees: B E, Grad Cert E, M P E, UG Study Abroad Program.
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

Engineering and Information Technologies

Credit points: 6 Session: Semester 2 Classes: 1 hour of lectures, 4 hours of tutorial/project work per 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%) Campus: Camperdown/Darlington Mode of delivery: Normal (lecture/lab/tutorial) Day

Associated degrees: B E, Grad Cert E, M P E, UG Study Abroad Program.

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

Engineering and Information Technologies

Credit points: 6 Session: Semester 1 Classes: 2 hours of lectures and 2 hours of tutorials per week. 10 hours of lab work per semester. Assumed knowledge: Enrolment in this unit of study assumes that all (six) core chemical engineering UoS in third year or their equivalent have been successfully completed. Assessment: Through semester assessment (45%), Final Exam (55%). Campus: Camperdown/Darlington Mode of delivery: Normal (lecture/lab/tutorial) Day

Note: Department permission required for enrolment.

Associated degrees: B E, Grad Cert E, M P E, UG Study Abroad Program.

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 Eng - Systems and Practice

Engineering and Information Technologies

Credit points: 6 Session: Semester 1 Classes: 4 hours of lectures and tutorials per week. Assumed knowledge: Ability to conduct mass and energy balances, and the integration of these concepts to solve real chemical engineering problems. Ability to understand basic principles of physical chemistry, physics and mechanics. Ability to use basic calculus and linear algebra, and carry out such computations using Matlab and MS Excel. Ability to read widely outside of the technical literature and to synthesise arguments based on such literature. Ability to write coherent reports and essays based on information from diverse sources. Assessment: Through semester assessment (50%), Final Exam (50%) Campus: Camperdown/Darlington Mode of delivery: Normal (lecture/lab/tutorial) Day

Associated degrees: B E, M E, M P E.

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

Engineering and Information Technologies

Credit points: 6 Session: Semester 2 Classes: 2hrs lectures per week; 1 hr tutorial per week; 1 hr laboratory per week. Assumed knowledge: CHNG5005 OR CHNG3804. Assessment: Through semester assessment (65%), Final Exam (35%) Campus: Camperdown/Darlington Mode of delivery: Normal (lecture/lab/tutorial) Day

Associated degrees: B E, M E, M P E.

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 Chemical & Biomolecular Engineering Adv

Engineering and Information Technologies

Credit points: 6 Session: Semester 2 Classes: Project Work - own time, Lectures 4hrs per week. Prerequisites: CHNG5801 OR CHNG3802 AND CHNG3805 AND CHNG3806 Assessment: Through semester assessment (100%) Campus: Camperdown/Darlington Mode of delivery: Normal (lecture/lab/tutorial) Day

Note: Department permission required for enrolment.

Associated degrees: B E, M P E.

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 minmise 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
Engineering and Information Technologies
Credit points: 6 Session: Semester 1 Classes: 4 hours of lectures and laboratory sessions per week. Assessment: Through semester assessment (50%), Final Exam (50%) Campus: Camperdown/Darlington Mode of delivery: Normal (lecture/lab/tutorial) Day
Associated degrees: B E, Grad Cert E, M P E
"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 understanding 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
Engineering and Information Technologies
Credit points: 6 Session: Semester 1 Classes: 4 hours of lectures/ project work classes per week. Assessment: Through semester assessment (50%), Final Exam (50%) Campus: Camperdown/ Darlington Mode of delivery: Normal (lecture/lab/tutorial) Day
Note: Department permission required for enrolment.
Associated degrees: B E, Grad Cert E, M P E
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
Engineering and Information Technologies
Credit points: 6 Session: Semester 1 Classes: Lectures 2hrs per week, Tutorials 1hr per week, Project Work - own time. Assumed knowledge: It is assumed that students have a general knowledge of: MATH 1001 Differential Calculus MATH 1003 Integral Calculus and Modeling Assessment: Through semester assessment (100%) Campus: Camperdown/Darlington Mode of delivery: Normal (lecture/lab/tutorial) Day
Associated degrees: B E, Grad Cert E, M P E
This course will give students an insight into the use of (computer-based) statistical techniques in extracting information from experimental data obtained from real life bio-physical systems. The issues and techniques required for mathematical modeling as well as monitoring and/or control scheme for bio-physical systems will be discussed and implemented in diverse range of bioprocesses, including biomaterials and fermentation products.

We will review statistical distribution; tests based on z, t, F variables; calculation of confidence intervals; hypothesis testing; linear and nonlinear regression; analysis of variance; principal component analysis; and use of computer-based statistical tools. The issues associated with dynamic response of bio-physical processes; inferred or estimated variables; control system design and implementation; introduction to model-based control; use of computer-based control system design and analysis tools will be elaborated.

When this course is successfully completed you will acquire knowledge to choose the appropriate statistical techniques within a computer based environment, such as Excel or MATLAB, for a given situation. The students will also obtain potential for monitoring/control scheme based on the key dynamic features of the process. Such information would be beneficial for any future career in Bio-manufacturing companies. Students are encouraged to promote an interactive environment for exchange of information.

CHNG5604 Membrane Science Laboratory
Engineering and Information Technologies
Credit points: 6 Session: Semester 2 Classes: 2 hours of lectures or tutorials per week. 4 hours of laboratory sessions per week. Assumed knowledge: CHNG5601 Assessment: Through semester assessment (100%) Campus: Camperdown/Darlington Mode of delivery: Normal (lecture/lab/tutorial) Day
Associated degrees: B E, Grad Cert E, M P E
Students will explore experimentally the theoretical concepts learned in the other modules of the MES course in Biophysical Processes. They will gain practical insights into electrodiffusion and other mass transport processes through membranes. Students will understand the construction and functional properties of synthetic separation membranes. Students will explore experimentally the various factors affecting the performance of synthetic separation membranes.

CHNG5605 Bio-Products: Laboratory to Marketplace
Engineering and Information Technologies
Credit points: 6 Session: Semester 2 Classes: 2 hours of lectures per week. Project Work - own time. Assessment: Through semester assessment (100%) Campus: Camperdown/Darlington Mode of delivery: Normal (lecture/lab/tutorial) Day
Note: This course is for Master degree students and is also offered as an elective course for fourth year students.
Associated degrees: B E, Grad Cert E, M P E
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
Engineering and Information Technologies

Credit points: 6
Session: Semester 2 Classes: Presentation 2.00 hours per week, Project Work - in class 2.00 hours per week. Assumed knowledge: First degree in Engineering or a related discipline. Assessment: Through semester assessment (100%) Campus: Camperdown/Darlington Mode of delivery: Normal (lecture/lab/tutorial) Day

Associated degrees: Grad Dip E, M P E, M P L, M P M.

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 safe work practices and systems assurance.

ENGG5205
Professional Practice in PM
Engineering and Information Technologies

Credit points: 6
Session: Semester 1. Semester 2 Classes: Lecture 3hrs per week, E-Learning 1 hr per week. Assumed knowledge: Basic engineering or science knowledge. At least 2-3 years of work experience preferred. Assessment: Through semester assessment (60%), Final Exam (40%) Campus: Camperdown/Darlington 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.

Associated degrees: Grad Cert P M, Grad Dip E, M P E.

This UoS teaches the fundamental knowledge on the importance, organizational context and professional practice in project management. It serves as an introduction to project management practices for non-PM students. For PM students, this UoS lays the foundation to progress to advanced PM subjects. Although serving as a general introduction unit, the focus has been placed on scope, time, cost, and integration related issues.

Specifically, the UoS aims to

1. introduce students to the institutional, organisational and professional environment for today’s project management practitioners as well as typical challenges and issues facing them;
2. demonstrate the importance of project management to engineering and organizations;
3. demonstrate the progression from strategy formulation to execution of the project;
4. provide a set of tools and techniques at different stages of a project’s lifecycle with emphasis on scope, time, cost and integration related issues;
5. highlight examples of project success/failures in project management and to take lessons from these;
6. consider the roles of project manager in the organization and management of people;
7. provide a path for students seeking improvements in their project management expertise.

ENGG5214
Management of Technology

Credit points: 6
Session: Semester 2, Winter Main Classes: 1 hr Lecture per week, 1 hr Tutorial per week, 2 hr Project work in class per week. Assumed knowledge: Sound competence in all aspects of engineering, and some understanding of issues of engineering management. Assessment: Through semester assessment (100%) Campus: Camperdown/Darlington Mode of delivery: Normal (lecture/lab/tutorial) Day

Associated degrees: Grad Dip E, M P E.

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.

ENGS5215
International Eng Strategy & Operations

Credit points: 6
Session: Semester 2 Classes: Lecture 2 hours per week, Tutorial 2 hours per week, Project Work - in class 2 hours per week. Assumed knowledge: Sound competence in all aspects of engineering, and some understanding of issues of engineering management and globalisation. Assessment: Through semester assessment (100%) Campus: Camperdown/Darlington Mode of delivery: Normal (lecture/lab/tutorial) Day

Associated degrees: Grad Dip E, M P E.

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.

ENGS5216
Management of Engineering Innovation

Credit points: 6
Session: Semester 1 Classes: 1hr Lecture per week, 1 hr Tutorials per week, 2 hr Project work in class per week for first half of semester. Assumed knowledge: Sound competence in all aspects of engineering, and some understanding of issues of engineering management. Assessment: Through semester assessment (100%) Campus: Camperdown/Darlington Mode of delivery: Normal (lecture/lab/tutorial) Day

Associated degrees: Grad Dip E, M P E.

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 units CHNG5021 and 6 cp of elective units.

CHNG5020
Capstone Project A

Engineering and Information Technologies

Credit points: 6
Session: Semester 1. Semester 2 Classes: Independent project work. Prerequisites: Completion of 24 credits of ME or exemption, or 42 credits of MPE. Assumed knowledge: CHNG5801 AND CHNG5802 AND CHNG5803 AND CHNG5805 AND CHNG5806. Assessment: Through semester assessment (100%) Campus: Camperdown/Darlington Mode of delivery: Supervision

Note: Department permission required for enrolment.

Associated degrees: M E, M P E.

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

CHNG5021
Capstone Project B
Engineering and Information Technologies
Credit points: 6 Session: Semester 1, Semester 2 Classes: Independent project work. Prerequisites: CHNG5020 Assumed knowledge: Enrolment in this unit of study assumes that Capstone Project A has been successfully completed. Assessment: Through semester assessment (100%) Campus: Camperdown/Darlington Mode of delivery: Supervision
Note: Department permission required for enrolment in the following sessions: Semester 1.

Associated degrees: M E, M P E.
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
Engineering and Information Technologies
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%) Campus: Camperdown/Darlington Mode of delivery: Supervision
Note: Department permission required for enrolment.

Associated degrees: M E, M P E.
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
Engineering and Information Technologies
Credit points: 12 Session: Semester 1, Semester 2 Classes: no formal classes Prerequisites: CHNG5020, ENGG5221 Assessment: Through semester assessment (100%) Campus: Camperdown/Darlington 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.

Associated degrees: M E, M P E.
To complete a substantial research project and successfully analyse a problem, devise appropriate experiments, analyse the results and produce a well-argued, in-depth thesis.

Department permission required for enrolment in the following session(s); 1.2

CHNG5223
Dissertation B
Engineering and Information Technologies
Credit points: 12 Session: Semester 1, Semester 2 Classes: no formal classes Prerequisites: CHNG5020, ENGG5221 Assessment: Through semester assessment (100%) Campus: Camperdown/Darlington Mode of delivery: Supervision
Note: Department permission required for enrolment.

Associated degrees: M E, M P E.
To complete a substantial research project and successfully analyse a problem, devise appropriate experiments, analyse the results and produce a well-argued, in-depth thesis.

Department permission required for enrolment in the following session(s); 1.2

MIPPS pathway (Major Industrial Project Placement Scheme)
MIPPS 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
Engineering and Information Technologies
Credit points: 24 Session: Semester 1 Classes: Practical Experience and Research with Industry partner. Prerequisites: Passed at least 48 credit points in Master of professional engineering with adequate foundation knowledge in discipline. Students wishing to do this unit of study should contact the Head of School prior to enrolment. Corequisites: MIPPS students are required to enroll
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.

Note: Department permission required for enrolment.

Associated degrees: M E, M Inf Tech, M Inf Tech Man, M P E, M P L, M P M.

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.

Note: Department permission required for enrolment.

Associated degrees: M E, M Inf Tech, M Inf Tech Man, M P E, M P L, M P M.

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Note: Department permission required for enrolment.

Associated degrees: M E, M Inf Tech, M Inf Tech Man, M P E, M P L, M P M.

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.

Note: Department permission required for enrolment.

Associated degrees: M E, M Inf Tech, M Inf Tech Man, M P E, M P L, M P M.
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 http://www.engineersaustralia.org.au/.

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

#### 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

<table>
<thead>
<tr>
<th>Unit of study</th>
<th>Credit points</th>
<th>A: Assumed knowledge</th>
<th>P: Prerequisites</th>
<th>C: Corequisites</th>
<th>N: Prohibition</th>
<th>Session</th>
</tr>
</thead>
<tbody>
<tr>
<td>ENGG5802 Foundations of Engineering Mechanics</td>
<td>6</td>
<td></td>
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<td></td>
<td></td>
<td>Semester 2</td>
</tr>
<tr>
<td>CIVL5501 Foundations of Materials</td>
<td>6</td>
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<td>Summer Main</td>
</tr>
<tr>
<td>CIVL5502 Foundations of Structural Mechanics</td>
<td>6</td>
<td>A 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 in certain mathematical skills. 1. Solving algebraic equations. 2. Differentiation and integration (including double integrals). 3. Drawing graphs of polynomials (especially) and other mathematical functions. 4. Trigonometry. This UoS is only available to students in the MPE degree who do not have a Civil Engineering background.</td>
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<td></td>
<td>Semester 1</td>
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<tr>
<td>CIVL5506 Foundations-Eng Construction &amp; Surveying</td>
<td>6</td>
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<td>Semester 1</td>
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</tbody>
</table>

##### Year One - Semester Two

<table>
<thead>
<tr>
<th>Unit of study</th>
<th>Credit points</th>
<th>A: Assumed knowledge</th>
<th>P: Prerequisites</th>
<th>C: Corequisites</th>
<th>N: Prohibition</th>
<th>Session</th>
</tr>
</thead>
<tbody>
<tr>
<td>CIVL5504 Foundations of Soil Mechanics</td>
<td>6</td>
<td>A 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 ENGG 1802 Engineering Mechanics, CIVL5502 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 ENGI3101 Engineering Computing. Familiarity with partial differential equations, and their analytical and numerical solutions. This UoS is only available to students in the MPE degree who do not have a Civil Engineering background.</td>
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<td>Semester 2</td>
</tr>
<tr>
<td>CIVL5505 Foundations of Intro. Fluid Mechanics</td>
<td>6</td>
<td>A CIVL5502: 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. This UoS is only available to students in the MPE degree who do not have a Civil Engineering background.</td>
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<td></td>
<td>Semester 2</td>
</tr>
<tr>
<td>CIVL5509 Foundations of Struct Concepts &amp; Design</td>
<td>6</td>
<td>A Structural mechanics, first year mathematics, but these are not prerequisites Basic structural elements include beams, columns slabs and simple frames</td>
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<td>Semester 2</td>
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<tr>
<td>ENGG5011 Foundation Engineering Studies A</td>
<td>6</td>
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<td>Semester 1</td>
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</table>

##### Year Two - Semester One

<table>
<thead>
<tr>
<th>Unit of study</th>
<th>Credit points</th>
<th>A: Assumed knowledge</th>
<th>P: Prerequisites</th>
<th>C: Corequisites</th>
<th>N: Prohibition</th>
<th>Session</th>
</tr>
</thead>
<tbody>
<tr>
<td>CIVL5507 Foundations of Concrete Structures 1</td>
<td>6</td>
<td>A Knowledge: CIVL2110 AND CIVL2201 AND CIVL2230; basic concepts of solid mechanics and structural mechanics, including: compatibility 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).</td>
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<td>Semester 1</td>
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<tr>
<td>CIVL5511 Foundations of Fluid Mechanics</td>
<td>6</td>
<td>A CIVL2201 AND CIVL2611 AND ENGG1802 AND MATH2081. This unit of study follows on from Fluid Mechanics CIVL2611, which provides the essential fundamental fluid mechanics background and theory, and is assumed to be known and fully understood.</td>
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<td>Semester 1</td>
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<tr>
<td>CIVL5512 Foundation of Eng Design &amp; Construction</td>
<td>6</td>
<td>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.</td>
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<td>Semester 1</td>
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<tr>
<td>ENGG5204 Engineering Professional Practice</td>
<td>6</td>
<td>A Competences and experience in engineering obtained during an accepted engineering degree</td>
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<td>Semester 1</td>
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</table>
### Unit of study table

<table>
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<tr>
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<th>Session</th>
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<tbody>
<tr>
<td><strong>Year Two - Semester Two</strong></td>
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<tr>
<td>CIVL5508 Foundations of Steel Structures 1</td>
<td>6</td>
<td>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, lx, ly, Zx, Zy, Sx, Sy, rx, ry, J; Ac: knowledge of the basic elastic-plastic material properties of steel, E, G, Iy, Ix; and knowledge of loading of structures.</td>
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<td>Semester 2</td>
</tr>
<tr>
<td>ENGG5205 Professional Practice in PM</td>
<td>6</td>
<td>A Basic engineering or science knowledge. At least 2-3 years of work experience preferred. 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.</td>
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<td>Semester 2</td>
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<tr>
<td><strong>Select 12 credit points from Civil Electives block.</strong></td>
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<td><strong>Year Three - Semester One</strong></td>
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<tr>
<td>ENGG5217 Practical Experience</td>
<td></td>
<td>Students should have completed one year of their MPE program before enrolling in this unit.</td>
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<td>Semester 1</td>
</tr>
<tr>
<td>CIVL5020 Capstone Project A</td>
<td>6</td>
<td>P 48 credits from MPE degree program Note: Department permission required for enrolment</td>
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<td>Semester 1</td>
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<tr>
<td>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.</td>
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<td>Semester 2</td>
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<tr>
<td>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.</td>
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<tr>
<td><strong>Select 6 credit points from Civil Electives block.</strong></td>
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<tr>
<td><strong>Select 12 credit points from Civil Advanced electives block.</strong></td>
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<tr>
<td><strong>Year Three - Semester Two</strong></td>
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<tr>
<td>CIVL5510 Foundations of Civil Engineering Design</td>
<td>6</td>
<td>A CIVL3205 AND CIVL3206.</td>
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<td>Semester 2</td>
</tr>
<tr>
<td>CIVL5021 Capstone Project B</td>
<td>6</td>
<td>C CIVL5020 Note: Department permission required for enrolment</td>
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<td>Semester 1</td>
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<tr>
<td>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.</td>
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<td>Semester 2</td>
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<tr>
<td>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.</td>
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<tr>
<td><strong>Select 12 credit points from Civil Advanced electives block.</strong></td>
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<tr>
<td><strong>Elective units</strong></td>
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<tr>
<td>Candidates must complete 18 credit points from the following Elective units of study.</td>
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<tr>
<td>CIVL5266 Steel Structures - Stability</td>
<td>6</td>
<td>A Knowledge: CIVL2201 AND CIVL3206 AND CIVL3235. There are no prerequisites for this unit of study but it is assumed that students are competent in the content covered in CIVL2201 Structural Mechanics, CIVL3206 Steel Structures 1, and CIVL3235 Structural Analysis. Students who have failed previous units of study should note that no special consideration will be given to them if they do choose to enrol in this unit of study (on the basis of timetable clashes or lack of knowledge of basics), and they are discouraged from enrolling in this unit of study. Students who have not yet passed first, second or third year units of study in precedence to any later year units of study.</td>
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<td>Semester 1</td>
</tr>
<tr>
<td>CIVL5269 Concrete Structures - Strength &amp; Service</td>
<td>6</td>
<td>P CIVL3205 OR CIVL5507</td>
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<td>Semester 2</td>
</tr>
<tr>
<td>CIVL5351 Geoenvironmental Engineering</td>
<td>6</td>
<td>A CIVL2410 AND CIVL411. 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)</td>
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<td>Semester 2</td>
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<tr>
<td>CIVL5452 Foundation Engineering</td>
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<tr>
<td>CIVL5458 Numerical Methods in Civil Engineering</td>
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<td>Semester 1</td>
</tr>
<tr>
<td>CIVL5513 Foundations of Structural Analysis</td>
<td>6</td>
<td>A CIVL2110 AND CIVL2230 AND MATH2061. This unit of study assumes previous study of the fundamental principles of structural mechanics obtained from CIVL5502 Foundations of Structural Mechanics or equivalent introductory structural mechanics subject.</td>
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</tr>
<tr>
<td>CIVL5514 Foundations of Geotechnical Engineering</td>
<td>6</td>
<td>A Fundamentals of soil mechanics including effective stress, pore pressure, consolidation and seepage</td>
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<tr>
<td>CIVL5665 Advanced Water Resources Management</td>
<td>6</td>
<td>A CIVL3612.</td>
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Advanced Elective units

Candidates must complete 24 credit points from the following Advanced elective units of study.

- **CHNG5005 Wastewater Eng - Systems and Practice**
  - 6 Credit points
  - 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.

- **CHNG5006 Advanced Wastewater Engineering**
  - 6 Credit points
  - A CHNG5005 OR CHNG33804.

- **CIVL5257 Concrete Structures: Prestressed**
  - 6 Credit points
  - Semester 1

- **CIVL5264 Composite Steel-Concrete Structures**
  - 6 Credit points
  - Semester 2

- **CIVL5267 Steel Structures - Advanced Design**
  - 6 Credit points
  - Semester 1

- **CIVL5268 Structural Dynamics**
  - 6 Credit points
  - 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.

- **CIVL5450 Analysis and Design of Pile Foundations**
  - 6 Credit points
  - Semester 1

- **CIVL5451 Computer Methods in Geotechnical Eng**
  - 6 Credit points
  - Semester 1

- **CIVL5454 Rock Engineering**
  - 6 Credit points
  - A Undergraduate geology and soil mechanics.

- **CIVL5455 Engineering Behaviour of Soils**
  - 6 Credit points
  - 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.

- **CIVL5666 Open Channel Flow & Hydraulic Structures**
  - 6 Credit points
  - A CIVL3612

- **CIVL5668 Wind Engineering for Design-Fundamentals**
  - 6 Credit points
  - Semester 1

- **CIVL5669 Applied Fluid Engineering Computing**
  - 6 Credit points
  - A CIVL5511. 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.

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 units CIVL5021 and 6 cp of elective units.

- **CIVL5020 Capstone Project A**
  - 6 Credit points
  - P 48 credits from MPE degree program
  - Note: Department permission required for enrolment

- **CIVL5021 Capstone Project B**
  - 6 Credit points
  - C CIVL5020
  - Note: Department permission required for enrolment

- **CIVL5022 Capstone Project B Extended**
  - 12 Credit points
  - 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

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**
  - 12 Credit points
  - N ENGS5220, ENGS5221
  - 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.

- **CIVL5223 Dissertation B**
  - 12 Credit points
  - N ENGS5220, ENGS5221
  - 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.

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.
For more information on degree program requirements visit CUSP.

<table>
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<tr>
<th>Unit of study</th>
<th>Credit points</th>
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<td>Engineering Graduate Exchange A</td>
<td>6</td>
<td>P Permission from faculty and school.</td>
<td>Note: Department permission required for enrolment</td>
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<tr>
<td>Engineering Graduate Exchange B</td>
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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

ENGG5802 Foundations of Engineering Mechanics Engineering and Information Technologies

Credit points: 6 Session: Semester 2, Summer Main Classes: 2 hrs Lectures per week, 3hrs tutorial per week Assessment: Through semester assessment (100%) Campus: Camperdown/Darlington Mode of delivery: Normal (lecture/lab/tutorial) Day

Associated degrees: M P E.

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.

CIVL5501 Foundations of Materials Engineering and Information Technologies

Credit points: 6 Session: Semester 1 Classes: 4 hours of lectures and 2 hours of tutorials per week. Assessment: Through semester assessment (50%), Final Exam (50%) Campus: Camperdown/Darlington Mode of delivery: Normal (lecture/lab/tutorial) Day

Note: This UoS is only available to students in the MPE degree who do not have a Civil Engineering background.

Associated degrees: Grad Dip E (Prof Eng), M P E.

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

CIVL5502 Foundations of Structural Mechanics Engineering and Information Technologies

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 Assumed knowledge: Students should be competent in the following areas. 1. The concept of force and momentum equilibrium in two and three dimensions. 2. Drawing free body diagrams. 3. Establishing and solving the equations of equilibrium from the FBD. 4. Setting out solutions logically, clearly and neatly. Students should be competent in certain 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%) Campus: Camperdown/Darlington Mode of delivery: Normal (lecture/lab/tutorial) Day

Note: This UoS is only available to students in the MPE degree who do not have a Civil Engineering background.

Associated degrees: Grad Dip E (Prof Eng), M P E.

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.

CIVL5506 Foundations-Eng Construction & Surveying Engineering and Information Technologies

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. Assessment: Through semester assessment (55%), Final Exam (45%) Campus: Camperdown/Darlington Mode of delivery: Normal (lecture/lab/tutorial) Day

Note: This UoS is only available to students in the MPE degree who do not have a Civil Engineering background. This 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 Webb's Creek (about 83km 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)

Associated degrees: Grad Dip E (Prof Eng), M P E.

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.

Year One - Semester Two

CIVL5504 Foundations of Soil Mechanics

**Engineering and Information Technologies**

**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. **Assumed knowledge:** 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 ENGG 1802 Engineering Mechanics, CIVL5502 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 ENGG1801 Engineering Computing. Familiarity with partial differential equations, and their analytical and numerical solution. **Assessment:** Through semester assessment (50%), Final Exam (50%) **Campus:** Camperdown/Darlington **Mode of delivery:** Normal (lecture/lab/tutorial) **Day** Note: This UoS is only available to students in the MPE degree who do not have a Civil Engineering background.

**Associated degrees:** Grad Dip E (Prof Eng), M P E.

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

CIVL5505 Foundations of Intro. Fluid Mechanics

**Engineering and Information Technologies**

**Credit points:** 6 **Session:** Semester 2 **Classes:** 2 hours of lectures and 2 hours of tutorials per week. 8 hours of laboratory work per semester. **Assumed knowledge:** CIVL5502. 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 (45%), Final Exam (55%) **Campus:** Camperdown/Darlington **Mode of delivery:** Normal (lecture/lab/tutorial) **Day** Note: This UoS is only available to students in the MPE degree who do not have a Civil Engineering background.

**Associated degrees:** Grad Dip E (Prof Eng), M P E.

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.

CIVL5509 Foundations of Struct Concepts & Design

**Engineering and Information Technologies**

**Credit points:** 6 **Session:** Semester 2 **Classes:** 4 hours of lectures and 2 hours of tutorials per week. **Assumed knowledge:** Structural mechanics, first year mathematics, but these are not prerequisites **Assessment:** Through semester assessment (25%), Final Exam (75%) **Campus:** Camperdown/Darlington **Mode of delivery:** Normal (lecture/lab/tutorial) **Day** Note: Basic structural elements include beams, columns slabs and simple frames

**Associated degrees:** Grad Dip E (Prof Eng), M P E.

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.

ENGG5011 Foundation Engineering Studies A

**Engineering and Information Technologies**

**Credit points:** 6 **Session:** Semester 1, Semester 2 **Classes:** no formal classes. required meetings with supervisor will be required. **Assessment:** Through semester assessment (100%) **Campus:** Camperdown/Darlington **Mode of delivery:** Supervision

**Associated degrees:** Grad Dip E (Prof Eng), M P E.

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 Two - Semester One

CIVL5507 Foundations of Concrete Structures 1

**Engineering and Information Technologies**

**Credit points:** 6 **Session:** Semester 1 **Classes:** 3 hours of lectures and 3 hours of project work in class per week. 2 hours of laboratory demonstration per semester. **Assumed knowledge:** Knowledge: CIVL2110 AND CIVL2201 AND CIVL2230. basic concepts of solid mechanics and structural mechanics, including: compatibility 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%) **Campus:** Camperdown/Darlington **Mode of delivery:** Normal (lecture/lab/tutorial) **Day**

**Associated degrees:** M P E.

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

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

CIVL5511 Foundations of Fluid Mechanics

**Engineering and Information Technologies**

**Credit points:** 6 **Session:** Semester 1 **Classes:** Lecture 2hrs per week, Tutorial 2hrs per week, Laboratory 2hrs per week. **Assumed knowledge:** CIVL2201 AND CIVL2611 AND ENGG1802 AND MATH2061. This unit of study follows on from Fluid Mechanics CIVL2611, which provides the essential fundamental fluid mechanics background and theory, and is assumed to be known and fully understood. **Assessment:** Through semester assessment (60%), Final Exam (40%) **Campus:** Camperdown/Darlington **Mode of delivery:** Normal (lecture/lab/tutorial) **Day**

**Associated degrees:** Grad Dip E (Prof Eng), M P E.
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.

**CIVL5512 Foundation of Eng Design & Construction Engineering and Information Technologies**

**Credit points:** 6  
**Session:** Semester 1  
**Classes:** Workshop 3 hours per week. Lecture/Presentation 2 hrs per week.  
**Assumed knowledge:** Basic knowledge of construction operations including excavation, embankments and other earthworks, hauling and associated procedures - drilling and blasting, survey, reinforced concrete construction (including formwork and formwork substitutes), interpretation of engineering drawings.  
**Assessment:** Through semester assessment (50%), Final Exam (50%)  
**Campus:** Camperdown/Darlington  
**Mode of delivery:** Normal (lecture/lab/tutorial) Day

**Associated degrees:** Grad Dip E (Prof Eng), M P E.

The objectives of this unit are to develop an understanding of construction methods, strategies, equipment and machinery in a range of construction activities and an understanding of the principles involved in the design for those construction activities.

At the end of this unit, students will have developed a familiarity with a variety of construction methods, strategies, equipment and machinery in a range of construction activities such that they will be able, if and when the opportunity arises to participate as site engineers (or similar role) in the planning and execution of those construction activities, albeit with supervision and guidance from experienced professionals. Students will also have developed an understanding of the design principles and techniques involved in the planning for those construction activities such that they are able, if and when the opportunity arises, to participate as design engineers, in the planning and design for those construction activities, with supervision and guidance from experienced professionals. The range of topics covered in this course is such that the learning outcomes form a basis for later development of more detailed knowledge, dependent on the future career experiences of the student. The course does not prepare a student for immediate, unsupervised participation in construction and design work associated with the topics covered.

The construction topics covered in this course have not been previously addressed in CIVL5506 (Foundations of Engineering Construction and Survey) or equivalent introductory study of construction and surveying techniques. The topics may vary dependent on current and planned projects in Sydney, NSW and Australia. At this stage the topics are hard rock tunnelling and general hard rock underground excavation; soft ground tunnelling; underground construction; micro tunnelling; cut and cover (cover and cut) tunnelling; earth retaining systems; piling; formwork and falsework (incl Tilt up, Ultrafloor, Sacrificial form); dewatering; pavement design and construction - rigid and flexible (incl and pavement construction materials); stormwater drainage design and construction; marine construction; civil construction in environmentally sensitive areas; contract administration for construction engineers; general engineering in remote localities (project based); construction methods in bridge engineering; QA documentation on a typical project; timber engineering; 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.

**CIVL5508 Foundations of Steel Structures 1 Engineering and Information Technologies**

**Credit points:** 6  
**Session:** Semester 2  
**Classes:** 3 hours of lectures and 3 hours of tutorials per week.  
**Assumed knowledge:** 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**

**CIVL5508 Foundations of Steel Structures 1 Engineering and Information Technologies**

**Credit points:** 6  
**Session:** Semester 2  
**Classes:** 3 hours of lectures and 3 hours of tutorials per week.  
**Assumed knowledge:** 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**

**Credit points:** 6  
**Session:** Semester 2  
**Classes:** 3 hours of lectures and 3 hours of tutorials per week.  
**Assumed knowledge:** 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.

**Associated degrees:** M P E.

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.

**ENGG5204 Engineering Professional Practice Engineering and Information Technologies**

**Credit points:** 6  
**Session:** Semester 1  
**Classes:** Lecture 1 hour per week.  
**Assumed knowledge:** Competence and experience in engineering obtained during an accepted engineering degree  
**Assessment:** Through semester assessment (100%)  
**Campus:** Camperdown/Darlington  
**Mode of delivery:** Normal (lecture/lab/tutorial) Day

**ENGG5205 Engineering Professional Practice in PM Engineering and Information Technologies**

**Credit points:** 6  
**Session:** Semester 1  
**Classes:** Lecture 3hrs per week, E-Learning 1 hr per week.  
**Assumed knowledge:** Basic engineering or science knowledge. At least 2-3 years of work experience preferred.  
**Assessment:** Through semester assessment (80%), Final Exam (40%)
Capstone Project A
Engineering and Information Technologies
Credit points: 6
Session: Semester 1, Semester 2
Classes: Independent project work.
Prerequisites: 48 credits from MPE degree program
Assessment: Through semester assessment (100%)
Campus: Camperdown/Darlington
Mode of delivery: Supervision
Note: Department permission required for enrolment.
Associated degrees: M E, M P E.

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.

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

CIVL5510
Foundations of Civil Engineering Design
Engineering and Information Technologies
Credit points: 6
Session: Semester 1, Semester 2
Classes: 1 hour of lectures and 3 hours of tutorials per week.
Assumed knowledge: CIVL3205 AND CIVL3206.
Assessment: Through semester assessment (75%), Final Exam (25%)
Campus: Camperdown/Darlington
Mode of delivery: Normal
(lecture/lab/tutorial) Day

Associated degrees: M P E.

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.

CIVL5021
Capstone Project B
Engineering and Information Technologies
Credit points: 6
Session: Semester 1, Semester 2
Classes: Independent project work.
Corequisites: CIVL5020 Assessment: Through semester assessment (100%)
Campus: Camperdown/Darlington
Mode of delivery: Supervision
Note: Department permission required for enrolment.
Associated degrees: M E, M P E.

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
Elective units
CIVL5266
Steel Structures - Stability
Engineering and Information Technologies
Credit points: 6 Session: Semester 1 Classes: 2 hrs of lecture and 2hrs of tutorial/laboratory per week. Assumed knowledge: Knowledge: CIVL2201 and CIVL3206 and CIVL3235. There are no prerequisites for this unit of study, but it is assumed that students are competent in the content covered in CIVL2201 Structural Mechanics, CIVL3206 Steel Structures 1, and CIVL3235 Structural Analysis. Students who have failed previous units of study should note that no special consideration will be given to them if they do choose to enrol in this unit of study (on the basis of timetable clashes or lack of knowledge of basics), and they are discouraged from enrolling in this unit of study. Students who have not yet passed first, second or third year units of study must enrol in those units of study in precedence to any later year units of study. Assessment: Through semester assessment (30%), Final Exam (70%) Campus: Camperdown/Darlington Mode of delivery: Normal (lecture/lab/tutorial) Day
Associated degrees: B E, Grad Cert E, M P E, PG Coursework Exchange.
Objectives: This Unit aims to:
- provide fundamental understanding at advanced level of the behaviour and design of 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, Design Direct Strength Method.
CIVL5269
Concrete Structures - Strength & Service
Engineering and Information Technologies
Credit points: 6 Session: Semester 2 Classes: 4-hr combined lecture and tutorial per week. Prerequisites: CIVL3205 OR CIVL5007 Assessment: Through semester assessment (50%), Final Exam (50%) Campus: Camperdown/Darlington Mode of delivery: Normal (lecture/lab/tutorial) Day
Associated degrees: B E, Grad Cert E, M P E, PG Coursework Exchange.
Objectives: This Unit reviews the fundamental concepts of 'elastic' behaviour of reinforced concrete structures and introduces models of behaviour and methods of analysis related to the time-dependent effects of creep and shrinkage (at service loads). This Unit also explains 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.
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/stains/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
introduction to water resources, how these are linked to the overal objective of this unit of study is to give a general Fluid Mechanics. Foundations of Introductory Fluid Mechanics and CIVL5511 Foundations of Note: The unit of study builds on the theory and concepts learnt in CIVL5505 Foundations of Structural Mechanics or equivalent introductory structural mechanics subject. Assessment: Through semester assessment (65%), Final Exam (35%) Campus: Camperdown/Darlington Mode of delivery: Normal (lecture/lab/tutorial) Day

Associated degrees: B E, Grad Cert E, M P E.

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 assemblies 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.
5. Extended knowledge of the application of FE to solve civil engineering problems.

CIVL5503 Foundations of Hydrology Engineering and Information Technologies Credit points: 6 Session: Semester 2 Classes: 2hrs lecture per week, 2hrs tutorials per week. Prerequisites: CIVL5505. Assumed knowledge: ENGG1802 AND MATH2061 AND CIVL5511. Assessment: Through semester assessment (50%), Final Exam (50%) Campus: Camperdown/Darlington Mode of delivery: Normal (lecture/lab/tutorial) Day


Associated degrees: Grad Dip E (Prof Eng), M P E.

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.

CIVL5513 Foundations of Structural Analysis Engineering and Information Technologies Credit points: 6 Session: Semester 2 Classes: Lecture 4 hours per week, Tutorial 2 hours per week. Assumed knowledge: CIVL2110 AND CIVL2230 AND MATH2061. This unit of study assumes previous study of the fundamental principles of structural mechanics obtained from CIVL5502 Foundations of Structural Mechanics or equivalent introductory structural mechanics subject. Assessment: Through semester assessment (65%), Final Exam (35%) Campus: Camperdown/Darlington Mode of delivery: Normal (lecture/lab/tutorial) Day

Associated degrees: Grad Dip E (Prof Eng), M P E.

The objective of this unit is 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.

CIVL5514 Foundations of Geotechnical Engineering Engineering and Information Technologies Credit points: 6 Session: Semester 2 Classes: Lecture 2 hrs per week, Tutorial 2 hrs per week. Assumed knowledge: Fundamentals of soil mechanics including effective stress, pore pressure, consolidation and seepage. Assessment: Through semester assessment (50%), Final Exam (50%) Campus: Camperdown/Darlington Mode of delivery: Normal (lecture/lab/tutorial) Day

Associated degrees: Grad Dip E (Prof Eng), M P E.

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.

CIVL5665 Advanced Water Resources Management
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 Engineering and Information Technologies**

**Credit points:** 6 **Session:** Semester 2 **Classes:** 2hr lectures per week; 1 hr tutorial per week; 1 hr laboratory per week. **Assumed knowledge:** CHNG5005 OR CHNG3804. **Assessment:** Through semester assessment (65%), Final Exam (35%) **Campus:** Camperdown/Darlington **Mode of delivery:** Normal (lecture/lab/tutorial) Day

**Associated degrees:** B, E, M, E, M P E.

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 Engineering and Information Technologies**

**Credit points:** 6 **Session:** Semester 1 **Classes:** Lectures 2hrs per week, Project Work - in class 1hr per week. **Assessment:** Through semester assessment (40%), Final Exam (60%) **Campus:** Camperdown/Darlington **Mode of delivery:** Normal (lecture/lab/tutorial) Day

**Associated degrees:** B E, Grad Cert E, M P E.

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.

**CHNG5005 Wastewater Eng - Systems and Practice Engineering and Information Technologies**

**Credit points:** 6 **Session:** Semester 1 **Classes:** 4 hours of lectures and tutorials per week. **Assumed knowledge:** Ability to conduct mass and energy balances, and the integration of these concepts to solve real chemical engineering problems. Ability to understand basic principles of physical chemistry, physics and mechanics. Ability to use basic calculus and linear algebra, and carry out such computations using Matlab and MS Excel. Ability to read widely outside of the technical literature and to synthesise arguments based on such literature. Ability to write coherent reports and essays based on information from diverse sources. **Assessment:** Through semester assessment (50%), Final Exam (50%) **Campus:** Camperdown/Darlington **Mode of delivery:** Normal (lecture/lab/tutorial) Day

**Associated degrees:** B, E, M, E, M P E.

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.
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
Engineering and Information Technologies
Credit points: 6
Session: Semester 1
Classes: 3-hr combined lecture and tutorial per week
Assessment: Through semester assessment (50%), Final Exam (50%)
Campus: Camperdown/Darlington
Mode of delivery: Normal (lecture/lab/tutorial) Day

Associated degrees: B E, Grad Cert E, M P E, PG Coursework Exchange.

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 (DOF) 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 Parts 4 of the Australian load 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
Engineering and Information Technologies
Credit points: 6
Session: Semester 1
Classes: 3 hours of lecture/project work in class per week, 3 hours of laboratory work per semester
Assessment: Through semester assessment (100%)
Campus: Camperdown/Darlington
Mode of delivery: Normal (lecture/lab/tutorial) Day

Associated degrees: B E, Grad Cert E, M P E.

Objectives: To develop an understanding of the modern principles of design of pile foundations and the application of those principles to practice.

Expected outcomes: Students should gain an advanced understanding of the types of pile foundations used in practice, and the procedures for analysis of pile foundations under various types of loading, and gain experience in carrying out pile design for real geotechnical profiles.

Syllabus summary: Types of piles and their uses, effects of pile installation, axial capacity of piles and pile groups, settlement of pile foundations, ultimate lateral capacity, lateral deformations, analysis of pile groups subjected to general loading conditions, piled raft foundations, piles subjected to ground movements, pile load testing, code provisions for pile design.

CIVL5451
Computer Methods in Geotechnical Eng
Engineering and Information Technologies
Credit points: 6
Session: Semester 1
Classes: 3-hr combined lecture and tutorial per week
Assessment: Through semester assessment (100%)
Campus: Camperdown/Darlington
Mode of delivery: Normal (lecture/lab/tutorial) Day

Associated degrees: Grad Cert E, M P E.

Objectives: To introduce students to major computer modelling techniques used to solve boundary-value and initial-value problems in geotechnical engineering.

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.

CIVL5454
Rock Engineering
Engineering and Information Technologies
Credit points: 6
Session: Semester 2
Classes: 3 hours of project work in class per week
Assessment: Through semester assessment (100%)
Campus: Camperdown/Darlington
Mode of delivery: Normal (lecture/lab/tutorial) Day

Associated degrees: B E, Grad Cert E, M P E.

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

Expected outcomes: Students will have learnt how to classify and characterise rocks and rock masses for engineering purposes and developed an understanding of basic rock mechanics etc.


CIVL5455
Engineering Behaviour of Soils
Engineering and Information Technologies
Credit points: 6
Session: Semester 2
Classes: Independent Study 4 hrs per week
Assessment: Through semester assessment (100%)

Campus: Camperdown/Darlington
Mode of delivery: Normal (lecture/lab/tutorial) Day

Combined lecture and tutorial: 3 hours per week. 3 hours of laboratory work per semester.

Assessment: Through semester assessment (100%)

Campus: Camperdown/Darlington
Mode of delivery: Normal (lecture/lab/tutorial) Day

Associated degrees: B E, Grad Cert E, M P E.

Objectives: To provide an introduction to the behaviour and design of rock engineering structures.
CIVL5666
Open Channel Flow & Hydraulic Structures
Engineering and Information Technologies

Credit points: 6  
Session: Semester 1  
Classes: 3-hr combined lecture and tutorial per week  
Assumed knowledge: CIVL3612  
Assessment: Through semester assessment (50%), Final Exam (50%)  
Campus: Camperdown/Darlington  
Mode of delivery: Normal (lecture/lab/tutorial) Day  
Associated degrees: B E, Grad Cert E, M P E, PG Coursework Exchange.

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
Engineering and Information Technologies

Credit points: 6  
Session: Semester 1  
Classes: 3-hr combined lecture and tutorial per week  
Assessment: Through semester assessment (60%), Final Exam (40%)  
Campus: Camperdown/Darlington  
Mode of delivery: Normal (lecture/lab/tutorial) Day  
Associated degrees: B E, Grad Cert E, M P E, PG Coursework Exchange.

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
Engineering and Information Technologies

Credit points: 6  
Session: Semester 2  
Classes: Lecture 1 hr per week, Tutorial 1hr per week, Laboratory 2hrs per week  
Assumed knowledge: CIVL5511  
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%)  
Campus: Camperdown/Darlington  
Mode of delivery: Normal (lecture/lab/tutorial) Day  
Associated degrees: B E, Grad Cert E, M P E, PG Coursework Exchange.

The objective of this unit is to provide students with advanced knowledge of Computational Fluid Dynamics (CFD) techniques and skills in solving fluid and thermal flow problems relevant to Civil and Environmental Engineering applications. Students will also gain experience in using a state-of-the-art commercial CFD package and advanced understanding of a range of engineering problems through working on projects.

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
Engineering and Information Technologies

Credit points: 6  
Session: Semester 1, Semester 2  
Classes: Independent project work.  
Prerequisites: 48 credits from MPE degree program  
Assessment: Through semester assessment (100%)  
Campus: Camperdown/Darlington  
Mode of delivery: Supervision  
Note: Department permission required for enrolment.

Associated degrees: M E, M P E.

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
Engineering and Information Technologies

Credit points: 6  
Session: Semester 1, Semester 2  
Classes: Independent project work.  
Corequisites: CIVL5020  
Assessment: Through semester assessment (100%)  
Campus: Camperdown/Darlington  
Mode of delivery: Supervision  
Note: Department permission required for enrolment.

Associated degrees: M E, M P E.

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 CIVL5021 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
Engineering and Information Technologies

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  
Assessment: Through semester assessment (100%)  
Campus: Camperdown/Darlington  
Mode of delivery: Supervision  
Note: Department permission required for enrolment.

Associated degrees: M P E, M P L.
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 credit 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 on 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

Engineering and Information Technologies
Credit points: 12 Session: Semester 1, Semester 2 Classes: no formal classes Prohibitions: ENGG5220, ENGG5221 Assessment: Through semester assessment (100%) Campus: Camperdown/Darlington 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.

Associated degrees: M E, M P E.
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.

CIVL5223
Dissertation B

Engineering and Information Technologies
Credit points: 12 Session: Semester 1, Semester 2 Classes: no formal classes Prohibitions: ENGG5220, ENGG5221 Assessment: Through semester assessment (100%) Campus: Camperdown/Darlington 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.

Associated degrees: M E, M P E.
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.

Exchange units
Exchange units require the approval of the Program Director. With approval, up to 12 credit points of Exchange units may be included in place of other units, towards the requirements of the degree.

ENGG5231
Engineering Graduate Exchange A

ENGG5232
Engineering Graduate Exchange B

Engineering and Information Technologies
Credit points: 6 Session: Int January, Int July Classes: overseas short-course
Prerequisites: Permission from faculty and school. Assessment: Through semester assessment (100%) Campus: Camperdown/Darlington Mode of delivery: Normal (lecture/lab/tutorial) Day
Note: Department permission required for enrolment.

Associated degrees: M E, M Inf Tech, M Inf Tech Man, M P E, M P L, M P M.
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.
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 http://www.engineersaustralia.org.au/.

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).
## 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**

<table>
<thead>
<tr>
<th>Unit of Study</th>
<th>Credit Points</th>
<th>A: Assumed knowledge</th>
<th>P: Prerequisites</th>
<th>C: Corequisites</th>
<th>N: Prohibition</th>
<th>Session</th>
</tr>
</thead>
<tbody>
<tr>
<td>COMP5212 Software Construction</td>
<td>6</td>
<td>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. Note: Department permission required for enrolment</td>
<td></td>
<td></td>
<td></td>
<td>Semester 1</td>
</tr>
<tr>
<td>ELEC5710 Electrical &amp; Electronic Engi (Fund)</td>
<td>6</td>
<td>A Basic knowledge of differentiation &amp; integration, and HSC Physics</td>
<td></td>
<td></td>
<td></td>
<td>Semester 1</td>
</tr>
<tr>
<td>ELEC5722 Foundations of Digital Systems Design</td>
<td>6</td>
<td>A ELEC1601. This unit of study assumes some knowledge of digital data representation and basic computer organisation.</td>
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<td></td>
<td></td>
<td>Semester 1</td>
</tr>
<tr>
<td>ENGG5011 Foundation Engineering Studies A</td>
<td>6</td>
<td>A HSC Mathematics extension 1 or 2</td>
<td></td>
<td></td>
<td></td>
<td>Semester 1 Semester 2</td>
</tr>
</tbody>
</table>

**Year One - Semester Two**

<table>
<thead>
<tr>
<th>Unit of Study</th>
<th>Credit Points</th>
<th>A: Assumed knowledge</th>
<th>P: Prerequisites</th>
<th>C: Corequisites</th>
<th>N: Prohibition</th>
<th>Session</th>
</tr>
</thead>
<tbody>
<tr>
<td>ELEC5711 Foundations of Computer Systems</td>
<td>6</td>
<td>A Ohm’s Law and Kirchhoff’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.</td>
<td></td>
<td></td>
<td></td>
<td>Semester 2</td>
</tr>
<tr>
<td>ELEC5720 Foundations Electronic Devs and Circuits</td>
<td>6</td>
<td>A Basic knowledge of differentiation &amp; integration, differential equations, and linear algebra.</td>
<td></td>
<td></td>
<td></td>
<td>Semester 2</td>
</tr>
<tr>
<td>ELEC5721 Foundations of Signals and Systems</td>
<td>6</td>
<td>A ELEC1103. Understanding of the fundamental concepts and building blocks of electrical and electronics circuits and aspects of professional project management, teamwork, and ethics.</td>
<td></td>
<td>N CSC1001 and CSC1901</td>
<td></td>
<td>Semester 2</td>
</tr>
<tr>
<td>ELEC5723 Foundations Simulations &amp; Numerical Solutions</td>
<td>6</td>
<td>A General knowledge in science and calculus and understanding of basic principles of chemistry, physics and mechanics</td>
<td></td>
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<td></td>
<td>Semester 2</td>
</tr>
</tbody>
</table>

**Year Two - Semester One**

<table>
<thead>
<tr>
<th>Unit of Study</th>
<th>Credit Points</th>
<th>A: Assumed knowledge</th>
<th>P: Prerequisites</th>
<th>C: Corequisites</th>
<th>N: Prohibition</th>
<th>Session</th>
</tr>
</thead>
<tbody>
<tr>
<td>ENGG5022 Sustainable Design, Eng and Mgt</td>
<td>6</td>
<td>A Competences and experience in engineering obtained during an accepted engineering degree</td>
<td></td>
<td></td>
<td></td>
<td>Semester 1</td>
</tr>
<tr>
<td>ENGG5024 Engineering Professional Practice</td>
<td>6</td>
<td>A General knowledge in science and calculus and understanding of basic principles of chemistry, physics and mechanics</td>
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<td></td>
<td>Semester 1</td>
</tr>
</tbody>
</table>

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.

Candidates complete 36 credit points of Electrical Electives and 12 credit points of Management Electives across Year Two and Year Three.

**Year Three - Semester One**

<table>
<thead>
<tr>
<th>Unit of Study</th>
<th>Credit Points</th>
<th>A: Assumed knowledge</th>
<th>P: Prerequisites</th>
<th>C: Corequisites</th>
<th>N: Prohibition</th>
<th>Session</th>
</tr>
</thead>
<tbody>
<tr>
<td>ENGG5217 Practical Experience</td>
<td>6</td>
<td>A HSC Mathematics extension 1 or 2</td>
<td></td>
<td></td>
<td></td>
<td>Semester 1 Semester 2</td>
</tr>
<tr>
<td>ELEC5020 Capstone Project A</td>
<td>6</td>
<td>P 48 credits from MPE degree program</td>
<td></td>
<td>Note: Department permission required for enrolment</td>
<td></td>
<td>Semester 1 Semester 2</td>
</tr>
</tbody>
</table>

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.

For internal use by University of Sydney staff only.
## Unit of study table

<table>
<thead>
<tr>
<th>Unit of study</th>
<th>Credit points</th>
<th>A: Assumed knowledge</th>
<th>P: Prerequisites</th>
<th>C: Corequisites</th>
<th>N: Prohibition</th>
<th>Session</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Select 18 credit points from Electrical Electives or Management Electives units block.</strong></td>
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</tr>
<tr>
<td>Candidates complete 36 credit points of Electrical Electives and 12 credit points of Management Electives across Year Two and Year Three.</td>
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<tr>
<td><strong>Year Three - Semester Two</strong></td>
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</tr>
<tr>
<td>ELEC5021 Capstone Project B</td>
<td>6</td>
<td>C ELEC5020</td>
<td>Note: Department permission required for enrolment</td>
<td></td>
<td></td>
<td>Semester 2</td>
</tr>
<tr>
<td>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.</td>
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</tr>
<tr>
<td>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.</td>
<td></td>
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<tr>
<td><strong>Select 18 credit points from Electrical Electives or Management Electives units block.</strong></td>
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</tr>
<tr>
<td>Candidates complete 36 credit points of Electrical Electives and 12 credit points of Management Electives across Year Two and Year Three.</td>
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<tr>
<td><strong>Foundation units</strong></td>
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<tr>
<td>Candidates must complete 24 credit points from the following Foundation units of study.</td>
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</tr>
<tr>
<td>ELEC5730 Foundations of Eng Electromagnetics</td>
<td>6</td>
<td>A 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.</td>
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<td></td>
<td>Semester 1</td>
</tr>
<tr>
<td>This Unit of Study is only available to Master of Professional Engineering students with a Non-Electrical Engineering degree.</td>
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<tr>
<td>ELEC5732 Foundations of Electricity Networks</td>
<td>6</td>
<td>A 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</td>
<td></td>
<td></td>
<td></td>
<td>Semester 1</td>
</tr>
<tr>
<td>N ELEC3020 This Unit of Study is only available to Master of Professional Engineering degree students with a Non-Electrical Engineering Bachelor's degree.</td>
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<tr>
<td>ELEC5733 Foundations of Power Electronics &amp; Apps</td>
<td>6</td>
<td>A 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.</td>
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<td>Semester 1</td>
</tr>
<tr>
<td>This Unit of Study is only available to Master of Professional Engineering degree students with a Non-Electrical Engineering Bachelor's degree.</td>
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<tr>
<td>ELEC5734 Foundations Elec Energy &amp; Conversion Sys</td>
<td>6</td>
<td>A 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.</td>
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<td></td>
<td>Semester 2</td>
</tr>
<tr>
<td>ELEC5735 Foundations of Control</td>
<td>6</td>
<td>A A specifically the following concepts are assumed knowledge for this unit; familiarity with basic Algebra, Differential and Integral Calculus, Physics; solution of linear differential equations, Matrix Theory, eigenvalues and eigenvectors; linear electrical circuits, ideal op-amps; continuous linear time-invariant systems and their time and frequency domain representations, Laplace transform, Fourier transform, ELEC2302 and MATH2061 or equivalent.</td>
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<td>Semester 2</td>
</tr>
<tr>
<td>ELEC5736 Foundations of Digital Signal Processing</td>
<td>6</td>
<td>A 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</td>
<td></td>
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<td></td>
<td>Semester 1</td>
</tr>
<tr>
<td>ELEC5737 Foundations of Electronic Circuit Design</td>
<td>6</td>
<td>A A background in basic electronics and circuit theory is assumed.</td>
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<td>Semester 1</td>
</tr>
<tr>
<td>ELEC5738 Foundations Comm Electrons &amp; Photonics.</td>
<td>6</td>
<td>A A background in basic electronics and circuit theory is assumed.</td>
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<td></td>
<td>Semester 2</td>
</tr>
<tr>
<td>ELEC5739 Foundations of Communications</td>
<td>6</td>
<td>A 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.</td>
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<td>Semester 1</td>
</tr>
<tr>
<td>ELEC5740 Foundations of Data Comm &amp; the Internet</td>
<td>6</td>
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<td>Semester 2</td>
</tr>
<tr>
<td>ELEC5741 Foundations of Embedded Systems</td>
<td>6</td>
<td>A A ELEC1601 AND ELEC2602 or equivalent. 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.</td>
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<td>Semester 1</td>
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<tr>
<td>ELEC5742 Foundations: Internet Software Platforms</td>
<td>6</td>
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<td>Semester 2</td>
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<tr>
<td>ELEC5743 Foundations of E-Business Anal &amp; Design</td>
<td>6</td>
<td>P INFO2120 or equivalent N EBUS3003</td>
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<td>Semester 1</td>
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<tr>
<td>ELEC5744 Foundations of Digital Comm Systems</td>
<td>6</td>
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<td>Semester 1</td>
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<tr>
<td><strong>Electrical Elective units</strong></td>
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<tr>
<td>Candidates must complete 36 credit points from the following Electrical Elective units of study.</td>
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<tr>
<td>COMP5047 Pervasive Computing</td>
<td>6</td>
<td>A 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. N NETS4047</td>
<td></td>
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<td>Semester 2</td>
</tr>
<tr>
<td>Unit of study</td>
<td>Credit points</td>
<td>A: Assumed knowledge</td>
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<td>Session</td>
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<tr>
<td>COMP5416 Advanced Network Technologies</td>
<td>6</td>
<td>COMP5116 OR ELEC3506</td>
<td></td>
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<td>Semester 2</td>
</tr>
<tr>
<td>COMP5425 Parallel and Distributed Computing</td>
<td>6</td>
<td>COMP5116</td>
<td></td>
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<td>Semester 1</td>
</tr>
<tr>
<td>ELEC5101 Antennas and Propagation</td>
<td>6</td>
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<td>Semester 2</td>
</tr>
<tr>
<td>ELEC5203 Topics in Power Engineering</td>
<td>6</td>
<td>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.</td>
<td></td>
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<td>Semester 2</td>
</tr>
<tr>
<td>ELEC5204 Power Systems Analysis and Protection</td>
<td>6</td>
<td>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.</td>
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<td>Semester 1</td>
</tr>
<tr>
<td>ELEC5205 High Voltage Engineering</td>
<td>6</td>
<td>P ELEC3203, The following previous knowledge is assumed for this unit. Circuit analysis techniques, electricity networks, power system fundamentals.</td>
<td></td>
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<td>Semester 2</td>
</tr>
<tr>
<td>ELEC5206 Sustainable Energy Systems</td>
<td>6</td>
<td>Following concepts are assumed 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.</td>
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<td></td>
<td>Semester 2</td>
</tr>
<tr>
<td>ELEC5207 Advanced Power Conversion Technologies</td>
<td>6</td>
<td>Fundamentals of Power Electronics and Applications</td>
<td></td>
<td></td>
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<td>Semester 2</td>
</tr>
<tr>
<td>ELEC5208 Intelligent Electricity Networks</td>
<td>6</td>
<td>Fundamentals of Electricity Networks, Control Systems and Telecommunications.</td>
<td></td>
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<td></td>
<td>Semester 1</td>
</tr>
<tr>
<td>ELEC5211 Power Systems Dynamics and Control</td>
<td>6</td>
<td>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.</td>
<td></td>
<td></td>
<td>Note: Department permission required for enrolment</td>
<td>Semester 1</td>
</tr>
<tr>
<td>ELEC5212 Power Systems Planning and Markets</td>
<td>6</td>
<td>P ELEC3203 or ELEC5732 or equivalent</td>
<td></td>
<td></td>
<td>Note: Department permission required for enrolment</td>
<td>Semester 2</td>
</tr>
<tr>
<td>ELEC5303 Computer Control System Design</td>
<td>6</td>
<td>This unit assumes a basic knowledge of calculus, functions of real variables, Laplace transform, matrix theory and control theory.</td>
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<td>Semester 1</td>
</tr>
<tr>
<td>ELEC5440 Digital Integrated Circuit Design</td>
<td>6</td>
<td>ELEC4400</td>
<td></td>
<td>N ELEC4400</td>
<td>Note: Department permission required for enrolment</td>
<td>Semester 1</td>
</tr>
<tr>
<td>ELEC5403 Radio Frequency Engineering</td>
<td>6</td>
<td>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.</td>
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<td>Semester 1</td>
</tr>
<tr>
<td>ELEC5507 Error Control Coding</td>
<td>6</td>
<td>Basic knowledge on digital communications. Fundamental mathematics including probability theory and linear algebra.</td>
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<td>Semester 1</td>
</tr>
<tr>
<td>ELEC5508 Wireless Engineering</td>
<td>6</td>
<td>Basic knowledge in probability and statistics, analog and digital communications, error probability calculation in communications channels, and telecommunications network.</td>
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<td></td>
<td>Semester 2</td>
</tr>
<tr>
<td>ELEC5509 Mobile Networks</td>
<td>6</td>
<td>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.</td>
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<td></td>
<td>Semester 1</td>
</tr>
<tr>
<td>ELEC5510 Satellite Communication Systems</td>
<td>6</td>
<td>Knowledge of error probabilities, analog and digital modulation techniques and error performance evaluation studied in ELEC5505 Communications and ELEC4505 Digital Communication Systems, is assumed.</td>
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<td>Semester 2</td>
</tr>
<tr>
<td>ELEC5511 Optical Communication Systems</td>
<td>6</td>
<td>ELEC3505 (Communications) and (ELEC3405 Communications Electronics and Photonics) or equivalent</td>
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<td>Semester 1</td>
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<tr>
<td>ELEC5512 Optical Networks</td>
<td>6</td>
<td>Knowledge of digital communications, wave propagation, and fundamental optics</td>
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<td>Semester 2</td>
</tr>
<tr>
<td>ELEC5514 Networked Embedded Systems</td>
<td>6</td>
<td>ELEC3305, ELEC3506, ELEC3607 and ELEC5508 or equivalent</td>
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<td>Semester 2</td>
</tr>
<tr>
<td>ELEC5614 Real Time Computing</td>
<td>6</td>
<td>SOFT2130 Software Construction (or SOFT204 Software Development Methods 1) and ELEC3607 Embedded Computing (or ELEC2601 Microprocessor Systems)</td>
<td></td>
<td></td>
<td>N MECH5701</td>
<td>Semester 1</td>
</tr>
<tr>
<td>ELEC5616 Computer and Network Security</td>
<td>6</td>
<td>A programming language, basic maths.</td>
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<td>Semester 1</td>
</tr>
<tr>
<td>ELEC5618 Software Quality Engineering</td>
<td>6</td>
<td>You are capable of writing programs with multiple functions or methods in multiple files. You are capable of design complex data structures and combine them in non trivial algorithms. You know how to use an integrated development environment. You are familiar and have worked previously with software version control systems. You know how to distribute the workload derived from the unit of study effectively throughout the week and make sure that time is truly productive.</td>
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<td>Semester 1</td>
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<tr>
<td>ELEC5619 Object Oriented Application Frameworks</td>
<td>6</td>
<td>Java programming, and some web development experience are essential. Databases strongly recommended</td>
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<td>Semester 2</td>
</tr>
<tr>
<td>ELEC5620 Model Based Software Engineering</td>
<td>6</td>
<td>A programming language, basic maths</td>
<td></td>
<td></td>
<td>Note: Department permission required for enrolment</td>
<td>Semester 2</td>
</tr>
<tr>
<td>ELEC5621 Digital Systems Design</td>
<td>6</td>
<td>Basic knowledge of digital logic, computer architecture and microprocessor systems is required. Equivalent to ELEC2602 and ELEC3608</td>
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<td>Note: Department permission required for enrolment</td>
<td>Semester 2</td>
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<tr>
<td>ELEC5622 Signals, Software and Health</td>
<td>6</td>
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<td>Semester 2</td>
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<tr>
<td>ELEC5701 Technology Venture Creation</td>
<td>6</td>
<td>ENGG5102</td>
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<td>Semester 2</td>
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</table>
### Unit of study table

<table>
<thead>
<tr>
<th>Unit of study</th>
<th>Credit points</th>
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</thead>
<tbody>
<tr>
<td>ELEC5803 Advanced Bioelectronics</td>
<td>6</td>
<td>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.</td>
<td>P: ELEC2104 AND ELEC2602. Familiarity with transistor operations, basic electrical circuits, embedded programming is required.</td>
<td>Note: Department permission required for enrolment</td>
<td>Semester 1</td>
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<tr>
<td>Management Elective units</td>
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<tr>
<td>ENGG5203 Quality Engineering and Management</td>
<td>6</td>
<td>A: First degree in Engineering or a related discipline,</td>
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<td>Semester 2</td>
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<tr>
<td>ENGG5205 Professional Practice in PM</td>
<td>6</td>
<td>A: Basic engineering or science knowledge. At least 2-3 years of work experience preferred. 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.</td>
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<td>Semester 1</td>
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<tr>
<td>ENGG5214 Management of Technology</td>
<td>6</td>
<td>A: Sound competence in all aspects of engineering, and some understanding of issues of engineering management</td>
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<td>Semester 2</td>
</tr>
<tr>
<td>ENGG5215 International Eng Strategy &amp; Operations</td>
<td>6</td>
<td>A: Sound competence in all aspects of engineering, and some understanding of issues of engineering management and globalisation</td>
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<td>Semester 2 Main</td>
</tr>
<tr>
<td>ENGG5216 Management of Engineering Innovation</td>
<td>6</td>
<td>A: Sound competence in all aspects of engineering, and some understanding of issues of engineering management</td>
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<td>Semester 1</td>
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<tr>
<td>Project units</td>
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<tr>
<td>All candidates are required to complete a minimum of 12 credit points of Project units.</td>
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<tr>
<td>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.</td>
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<tr>
<td>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.</td>
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<tr>
<td>ELEC5020 Capstone Project A</td>
<td>6</td>
<td>P: 48 credits from MPE degree program</td>
<td>Note: Department permission required for enrolment</td>
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<td></td>
<td>Semester 1</td>
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<tr>
<td>ELEC5021 Capstone Project B</td>
<td>6</td>
<td>C: ELEC5020</td>
<td>Note: Department permission required for enrolment</td>
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<td></td>
<td>Semester 1</td>
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<tr>
<td>ELEC5022 Capstone Project B Extended</td>
<td>12</td>
<td>P: 42 credits in the Master of Engineering and WAM &gt; 70, or 66 credit points in the Master of Professional Engineering and WAM &gt; 70 or exemption</td>
<td>Note: Department permission required for enrolment</td>
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<td>Semester 1</td>
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<tr>
<td>Research pathway</td>
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<tr>
<td>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.</td>
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<tr>
<td>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.</td>
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<tr>
<td>ELEC5222 Dissertation A</td>
<td>12</td>
<td>N: ELEC4001, ELEC4002, ENGG5222, ENGG5223</td>
<td>Note: Department permission required for enrolment</td>
<td>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.</td>
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<td>Semester 1</td>
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<tr>
<td>ELEC5223 Dissertation B</td>
<td>12</td>
<td>N: ELEC4001, ELEC4002, ENGG5222, ENGG5223</td>
<td>Note: Department permission required for enrolment</td>
<td>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.</td>
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<td>Semester 1</td>
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<td>Exchange units</td>
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<tr>
<td>Exchange units require the approval of the Program Director. With approval, up to 12 credit points of Exchange units may be taken in place of other units, towards the requirements of the degree.</td>
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<tr>
<td>ENGG5231 Engineering Graduate Exchange A</td>
<td>6</td>
<td>P: Permission from faculty and school.</td>
<td>Note: Department permission required for enrolment</td>
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<td>Int January</td>
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<tr>
<td>ENGG5232 Engineering Graduate Exchange B</td>
<td>6</td>
<td>P: Permission from faculty and school.</td>
<td>Note: Department permission required for enrolment</td>
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<tr>
<td>For more information on degree program requirements visit CUSP.</td>
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</table>
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

COMP5212 Software Construction
Engineering and Information Technologies
Credit points: 6 Session: Semester 1 Classes: One 2 hour lecture and one 2 hour tutorial per week. 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%). Campus: Camperdown/Darlington Mode of delivery: Normal (lecture/lab/tutorial) Day
Note: Department permission required for enrolment.

Associated degrees: B E, Grad Dip Comp, M I D M, M P E, PG Coursework Exchange.

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.

ELEC5710 Electrical & Electronic Engi (Fund)
Engineering and Information Technologies
Credit points: 6 Session: Semester 1 Classes: 3hrs lectures/labs/tutorials per week. Assumed knowledge: Basic knowledge of differentiation & integration, and HSC Physics Assessment: Through semester assessment (50%), Final Exam (50%). Campus: Camperdown/Darlington Mode of delivery: Normal (lecture/lab/tutorial) Day

Associated degrees: M P E.

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

ELEC5722 Foundations of Digital Systems Design
Engineering and Information Technologies
Credit points: 6 Session: Semester 1 Classes: 2 hours of lectures, 2 hours of tutorials and 3 hours of laboratory work per week. Assumed knowledge: ELEC1601. This unit of study assumes some knowledge of digital data representation and basic computer organisation. Assessment: Through semester assessment (40%), Final Exam (60%). Campus: Camperdown/Darlington Mode of delivery: Normal (lecture/lab/tutorial) Day

Associated degrees: Grad Dip E (Prof Eng), M P E.

The purpose of this unit is to equip 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
Engineering and Information Technologies
Credit points: 6 Session: Semester 1, Semester 2 Classes: no formal classes, regular meetings with supervisor will be required. Assessment: Through semester assessment (100%) Campus: Camperdown/Darlington Mode of delivery: Supervision

Associated degrees: Grad Dip E (Prof Eng), M P E.

Foundation 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

ELEC5711 Foundations of Computer Systems
Engineering and Information Technologies
Credit points: 6 Session: Semester 2 Classes: 2hrs of Lectures per week, 8 hrs of project work in class per semester. Assumed knowledge: HSC Mathematics extension 1 or 2 Assessment: Through semester assessment (59%), Final Exam (41%). Campus: Camperdown/Darlington Mode of delivery: Normal (lecture/lab/tutorial) Day

Associated degrees: M P E.

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.
ELEC5720 Foundations Electronic Devs and Circuits
Engineering and Information Technologies

Credit points: 6  
Session: Semester 2  
Classes: 2 hours of lectures per week, and a 2 hours tutorial and 2 hours lab per fortnight.  
Prohibitions: ELEC2104  
Assumed knowledge: Ohm's Law and Kirchhoff'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%).  
Campus: Camperdown/Darlington  
Mode of delivery: Normal (lecture/lab/tutorial) Day  
Associated degrees: Grad Dip E (Prof Eng), M P E.  

Modern Electronics has come to be known as microelectronics which refers to the Integrated Circuits (ICs) containing millions of discrete devices. This course introduces some of the basic electronic devices like diodes and different types of transistors. It also aims to introduce students the analysis and design techniques of circuits involving these discrete devices as well as the integrated circuits. Completion of this course is essential to specialize in Electrical, Telecommunication or Computer Engineering stream. The knowledge of ELEC1103 is assumed.

ELEC5721 Foundations of Signals and Systems
Engineering and Information Technologies

Credit points: 6  
Session: Semester 2  
Classes: 2 hours of lectures, 2 hours lab/tutorial per week and 1 hour of eLearning session per week.  
Assumed knowledge: Basic knowledge of differentiation & integration, differential equations, and linear algebra.  
Assessment: Through semester assessment (30%), Final Exam (70%).  
Campus: Camperdown/Darlington  
Mode of delivery: Normal (lecture/lab/tutorial) Day  
Associated degrees: Grad Dip E (Prof Eng), M P E.  

This unit aims to teach some of the basic properties of many engineering signals and systems and the necessary mathematical tools that aid in this process. The particular emphasis is on the time and frequency domain modeling of linear time invariant systems. The concepts learnt in this unit will be heavily used in many units of study (in later years) in the areas of communication, control, power systems and signal processing. A basic knowledge of differentiation and integration, differential equations, and linear algebra is assumed.

ELEC5723 Found: Simulations & Numerical Solutions
Engineering and Information Technologies

Credit points: 6  
Session: Semester 2  
Classes: Lecture 1 hours per week, Laboratory 3 hours per week.  
Prohibitions: COSC1001 and COSC1901  
Assumed knowledge: ELEC1103. 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 assessment (25%), Final Exam (75%).  
Campus: Camperdown/Darlington  
Mode of delivery: Normal (lecture/lab/tutorial) Day  
Associated degrees: Grad Dip E, M P E.  

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.


Year Two - Semester One

ENNGS202 Sustainable Design, Eng and Mgt
Engineering and Information Technologies

Credit points: 6  
Session: Semester 1  
Classes: 2 lectures per week, tutorials 2 hour per week and projects and self assisted learning (4 hours per week)  
Assumed knowledge: General knowledge in science and calculus and understanding of basic principles of chemistry, physics and mechanics  
Assessment: Through semester assessment (70%), Final Exam (30%).  
Campus: Camperdown/Darlington  
Mode of delivery: Normal (lecture/lab/tutorial) Day  
Associated degrees: Grad Cert E, M P E.  

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
Engineering and Information Technologies

Credit points: 6  
Session: Semester 1  
Classes: Lecture 1 hour per week, Tutorial 1 hour per week, Workgroup 1 hour per week.  
Assumed knowledge: Competences and experience in engineering obtained during an accepted engineering degree  
Assessment: Through semester assessment (100%)  
Campus: Camperdown/Darlington  
Mode of delivery: Normal (lecture/lab/tutorial) Day  
Associated degrees: Grad Dip E, M P E.  

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.
Candidates complete 36 credit points of Electrical Electives and 12 credit points of Management Electives across Year Two and Year Three.

Year Three - Semester One

ENGG5217
Practical Experience
Engineering and Information Technologies
Session: Semester 1, Semester 2 Classes: no formal classes
Assessment: Students will write reports on their industrial experiences and maintain a portfolio of work. Portfolio (100%) Campus: Camperdown/Darlington
Mode of delivery: Professional Practice
Note: Students should have completed one year of their MPE program before enrolling in this unit.

Associated degrees: M P E.

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 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 website http://sydney.edu.au/engineering/practical-experience/index.shtml

ELEC5020
Capstone Project A
Engineering and Information Technologies
Credit points: 6 Session: Semester 1, Semester 2 Classes: Independent project work.
Prerequisites: 48 credits from MPE degree program
Assessment: Through semester assessment (100%) Campus: Camperdown/Darlington
Mode of delivery: Supervision
Note: Department permission required for enrolment.

Associated degrees: M E, M P E.

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.
Candidates 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.

ELEC5730
Foundations of Eng Electromagnetics
Engineering and Information Technologies
Credit points: 6 Session: Semester 1 Classes: 2 hours of lectures and a 2 hours tutorial per week.
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%) Campus: Camperdown/Darlington
Mode of delivery: Normal (lecture/lab/tutorial) Day
Note: This Unit of Study is only available to Master of Professional Engineering students with a Non-Electrical Engineering degree.

Associated degrees: M P E.

This unit introduces students to the broad spectrum of engineering electromagnetics and helps students to develop theoretical and analytical skills in the area of electrical and telecommunications engineering and develop understanding of the basic electromagnetic theory underpinning optical communications, wireless communications and electrical engineering.

ELEC5732
Foundations of Electricity Networks
Engineering and Information Technologies
Credit points: 6 Session: Semester 1 Classes: 2 hours of lectures and 3 hours lab/tutorial per week.
Assessment: Through semester assessment (60%), Final Exam (40%)
Campus: Camperdown/Darlington
Mode of delivery: Normal (lecture/lab/tutorial) Day
Note: This Unit of Study is only available to Master of Professional Engineering degree students with a Non-Electrical Engineering Bachelor’s degree.

Associated degrees: M P E.

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 electrical 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.

ELEC5733
Foundations of Power Electronics & Apps
Engineering and Information Technologies
Credit points: 6 Session: Semester 1 Classes: 2 hours of lectures, 3 hours lab/tutorial per week. 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%) Campus: Camperdown/Darlington Mode of delivery: Normal (lecture/lab/tutorial) Day
Note: This Unit of Study is only available to Master of Professional Engineering degree students with a Non- Electrical Engineering Bachelor’s degree.
Associated degrees: M P E.
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 as 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; controlled rectifiers: single- and three-phase; non-isolated dc-dc converters; buck, boost and buck-boost; isolated dc-dc converters; inverters: single- and three-phase; uninterruptible power supplies; battery chargers and renewable energy systems; electric and hybrid electric vehicles technologies, design of converters and systems.

ELEC5734
Foundations Elec Energy & Conversion Sys
Engineering and Information Technologies
Credit points: 6 Session: Semester 2 Classes: 2 hours of lectures per week and 3 hours of labs and one hour of tutorial per fortnight. Assumed knowledge: Following concepts are assumed knowledge for this unit of study: familiarity with circuit theory, electronic devices, ac power, capacitors and inductors, and differential equations. Following concepts are assumed knowledge for this unit of study: 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. ELEC2002 and MATH2061 or equivalent. Assessment: Through semester assessment (43%). Final Exam (57%) Campus: Camperdown/Darlington Mode of delivery: Normal (lecture/lab/tutorial) Day
Associated degrees: M P E.
This unit 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.

ELEC5735
Foundations of Control
Engineering and Information Technologies
Credit points: 6 Session: Semester 2 Classes: 2 hours of lectures and a 3 hours lab/tutorial per week. 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%) Campus: Camperdown/Darlington Mode of delivery: Normal (lecture/lab/tutorial) Day
Associated degrees: M P E.
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

ELEC5737
Foundations of Electronic Circuit Design
the effect of noise and interference in performance of the digital schemes and reasons to use digital techniques instead of analog, and communications channels, different analog and digital modulation techniques instead of analog, and the effect of noise and interference in performance of the digital communication systems. On completion of this unit, students will have sufficient knowledge of the physical channel of 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: bandwidth signals, digital PAM, eye diagram, equalization, correlation coding, error probabilities in baseband digital transmission, bandpass transmission, digital amplitude shift keying (ASK), frequency shift keying (FSK), phase shift keying (PSK) and quadrature shift keying (QPSK), error probabilities in bandpass digital transmission, a case study of digital communication systems. Introduction to information theory: fundamental limits in communications, channel capacity and channel coding, signal compression.

ELEC5740 Foundations of Data Comm & the Internet

ELEC5739 Foundations of Communications

ELEC5738 Foundations Comm Electronics & Photonics

ELEC5742 Foundations: Internet Software Platforms

ELEC5741 Foundations of Embedded Systems
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/ODE web application development with Microsoft .NET web application development.
- Exposure to relevant developer tools (e.g. Eclipse and VS.NET).
- Be able to develop a real application on one of those environments.
- Use XML to implement simple web services and AJAX applications.

ELEC5743
Foundations of E-Business Anal & Design
Engineering and Information Technologies
Credit points: 6
Session: Semester 1
Classes: 2 hours project work in class and 1 hour tutorial per week.
Prerequisites: INFO2120 or equivalent
Prohibitions: EBUS3003
Assessment: Through semester assessment (40%), Final Exam (30%)
Campus: Camperdown/Darlington
Mode of delivery: Normal (lecture/lab/tutorial) Day

Associated degrees: M P E

This unit examines the essential pre-production stages of designing successful internet websites and services. It focuses on the aspects of analysis, project specification, design, and prototype that lead up to the actual build of a website or application. Topics include, B2C, B2B and B2E systems, business models, methodologies, modeling with use cases / UML and WebML, the Project Proposal and Project Specification Document, Information Architecture and User-Centred Design, legal issues, and standards-based web development. Students build a simple use-case based e-business website prototype with web standards. A final presentation of the analysis, design and prototype are presented in a role play environment where students try to win funding from a venture capitalist. An understanding of these pre-production fundamentals is critical for future IT and Software Engineering Consultants, Project Managers, Analysts and CTOs.

ELEC5744
Foundations of Digital Comm Systems
Engineering and Information Technologies
Credit points: 6
Session: Semester 1
Classes: 2 hours of lectures and a 2 hours lab/tutorial per week.
Assessment: Through semester assessment (45%), Final Exam (45%)
Campus: Camperdown/Darlington
Mode of delivery: Normal (lecture/lab/tutorial) Day

Associated degrees: M P E

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.

Electrical Elective units
Candidates must complete 36 credit points from the following Electrical Elective units of study.

COMP5047
Pervasive Computing
Engineering and Information Technologies
Credit points: 6
Session: Semester 2
Classes: 3hr integrated lecture and practical session
Prohibitions: NETS4047
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 done.
Assessment: Through semester assessment (60%), Final Exam (40%)
Campus: Camperdown/Darlington
Mode of delivery: Normal (lecture/lab/tutorial) Day

Associated degrees: B C S T (Hons), B E, B I T (Hons), B Sc (Hons), Grad Cert I T, M P E

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
Engineering and Information Technologies
Credit points: 6
Session: Semester 2
Classes: (Lec 2hrs & Pract 1hr) per week
Assumed knowledge: COMP5116 OR ELEC3506
Assessment: Through semester assessment (40%), Final Exam (60%)
Campus: Camperdown/Darlington
Mode of delivery: Normal (lecture/lab/tutorial) Day

Associated degrees: B C S T (Hons), B E, B I T (Hons), B Psych (Hons), B Sc (Hons), Grad Cert I T, Grad Cert E

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
Engineering and Information Technologies
Credit points: 6
Session: Semester 1
Classes: (Lec 2hrs & Pract 1hr) per week
Assumed knowledge: COMP5116
Assessment: Through semester assessment (40%), Final Exam (60%)
Campus: Camperdown/Darlington
Mode of delivery: Normal (lecture/lab/tutorial) Day

Associated degrees: B C S T (Hons), B E, B I T (Hons), B Psych (Hons), B Sc (Hons), Grad Cert E, Grad Cert I T, M P E

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
Engineering and Information Technologies
Credit points: 6
Session: Semester 2
Classes: 2 hours of lectures and a 3 hours laboratory each week
Assessment: Through semester assessment (40%), Final Exam (60%)
Campus: Camperdown/Darlington
Mode of delivery: Normal (lecture/lab/tutorial) Day

Associated degrees: B E, Grad Cert E, M P E, PG Coursework Exchange

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 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
Engineering and Information Technologies
Credit points: 6 Session: Semester 2 Classes: 2 hours of lectures and 2 hours tutorial/lab/oratory per 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%) Campus: Camperdown/Darlington Mode of delivery: Normal (lecture/lab/tutorial) Day
Associated degrees: B E, Grad Cert E, M P E, UG Study Abroad Program.
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
Engineering and Information Technologies
Credit points: 6 Session: Semester 1 Classes: 2 hours of lectures and a 1 hour tutorial per week, 2 hours laboratory per 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 (40%), Final Exam (60%) Campus: Camperdown/Darlington Mode of delivery: Normal (lecture/lab/tutorial) Day
Associated degrees: B E, Grad Cert E, M P E, UG Study Abroad Program.
This 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.

ELEC5205
High Voltage Engineering
Engineering and Information Technologies
Credit points: 6 Session: Semester 2 Classes: 2 hours lecture and 2 hours tutorial per week. Prerequisites: ELEC3203. 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%) Campus: Camperdown/Darlington Mode of delivery: Normal (lecture/lab/tutorial) Day
Associated degrees: B E, Grad Cert E, M P E, UG Study Abroad Program.
This 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.
Unit of study descriptions

ELEC5208
Intelligent Electricity Networks
Engineering and Information Technologies

Credit points: 6 Session: Semester 1 Classes: 2 hrs lectures per week, 1 hr tutorial per week. Assumed knowledge: Fundamentals of Electricity Networks, Control Systems and Telecommunications Assessment: Through semester assessment (40%), Final Exam (60%) Campus: Camperdown/Darlington Mode of delivery: Normal (lecture/lab/tutorial) Day Note: Department permission required for enrolment.

Associated degrees: B E, Grad Cert E, M P E.

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
Engineering and Information Technologies

Credit points: 6 Session: Semester 1 Classes: 2 hrs lectures per week, 2 hrs tutorial per week; 3 hrs Laboratory per week. Prerequisites: ELEC5203 or ELEC5732 or equivalent 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 (40%), Final Exam (60%) Campus: Camperdown/Darlington Mode of delivery: Normal (lecture/lab/tutorial) Day Note: Department permission required for enrolment.

Associated degrees: B E, Grad Cert E, M P E.

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

- 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; Voltage stability; Frequency stability; Small signal stability.
Approximating continuous time controllers. Finite word length implementations.

ELEC5402 Digital Integrated Circuit Design Engineering and Information Technologies
This unit of study is not available in 2014
Credit points: 6 Session: Semester 1 Classes: 2 hours of lectures and a 2 hours project work in class per week. Prohibitions: ELEC4402 Assumed knowledge: Electronic circuit design and physics of electronic devices. Assessment: Lab Skills (70%), Final Exam (30%) Campus: Camperdown/Darlington Mode of delivery: Normal (lecture/lab/tutorial) Day
Note: Department permission required for enrolment.
Associated degrees: B E, Grad Cert E, Grad Cert I T, M P E, PG Coursework Exchange.
This unit of study explores CMOS technology and integrated circuit design and fabrication. The fundamental theory and techniques behind digital integrated circuit design are introduced. A primary focus of this unit is providing the student with practical laboratory design experience using a professional VLSI CAD tool to design digital integrated circuits. This unit provides a foundation for more advanced digital integrated circuit design techniques and also analogue integrated circuit design. Topics covered in this unit are: IC manufacturing process and CMOS technology, CMOS static logic design, CMOS dynamic logic design, arithmetic building block design, sequential logic design, VLSI interconnection and wiring issues, timing issues, digital memory design, digital system design methodologies.

ELEC5403 Radio Frequency Engineering Engineering and Information Technologies
Credit points: 6 Session: Semester 1 Classes: 2 hours of lectures and 2 hours lab/tutorial per 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%) Campus: Camperdown/Darlington Mode of delivery: Normal (lecture/lab/tutorial) Day
Associated degrees: B E, Grad Cert E, M P E, PG Coursework Exchange.
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 Engineering and Information Technologies
Credit points: 6 Session: Semester 1 Classes: 2 hours of lectures and a 1 hour tutorial per week. Assumed knowledge: Basic knowledge on digital communications. Fundamental mathematics including probability theory and linear algebra. Assessment: Through semester assessment (50%), Final Exam (50%) Campus: Camperdown/Darlington Mode of delivery: Normal (lecture/lab/tutorial) Day
Associated degrees: B E, Grad Cert E, Grad Cert I T, M P E, PG Coursework Exchange.
This unit deals with the principles of error control coding techniques and their applications in various communication and data storage systems. Its aim is to present the fundamentals of error control coding techniques and develop theoretical and practical skills in the design of error control encoders/decoders. Successful completion of this unit will facilitate progression to advanced study or to work in the fields of telecommunications and computer engineering. It is assumed that the students have some background in communications principles and probability theory. The following topics are covered. Error introduction to error control coding, linear algebra. Linear block codes, cyclic codes, BCH codes, Reed-Solomon codes, burst-error correcting codes, design of codes for block codes, applications of block codes in communications and digital recording. Convolutional codes, Viterbi algorithm, design of codes for convolutional codes, applications of convolutional codes in communications, soft decision decoding of block and convolutional codes, trellis coded modulation, block coded modulation, design of codes for trellis codes, applications of trellis codes in data transmission. Turbo codes and applications to space and mobile communications.

ELEC5508 Wireless Engineering Engineering and Information Technologies
Assessment: Through semester assessment (30%), Final Exam (70%) Campus: Camperdown/Darlington Mode of delivery: Normal (lecture/lab/tutorial) Day
Associated degrees: B C S T (Hons), B E, B I T (Hons), Grad Cert E, Grad Cert I T, M P E, PG Coursework Exchange.
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-s aloha multiple access. GSM: System architecture, radio resource management, mobility management, connection management.

ELEC5509 Mobile Networks Engineering and Information Technologies
Assessment: Normal (lecture/lab/tutorial) Day
Associated degrees: B C S T (Hons), B E, B I T (Hons), Grad Cert E, Grad Cert I T, M P E, PG Coursework Exchange.
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

ELEC5510
Satellite Communication Systems
Engineering and Information Technologies
Credit points: 6  Session: Semester 2  Classes: 2 hours of lectures, 1 hour tutorial per week. 3 hour site visit during semester.  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%).  Campus: Camperdown/Darlington  Mode of delivery: Normal (lecture/lab/tutorial) Day
Associated degrees: B E, Grad Cert E, Grad Cert I T, M P E, PG Coursework Exchange.
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
Engineering and Information Technologies
Credit points: 6  Session: Semester 1  Classes: 2 hours of lectures and 2 hours laboratory/tutorial per week.  Assumed knowledge: (ELEC3505 Communications) and (ELEC3405 Communications Electronics and Photonics) or equivalent.  Assessment: Through semester assessment (25%), Final Exam (75%).  Campus: Camperdown/Darlington  Mode of delivery: Normal (lecture/lab/tutorial) Day
Associated degrees: B E, Grad Cert E, Grad Cert I T, M P E, PG Coursework Exchange.
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
Engineering and Information Technologies
Credit points: 6  Session: Semester 2  Classes: 2 hours of lectures and 1 hour laboratory/tutorial per week.  Assumed knowledge: Knowledge of digital communications, wave propagation, and fundamental optics.  Assessment: Through semester assessment (25%), Final Exam (75%).  Campus: Camperdown/Darlington  Mode of delivery: Normal (lecture/lab/tutorial) Day
Associated degrees: B E, Grad Cert E, Grad Cert I T, M P E, PG Coursework Exchange.
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.

ELEC5514
Networked Embedded Systems
Engineering and Information Technologies
Credit points: 6  Session: Semester 2  Classes: 2 hours lecture and 2 hours lab per week.  Assumed knowledge: ELEC3305, ELEC3506, ELEC3607 and ELEC5508 or equivalent.  Assessment: Through semester assessment (60%), Final Exam (40%)  Campus: Camperdown/Darlington  Mode of delivery: Normal (lecture/lab/tutorial) Day
Associated degrees: B C S T (Hons), B E, B I T (Hons), Grad Cert E, Grad Cert I T, M P E, PG Coursework Exchange.
This unit aims to teach the fundamentals concepts associated with:
- Networked Embedded Systems, wireless sensor networks
- Wireless channel propagation and radio power consumption
- Wireless networks, ZigBee, Bluetooth, etc.
- Sensor principle, data fusion, source detection and identification
- Multiple source detection, multiple access communications.
- Network topology, routing, network information theory
- Distributed source channel coding for sensor networks
- Power-aware and energy-aware communication protocols.
- Distributed 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 gives them a well-rounded view of the state-of-the-art in the networked embedded systems field.
Student involvement with projects will expose them to the usage of simulators and/or programming some types of networked embedded systems platforms.
- Ability to identify the main issues and trade-offs in networked embedded systems.
- Understanding of the state-of-the-art solutions in the area
- Based on the above understanding, ability to analyze requirements and devise first-order solutions for particular networked embedded systems problems.
- Familiarization with a simulator platform and real hardware platforms for network embedded systems through the Students involvement in projects.

ELEC5614
Real Time Computing
Engineering and Information Technologies
Credit points: 6  Session: Semester 1  Classes: 2 hours of lectures, 1 hour tutorial per week, 2 hours labs per week.  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%)  Campus: Camperdown/Darlington  Mode of delivery: Normal (lecture/lab/tutorial) Day
Associated degrees: B C S T (Hons), B E, B I T (Hons), Grad Cert E, Grad Cert I T, M P E, PG Coursework Exchange.
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
Engineering and Information Technologies
Credit points: 6 Session: Semester 1 Classes: 2 hours of lectures, 1 hour of tutorial and 2 hours labs per week. Assumed knowledge: A programming language, basic maths. Assessment: Through semester assessment (50%), Final Exam (50%) Campus: Camperdown/Darlington Mode of delivery: Normal (lecture/lab/tutorial) Day
Associated degrees: B C S T (Hons), B E, B I T (Hons), Grad Cert E, Grad Cert I T, M P E, PG Coursework Exchange.
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
Engineering and Information Technologies
Credit points: 6 Session: Semester 1 Classes: 2 hours lecture and 2 hours tutorials per week. Assumed knowledge: You are capable of writing programs with multiple functions or methods in multiple files. You are capable of designing complex data structures and combine them in non trivial algorithms. You know how to use an integrated development environment. You are familiar and have worked previously with software version control systems. You know how to distribute the workload derived from the unit of study effectively throughout the week and make sure that time is truly productive. Assessment: Through semester assessment (30%), Final Exam (70%) Campus: Camperdown/Darlington Mode of delivery: Normal (lecture/lab/tutorial) Day
Associated degrees: B C S T (Hons), B E, B I T (Hons), Grad Cert I T, Grad Dip E, M P E, UG Study Abroad Program.
This unit will cover software quality planning, validation and verification methods and techniques, risk analysis, software review techniques, software standards and software process improvement and software reliability. The unit covers testing and quality assurance from a unit testing/developer-based focus up to an overall quality process overview of the software development life cycle. Students who successfully complete this unit will: understand the fundamental concepts of software quality, be able to assess the quality of a software design, be acquainted with methods of building for quality and be able to verify and test a unit of code through familiarity with unit testing strategies and understanding software quality assurance as a rigorous and structured formal process.

ELEC5619
Object Oriented Application Frameworks
Engineering and Information Technologies
Credit points: 6 Session: Semester 2 Classes: 3 hours project work in class per week. Assumed knowledge: Java programming, and some web development experience are essential. Databases strongly recommended Assessment: Through semester assessment (100%) Campus: Camperdown/Darlington Mode of delivery: Normal (lecture/lab/tutorial) Day
Associated degrees: B E, Grad Cert I T, Grad Dip E, M P E, UG Study Abroad Program.
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
Engineering and Information Technologies
Credit points: 6 Session: Semester 2 Classes: 2 hours lectures, 1 hour of tutorial and 2 hours of lab/project work in class per week. Assumed knowledge: A programming language, basic maths Assessment: Through semester assessment (50%), Final Exam (50%) Campus: Camperdown/Darlington Mode of delivery: Normal (lecture/lab/tutorial) Day
Note: Department permission required for enrolment.
Assessment: A programming language, basic maths Assessment: Through semester assessment (50%), Final Exam (50%) 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.

ELEC5621
Digital Systems Design
Engineering and Information Technologies
This unit of study is not available in 2014
Credit points: 6 Session: Semester 2 Classes: Lecture 2 hours per week, Laboratory 3 hours per week. Assumed knowledge: Basic knowledge of digital logic, computer architecture and microprocessor systems is required. Equivalent to ELEC2602 and ELEC3608 Assessment: Assignment (20%), Project Report (30%), Final Exam (50%) Campus: Camperdown/Darlington Mode of delivery: Normal (lecture/lab/tutorial) Day
Note: Department permission required for enrolment.
ELEC5622
Signals, Software and Health Engineering and Information Technologies
Credit points: 6 Session: Semester 2 Classes: 3 hr project work session per week, 3hr tutorials/labs per week. Assessment: Through semester assessment (100%). Campus: Camperdown/Darlington Mode of delivery: Normal (lecture/lab/tutorial) Day
Associated degrees: B E, Grad Cert E, M P E.
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 visualisation 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 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 Engineering and Information Technologies
Credit points: 6 Session: Semester 2 Classes: 2 hours of lectures and 1 hour visiting professional or team-based interaction exercise per week. Prohibitions: ENGG5102 Assessment: Through semester assessment (40%), Final Exam (60%) Campus: Camperdown/Darlington Mode of delivery: Normal (lecture/lab/tutorial) Day
Associated degrees: B E, Grad Cert E, M P E, PG Coursework Exchange.
This unit of study prepares graduating students with insight and skills in how to turn a concept into a high technology startup company. The class will provide students with knowledge, practical experience and frameworks to assist in evaluating the market for a technology product or service, the design & viability of business models around it, the formulation of a funding-reading business plan & financials, capital raising options & process, venture capital, building distribution channels, intellectual property protection, putting together an A-grade management team, term sheets & funding documentation, technology sales models and going global. We will look at real world case studies of successful technology companies (and flame outs). Does Twitter have a viable business model? Will Facebook eat its lunch? Is YouTube just burning cash? Will Google rule the world? During the period of the course, students will form teams and write a business plan around a concept they propose. Each student will assume a role in the team (CEO, CTO, CFO, VP Sales & Marketing). The plan will be judged by a panel of real world venture capitalists, entrepreneurs and angel investors to determine the final grade for the course. The course is limited to 40 students (10 teams of 4) in addition to a waiting list of 8. Be warned that a serious commitment will be required in developing the concept into a viable business plan. The outcome, however, will be very rewarding to those students interested in starting the next Google. Prospective students should send an email in 400 words or less on why they want to enroll prior to acceptance, to the course email address. This course is taught by instructors experienced in technology startups & venture capital. The course will include a number of guest lectures by industry.

ELEC5803
Advanced Bioelectronics Engineering and Information Technologies
Credit points: 6 Session: Semester 1 Classes: 2 hr Lectures per week, 2hr Lab/Tutorial per week. Prerequisites: ELEC2104 AND ELEC2602. Familiarity with transistor operations, basic electrical circuits, embedded programming is required. 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%) Campus: Camperdown/Darlington Mode of delivery: Normal (lecture/lab/tutorial) Day
Note: Department permission required for enrolment.
Associated degrees: B E, Grad Cert E.
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.

ENGS5203
Quality Engineering and Management Engineering and Information Technologies
Credit points: 6 Session: Semester 2 Classes: Presentation 2.00 hours per week, Project Work - in class 2.00 hours per week. Assumed knowledge: First degree in Engineering or a related discipline. Assessment: Through semester assessment (100%). Campus: Camperdown/Darlington Mode of delivery: Normal (lecture/lab/tutorial) Day
Associated degrees: Grad Dip E, M P E, M P L, M P M.
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.

ENGS5205
Professional Practice in PM Engineering and Information Technologies
Credit points: 6 Session: Semester 1, Semester 2 Classes: Lecture 3hrs per week, E-Learning 1 hr per week. Assumed knowledge: Basic engineering or science knowledge. At least 2-3 years of work experience preferred. Assessment: Through semester assessment (60%), Final Exam (40%) Campus: Camperdown/Darlington 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.
Associated degrees: Grad Cert P M, Grad Dip E, M P E.
This UoS teaches the fundamental knowledge on the importance, organizational context and professional practice in project management. It serves as an introduction to project management practices for non-PM students. For PM students, this UoS lays the foundation to progress to advanced PM subjects. Although serving as a general introduction unit, the focus has been placed on scope, time, cost, and integration related issues. Specifically, the UoS aims to
1. introduce students to the institutional, organisational and professional environment for today's project management practitioners as well as typical challenges and issues facing them;
2. demonstrate the importance of project management to engineering and organizations;
3. demonstrate the progression from strategy formulation to execution of the project;
4. provide a set of tools and techniques at different stages of a project's lifecycle with emphasis on scope, time, cost and integration related issues;
5. highlight examples of project success/failures in project management and to take lessons from these;
6. consider the roles of project manager in the organization and management of people;
7. provide a path for students seeking improvements in their project management expertise.

ENGG5214
Management of Technology

**Engineering and Information Technologies**

Credit points: 6 Session: Semester 2, Winter Main Classes: 1 hr Lecture per week, 1 hr Tutorial per week, 2hr Project work in class per week. **Assumed knowledge:** Sound competence in all aspects of engineering, and some understanding of issues of engineering management. **Assessment:** Through semester assessment (100%) **Campus:** Camperdown/Darlington **Mode of delivery:** Normal (lecture/lab/tutorial) Day

**Associated degrees:** Grad Dip E, M P E.

This UoS is designed to introduce students to the global context of much of contemporary engineering and the consequent strategic and operational issues. It will address the nature, characteristics and variety of risks of global businesses, the opportunities and pressures for effective strategies, and the many management challenges in international business. In particular it will focus on Australian consulting, logistics and construction engineering firms that are operating on a global basis.

ENGG5215
International Eng Strategy & Operations

**Engineering and Information Technologies**

Credit points: 6 Session: Semester 2 Classes: Lecture 2 hours per week, Tutorial 2 hours per week, Project Work - in class 2 hours per week. **Assumed knowledge:** Sound competence in all aspects of engineering, and some understanding of issues of engineering management and globalisation. **Assessment:** Through semester assessment (100%) **Campus:** Camperdown/Darlington **Mode of delivery:** Normal (lecture/lab/tutorial) Day

**Associated degrees:** Grad Dip E, M P E.

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

**Engineering and Information Technologies**

Credit points: 6 Session: Semester 1 Classes: 1hr Lecture per week, 1 hr Tutorials per week, 2 hr Project work in class per week for first half of semester. **Assumed knowledge:** Sound competence in all aspects of engineering, and some understanding of issues of engineering management. **Assessment:** Through semester assessment (100%) **Campus:** Camperdown/Darlington **Mode of delivery:** Normal (lecture/lab/tutorial) Day

**Associated degrees:** Grad Dip E, M P E.

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

**Engineering and Information Technologies**

Credit points: 6 Session: Semester 1, Semester 2 Classes: Independent project work. **Prerequisites:** 48 credits from MPE degree program. **Assessment:** Through semester assessment (100%) **Campus:** Camperdown/Darlington **Mode of delivery:** Supervision

Note: Department permission required for enrolment.

**Associated degrees:** M E, M P E.

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

**Engineering and Information Technologies**

Credit points: 6 Session: Semester 1, Semester 2 Classes: Independent project work. **Corequisites:** ELEC5020 Assessment: Through semester assessment (100%) **Campus:** Camperdown/Darlington **Mode of delivery:** Supervision

Note: Department permission required for enrolment.

**Associated degrees:** M E, M P E.

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

**Engineering and Information Technologies**

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. **Assessment:** Through semester assessment (100%) **Campus:** Camperdown/Darlington **Mode of delivery:** Supervision

Note: Department permission required for enrolment.

**Associated degrees:** M E, M P E.

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.

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 ELEC5022 and ELEC5023 (total 24 cp) in place of Capstone Project units and 12 cp of elective units.
ELEC5222
Dissertation A
Engineering and Information Technologies
Credit points: 12 Session: Semester 1, Semester 2 Classes: no formal classes Prohibitions: ELEC8901, ELEC8902, ENGG5222, ENGG5223 Assessment: Through semester assessment (100%) Campus: Camperdown/Darlington 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.
Associated degrees: M E, M P E.
To complete a substantial research project and successfully analyse a problem, devise appropriate experiments, analyse the results and produce a well-argued, in-depth thesis. Department permission required for enrolment in the following session(s); 1, 2

ELEC5223
Dissertation B
Engineering and Information Technologies
Credit points: 12 Session: Semester 1, Semester 2 Classes: no formal classes Prohibitions: ELEC8901, ELEC8902, ENGG5222, ENGG5223 Assessment: Through semester assessment (100%) Campus: Camperdown/Darlington 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.
Associated degrees: M E, M P E.
To complete a substantial research project and successfully analyse a problem, devise appropriate experiments, analyse the results and produce a well-argued, in-depth thesis. Department permission required for enrolment in the following session(s); 1, 2

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
Engineering and Information Technologies
Note: Department permission required for enrolment.
Associated degrees: M E, M Inf Tech, M Inf Tech Man, M P E, M P L, M P M.
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.
ENGG5232
Engineering Graduate Exchange B
Engineering and Information Technologies
Credit points: 6 Session: Int January, Int July Classes: overseas short-course Prerequisites: Permission from faculty and school. Assessment: Through
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 [http://www.engineersaustralia.org.au/].

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

## 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

<table>
<thead>
<tr>
<th>Unit of study</th>
<th>Credit points</th>
<th>A: Assumed knowledge</th>
<th>P: Prerequisites</th>
<th>C: Corequisites</th>
<th>N: Prohibition</th>
<th>Session</th>
</tr>
</thead>
<tbody>
<tr>
<td>ENGG5802 Foundations of Engineering Mechanics</td>
<td>6</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Semester 2</td>
</tr>
<tr>
<td>CIVL5501 Foundations of Materials</td>
<td>6</td>
<td>This UoS is only available to students in the MPE degree who do not have a Civil Engineering background.</td>
<td></td>
<td></td>
<td></td>
<td>Summer Main</td>
</tr>
<tr>
<td>CIVL5502 Foundations of Structural Mechanics</td>
<td>6</td>
<td>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 in simple 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.</td>
<td></td>
<td></td>
<td></td>
<td>Semester 1</td>
</tr>
<tr>
<td>CIVL5506 Foundations-Eng Construction &amp; Surveying</td>
<td>6</td>
<td>This UoS is only available to students in the MPE degree who do not have a Civil Engineering background.</td>
<td></td>
<td></td>
<td></td>
<td>Semester 1</td>
</tr>
</tbody>
</table>

### Year One - Semester Two

<table>
<thead>
<tr>
<th>Unit of study</th>
<th>Credit points</th>
<th>A: Assumed knowledge</th>
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<th>N: Prohibition</th>
<th>Session</th>
</tr>
</thead>
<tbody>
<tr>
<td>CIVL5504 Foundations of Soil Mechanics</td>
<td>6</td>
<td>A 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 ENGG 1802 Engineering Mechanics, CIVL5502 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 ENGS1801 Engineering Computing. Familiarity with partial differential equations, and their analytical and numerical solution.</td>
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<td></td>
<td>Semester 2</td>
</tr>
<tr>
<td>CIVL5505 Foundations of Intro. Fluid Mechanics</td>
<td>6</td>
<td>A CIVL5502. 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. This UoS is only available to students in the MPE degree who do not have a Civil Engineering background.</td>
<td></td>
<td></td>
<td></td>
<td>Semester 2</td>
</tr>
<tr>
<td>CIVL5509 Foundations of Struct Concepts &amp; Design</td>
<td>6</td>
<td>A Structural mechanics, first year mathematics, but these are not prerequisites Basic structural elements include beams, columns slabs and simple frames</td>
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<td></td>
<td>Semester 2</td>
</tr>
<tr>
<td>ENGG5011 Foundation Engineering Studies A</td>
<td>6</td>
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<td></td>
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<td>Semester 1</td>
</tr>
</tbody>
</table>

### Year Two - Semester One

<table>
<thead>
<tr>
<th>Unit of study</th>
<th>Credit points</th>
<th>A: Assumed knowledge</th>
<th>P: Prerequisites</th>
<th>C: Corequisites</th>
<th>N: Prohibition</th>
<th>Session</th>
</tr>
</thead>
<tbody>
<tr>
<td>CIVL5507 Foundations of Concrete Structures 1</td>
<td>6</td>
<td>A Knowledge: CIVL2110 AND CIVL2201 AND CIVL2230; basic concepts of solid mechanics and structural mechanics, including compatibility 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).</td>
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<td></td>
<td>Semester 1</td>
</tr>
<tr>
<td>CIVL5511 Foundations of Fluid Mechanics</td>
<td>6</td>
<td>A CIVL2201 AND CIVL2611 AND ENGG1802 AND MATH2061. This unit of study follows on from Fluid Mechanics CIVL2611, which provides the essential fundamental fluid mechanics background and theory, and is assumed to be known and fully understood.</td>
<td></td>
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<td>Semester 1</td>
</tr>
<tr>
<td>CIVL5512 Foundation of Eng Design &amp; Construction</td>
<td>6</td>
<td>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 substitues), interpretation of engineering drawings.</td>
<td></td>
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<td></td>
<td>Semester 1</td>
</tr>
<tr>
<td>ENGG5204 Engineering Professional Practice</td>
<td>6</td>
<td>A Competences and experience in engineering obtained during an accepted engineering degree</td>
<td></td>
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<td></td>
<td>Semester 1</td>
</tr>
</tbody>
</table>
## Unit of study table

### Year Two - Semester Two

<table>
<thead>
<tr>
<th>Unit of study</th>
<th>Credit points</th>
<th>A: Assumed knowledge</th>
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<th>N: Prohibition</th>
<th>Session</th>
</tr>
</thead>
<tbody>
<tr>
<td>CIVL5506 Foundations of Steel Structures 1</td>
<td>6</td>
<td>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.</td>
<td>Semester 2</td>
<td></td>
<td></td>
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</tr>
<tr>
<td>ENGG5205 Professional Practice in PM</td>
<td>6</td>
<td>A Basic engineering or science knowledge. At least 2-3 years of work experience preferred. 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.</td>
<td>Semester 1</td>
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</tr>
</tbody>
</table>

Select 6 credit points from the Specialist electives block.

### Year Three - Semester One

<table>
<thead>
<tr>
<th>Unit of study</th>
<th>Credit points</th>
<th>A: Assumed knowledge</th>
<th>P: Prerequisites</th>
<th>C: Corequisites</th>
<th>N: Prohibition</th>
<th>Session</th>
</tr>
</thead>
<tbody>
<tr>
<td>CIVL5666 Open Channel Flow &amp; Hydraulic Structures</td>
<td>6</td>
<td>A CIVL3612</td>
<td></td>
<td></td>
<td></td>
<td>Semester 1</td>
</tr>
<tr>
<td>CIVL5668 Wind Engineering for Design-Fundamentals</td>
<td>6</td>
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<td></td>
<td></td>
<td>Semester 1</td>
</tr>
<tr>
<td>ENGG5217 Practical Experience</td>
<td></td>
<td>Students should have completed one year of their MPE program before enrolling in this unit.</td>
<td>Semester 1</td>
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</tbody>
</table>

Select 6 credit points from the Specialist electives block.

### Year Three - Semester Two

<table>
<thead>
<tr>
<th>Unit of study</th>
<th>Credit points</th>
<th>A: Assumed knowledge</th>
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<th>N: Prohibition</th>
<th>Session</th>
</tr>
</thead>
<tbody>
<tr>
<td>CIVL5510 Foundations of Civil Engineering Design</td>
<td>6</td>
<td>A CIVL3205 AND CIVL3206.</td>
<td></td>
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<td></td>
<td>Semester 2</td>
</tr>
<tr>
<td>CIVL5669 Applied Fluid Engineering Computing</td>
<td>6</td>
<td>A CIVL5511. 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.</td>
<td>Semester 2</td>
<td></td>
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</tr>
<tr>
<td>CIVL5021 Capstone Project B</td>
<td>6</td>
<td>C CIVL5020 Note: Department permission required for enrolment</td>
<td>Semester 1</td>
<td></td>
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</tr>
<tr>
<td>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.</td>
<td>Semester 2</td>
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<tr>
<td>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.</td>
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</tbody>
</table>

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.

<table>
<thead>
<tr>
<th>Unit of study</th>
<th>Credit points</th>
<th>A: Assumed knowledge</th>
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</tr>
</thead>
<tbody>
<tr>
<td>CIVL5351 Geoenvironmental Engineering</td>
<td>6</td>
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<td></td>
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<td></td>
<td>Semester 1</td>
</tr>
<tr>
<td>CIVL5665 Advanced Water Resources Management</td>
<td>6</td>
<td>A CIVL3612.</td>
<td></td>
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<td></td>
<td>Semester 2</td>
</tr>
<tr>
<td>CIVL5670 Reservoir Stream &amp; Coastal Eng</td>
<td>6</td>
<td>A CIVL3612 AND MATH2061. Students who have previously studied CIVL3613 will only be permitted to enrol in this unit by approval of the Director of Undergraduate Studies.)</td>
<td>Semester 1</td>
<td></td>
<td></td>
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</tr>
</tbody>
</table>

### Elective units

Candidates must complete 6 credit points from the following Advanced elective units of study.

<table>
<thead>
<tr>
<th>Unit of study</th>
<th>Credit points</th>
<th>A: Assumed knowledge</th>
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<th>C: Corequisites</th>
<th>N: Prohibition</th>
<th>Session</th>
</tr>
</thead>
<tbody>
<tr>
<td>CIVL5257 Concrete Structures: Prestressed</td>
<td>6</td>
<td></td>
<td></td>
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<td></td>
<td>Semester 1</td>
</tr>
<tr>
<td>CIVL5264 Composite Steel-Concrete Structures</td>
<td>6</td>
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<td></td>
<td>Semester 2</td>
</tr>
<tr>
<td>CIVL5267 Steel Structures - Advanced Design</td>
<td>6</td>
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<td></td>
<td></td>
<td></td>
<td>Semester 1</td>
</tr>
</tbody>
</table>
### Unit of study table

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<tr>
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<th>Session</th>
</tr>
</thead>
<tbody>
<tr>
<td>CIVL5268 Structural Dynamics</td>
<td>6</td>
<td>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.</td>
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<td></td>
<td></td>
<td>Semester 2</td>
</tr>
<tr>
<td>CIVL5450 Analysis and Design of Pile Foundations</td>
<td>6</td>
<td></td>
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<td></td>
<td></td>
<td>Semester 1</td>
</tr>
<tr>
<td>CIVL5451 Computer Methods in Geotechnical Eng</td>
<td>6</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Semester 1</td>
</tr>
<tr>
<td>CIVL5454 Rock Engineering</td>
<td>6</td>
<td>A Undergraduate geology and soil mechanics.</td>
<td></td>
<td></td>
<td></td>
<td>Semester 2</td>
</tr>
<tr>
<td>CIVL5455 Engineering Behaviour of Soils</td>
<td>6</td>
<td>A CIVL2410 AND CIVL4311. 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.</td>
<td></td>
<td></td>
<td></td>
<td>Semester 2</td>
</tr>
</tbody>
</table>

### 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.

<table>
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<tr>
<th>Unit of study</th>
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<th>A: Assumed knowledge</th>
<th>P: Prerequisites</th>
<th>C: Corequisites</th>
<th>N: Prohibition</th>
<th>Session</th>
</tr>
</thead>
<tbody>
<tr>
<td>CIVL5020 Capstone Project A</td>
<td>6</td>
<td>P 48 credits from MPE degree program</td>
<td>Note: Department permission required for enrolment</td>
<td></td>
<td></td>
<td>Semester 1 Semester 2</td>
</tr>
<tr>
<td>CIVL5021 Capstone Project B</td>
<td>6</td>
<td>C CIVL5020</td>
<td>Note: Department permission required for enrolment</td>
<td></td>
<td></td>
<td>Semester 1 Semester 2</td>
</tr>
<tr>
<td>CIVL5022 Capstone Project B Extended</td>
<td>12</td>
<td>P 42 credit points in the Master of Engineering and WAM &gt;70, or 66 credit points in the Master of Professional Engineering and WAM &gt;70 or exemption</td>
<td>Note: Department permission required for enrolment</td>
<td></td>
<td></td>
<td>Semester 1 Semester 2</td>
</tr>
</tbody>
</table>

### 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.

<table>
<thead>
<tr>
<th>Unit of study</th>
<th>Credit points</th>
<th>A: Assumed knowledge</th>
<th>P: Prerequisites</th>
<th>C: Corequisites</th>
<th>N: Prohibition</th>
<th>Session</th>
</tr>
</thead>
<tbody>
<tr>
<td>CIVL5222 Dissertation A</td>
<td>12</td>
<td>N ENGG5220, ENGG5221</td>
<td>Note: Department permission required for enrolment</td>
<td>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.</td>
<td></td>
<td>Semester 1 Semester 2</td>
</tr>
<tr>
<td>CIVL5223 Dissertation B</td>
<td>12</td>
<td>N ENGG5220, ENGG5221</td>
<td>Note: Department permission required for enrolment</td>
<td>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.</td>
<td></td>
<td>Semester 1 Semester 2</td>
</tr>
</tbody>
</table>

### 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.

<table>
<thead>
<tr>
<th>Unit of study</th>
<th>Credit points</th>
<th>A: Assumed knowledge</th>
<th>P: Prerequisites</th>
<th>C: Corequisites</th>
<th>N: Prohibition</th>
<th>Session</th>
</tr>
</thead>
<tbody>
<tr>
<td>ENGG5231 Engineering Graduate Exchange A</td>
<td>6</td>
<td>P Permission from faculty and school.</td>
<td>Note: Department permission required for enrolment</td>
<td></td>
<td></td>
<td>Int January Int July</td>
</tr>
<tr>
<td>ENGG5232 Engineering Graduate Exchange B</td>
<td>6</td>
<td>P Permission from faculty and school.</td>
<td>Note: Department permission required for enrolment</td>
<td></td>
<td></td>
<td>Int January Int July</td>
</tr>
</tbody>
</table>

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
ENGG5802 Foundations of Engineering Mechanics Engineering and Information Technologies
Credit points: 6 Session: Semester 2, Summer Main Classes: 2 hrs Lectures per week, 3hrs tutorial per week Assessment: Through semester assessment (100%) Campus: Camperdown/Darlington Mode of delivery: Normal (lecture/lab/tutorial) Day
Associated degrees: M P E.
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.

CIVL5501 Foundations of Materials Engineering and Information Technologies
Credit points: 6 Session: Semester 1 Classes: 4 hours of lectures and 2 hours of tutorials per week. 18 hours of practical exercises per semester. Assessment: Through semester assessment (50%), Final Exam (50%) Campus: Camperdown/Darlington Mode of delivery: Normal (lecture/lab/tutorial) Day
Note: This UoS is only available to students in the MPE degree who do not have a Civil Engineering background.
Associated degrees: Grad Dip E (Prof Eng), M P E.

CIVL5502 Foundations of Structural Mechanics Engineering and Information Technologies
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. Assumed knowledge: Students should be competent in the following areas. 1. The concept of force and momentum equilibrium in two and three dimensions. 2. Drawing free body diagrams. 3. Establishing and solving the equations of equilibrium from the FBD. 4. Setting out solutions logically, clearly and neatly. Students should be competent in certain 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%) Campus: Camperdown/Darlington Mode of delivery: Normal (lecture/lab/tutorial) Day
Note: This UoS is only available to students in the MPE degree who do not have a Civil Engineering background.
Associated degrees: Grad Dip E (Prof Eng), M P E.
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.

CIVL5506 Foundations-Eng Construction & Surveying Engineering and Information Technologies
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. Assessment: Through semester assessment (55%), Final Exam (45%) Campus: Camperdown/Darlington Mode of delivery: Normal (lecture/lab/tutorial) Day
Note: This UoS is only available to students in the MPE degree who do not have a Civil Engineering background. This 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 93km 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 by student feedback over recent years)
Associated degrees: Grad Dip E (Prof Eng), M P E.
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.

Year One - Semester Two

CIVL5504 Foundations of Soil Mechanics

Engineering and Information Technologies

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. Assumed knowledge: 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 the coordinators of the specialist programs. A basic fluid mechanics background and theory, and is assumed to be known and fully assimilated. Assumed knowledge: CIVL2201 AND CIVL2230, basic concepts of solid mechanics and structural mechanics, including: compatibility of strains; stress-strain relationships; equilibrium; flexure, shear and torsion; statically determinate load effects (reactions, bending moments, shear forces); elastic beam theory (stresses, strains and beam deflections). Assessment: Assessment: Through semester assessment (50%), Final Exam (50%) Campus: Camperdown/Darlington. Mode of delivery: Normal (lecture/lab/tutorial) Day Note: This UoS is only available to students in the MPE degree who do not have a Civil Engineering background.

Associated degrees: Grad Dip E (Prof Eng), M P E.

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

CIVL5505 Foundations of Intro. Fluid Mechanics

Engineering and Information Technologies

Credit points: 6 Session: Semester 2 Classes: 2 hours of lectures and 2 hours of tutorials per week, 8 hours of laboratory work per semester. Assumed knowledge: CIVL5502. 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 (45%), Final Exam (55%) Campus: Camperdown/Darlington. Mode of delivery: Normal (lecture/lab/tutorial) Day Note: This UoS is only available to students in the MPE degree who do not have a Civil Engineering background.

Associated degrees: Grad Dip E (Prof Eng), M P E.

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.

CIVL5509 Foundations of Struct Concepts & Design

Engineering and Information Technologies

Credit points: 6 Session: Semester 2 Classes: 4 hours of lectures and 2 hours of tutorials per week. Assumed knowledge: Structural mechanics, first year mathematics, but these are not prerequisites. Assessment: Through semester assessment (25%), Final Exam (75%) Campus: Camperdown/Darlington. Mode of delivery: Normal (lecture/lab/tutorial) Day Note: Basic structural elements include beams, columns slabs and simple frames

Associated degrees: Grad Dip E (Prof Eng), M P E.

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.

ENGG5011 Foundation Engineering Studies A

Engineering and Information Technologies

Credit points: 6 Session: Semester 1, Semester 2 Classes: no formal classes. Assumed knowledge: 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 the coordinators of the specialist programs. A basic fluid mechanics background and theory, and is assumed to be known and fully assimilated. Assessment: Assessment: Through semester assessment (100%) Campus: Camperdown/Darlington. Mode of delivery: Supervision

Associated degrees: Grad Dip E (Prof Eng), M P E.

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 Two - Semester One

CIVL5507 Foundations of Concrete Structures 1

Engineering and Information Technologies

Credit points: 6 Session: Semester 1 Classes: 3 hours of lectures and 3 hours of project work in class per week, 2 hours of laboratory demonstration per semester. Assumed knowledge: Knowledge: CIVL2110 AND CIVL2201 AND CIVL2230. An understanding of basic reinforced concrete members and structures, including: material properties, ‘elastic’ analysis (stresses/deformations/time-dependence), ultimate strengths of beams and columns (short and slender), behaviour or reinforced concrete slabs. The reinforced concrete truss analogy (shear/torsion and detailing implications). Design of typical elements of a reinforced concrete building, structural modelling, analysis of load-effects (incl.earthquakes), design criteria (for durability, fire-resistance, serviceability and strength), design calculation procedures, reinforcement detailing, structural drawings. At the end of this unit students will gain proficiency in basic methods of reinforced concrete analysis and design.

CIVL5511 Foundations of Fluid Mechanics

Engineering and Information Technologies

Credit points: 6 Session: Semester 1 Classes: Lecture 2hrs per week, Tutorial 2hrs per week, Laboratory 2hrs per week. Assumed knowledge: CIVL2201 AND CIVL2611 AND ENGG1802 AND MATH2061. This unit of study follows on from Fluid Mechanics CIVL2611, which provides the essential fundamental fluid mechanics background and theory, and is assumed to be known and fully understood. Assessment: Assessment: Through semester assessment (60%), Final Exam (40%) Campus: Camperdown/Darlington. Mode of delivery: Normal (lecture/lab/tutorial) Day

Associated degrees: Grad Dip E (Prof Eng), M P E.
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.

CIVL5512
Foundation of Eng Design & Construction Engineering and Information Technologies
Credit points: 6 Session: Semester 1 Classes: Workshop 3 hours per week. Lecture/Presentation 2 hrs per week. Assumed knowledge: Basic knowledge of construction operations including excavation, embankments and other earthworks, hauling and associated procedures - drilling and blasting, survey, reinforced concrete construction (including formwork and formwork substitutes), interpretation of engineering drawings. Assessment: Through semester assessment (50%), Final Exam (50%) Campus: Camperdown/Darlington Mode of delivery: Normal (lecture/lab/tutorial) Day

Associated degrees: Grad Dip E, M P E.

The objectives of this unit are to develop an understanding of construction methods, strategies, equipment and machinery in a range of construction activities and an understanding of the principles involved in the design for those construction activities. At the end of this unit, students will have developed a familiarity with a variety of construction methods, strategies, equipment and machinery in a range of construction activities such that they will be able, if and when the opportunity arises to participate as site engineers (or similar role) in the planning and execution of those construction activities, albeit with supervision and guidance from experienced professionals. Students will also have developed an understanding of the design principles and techniques involved in the planning for those construction activities such that they are able, if and when the opportunity arises, to participate as design engineers, in the planning and design for those construction activities, with supervision and guidance from experienced professionals. The range of topics covered in this course is such that the learning outcomes form a basis for later development of more detailed knowledge, dependent on the future career experiences of the student. The course does not prepare a student for immediate, unsupervised participation in construction and design work associated with the topics covered.

The construction topics covered in this course have not been previously addressed in CIVL5506 (Foundations of Engineering Construction and Survey) or equivalent introductory study of construction and surveying techniques. The topics may vary dependent on current and planned projects in Sydney, NSW and Australia. At this stage the topics are hard rock tunneling and general hard rock underground excavation; soft ground tunneling; underground construction; micro tunneling; cut and cover (cover and cut) tunneling; earth retaining systems; piling; formwork and falsework (incl Tilt up, Ultrafloor, Sacrificial form); dewatering; pavement design and construction - rigid and flexible (incl 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 engineering; 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.

ENNG5204
Engineering Professional Practice Engineering and Information Technologies
Credit points: 6 Session: Semester 1 Classes: Lecture 1 hour per week, Tutorial 1 hour per week, Workshop 1 hour per week. Assumed knowledge: Competences and experience in engineering obtained during an accepted engineering degree Assessment: Through semester assessment (100%) Campus: Camperdown/Darlington Mode of delivery: Normal (lecture/lab/tutorial) Day

Associated degrees: Grad Dip E, M P E.

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**

**Engineering and Information Technologies**

**Credit points:** 6 **Session:** Semester 1, Semester 2 **Classes:** Lecture 3hrs per week, E-Learning 1 hr per week. **Assumed knowledge:** Basic engineering or science knowledge. At least 2-3 years of work experience preferred. **Assessment:** Through semester assessment (60%), Final Exam (40%) **Campus:** Camperdown/Darlington **Mode of delivery:** Normal (lecture/lab/tutorial) Day

**Associated degrees:** Grad Cert P M, Grad Dip E, M P E.

This UoS teaches the fundamental knowledge on the importance, organizational context and professional practice in 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 projects;
7. provide a path for students seeking improvements in their project management expertise.

Select 6 credit points from the Specialist electives block.

**Year Three - Semester One**

**CIVL5666**

**Open Channel Flow & Hydraulic Structures**

**Engineer}
For details of the reporting requirements, go to the faculty's Practical Experience portfolio website at http://sydney.edu.au/engineering/practical-experience/index.shtml

CIVL5020
Capstone Project A
Engineering and Information Technologies
Credit points: 6 Session: Semester 1, Semester 2 Classes: Independent project work. Prerequisites: 48 credits from MPE degree program. Assessment: Through semester assessment (100%) Campus: Camperdown/Darlington Mode of delivery: Supervision
Note: Department permission required for enrolment.
Associated degrees: M E, M P E.
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.
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
CIVL5510
Foundations of Civil Engineering Design Engineering and Information Technologies
Credit points: 6 Session: Semester 2 Classes: 1 hour of lectures and 3 hours of tutorials per week. Assumed knowledge: CIVL3205 AND CIVL3206. Assessment: Through semester assessment (75%), Final Exam (25%) Campus: Camperdown/Darlington Mode of delivery: Normal (lecture/lab/tutorial) Day
Associated degrees: M P E.
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.

CIVL5669
Applied Fluid Engineering Computing Engineering and Information Technologies
Credit points: 6 Session: Semester 2 Classes: Lecture 1 hr per week, Tutorial 1hr per week, Laboratory 2hrs per week. Assumed knowledge: CIVL3511. 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%) Campus: Camperdown/Darlington Mode of delivery: Normal (lecture/lab/tutorial) Day
Associated degrees: B E, Grad Cert E, M P E, PG Coursework Exchange.
The objective of this unit is to provide students with an advanced knowledge of Computational Fluid Dynamics (CFD) techniques and skills in solving fluid and thermal flow problems relevant to Civil and Environmental Engineering applications. Students will also gain experience in using a state-of-the-art commercial CFD package and advanced understanding of a range of engineering problems through working on projects.
CIVL5021
Capstone Project B
Engineering and Information Technologies
Credit points: 6 Session: Semester 1, Semester 2 Classes: Independent project work. Prerequisites: CIVL5020 Assessment: Through semester assessment (100%) Campus: Camperdown/Darlington Mode of delivery: Supervision
Note: Department permission required for enrolment.
Associated degrees: M E, M P E.
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.
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 Engineering and Information Technologies
Credit points: 6 Session: Semester 1 Classes: 4 hours of lectures/project work per week. Assessment: Through semester assessment (100%) Campus: Camperdown/Darlington Mode of delivery: Normal (lecture/lab/tutorial) Day
Associated degrees: B E, Grad Cert E, M P E.
Objectives: To develop an understanding of the geotechnical aspects of the design and management of industrial and domestic waste disposal systems.
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
Engineering and Information Technologies
Credit points: 6 Session: Semester 2 Classes: 2 hours of lectures and 1 hour of tutorials per week. Assumed knowledge: CIVL3612. Assessment: Through semester assessment (50%), Final Exam (50%). Campus: Camperdown/Darlington. Mode of delivery: Normal (lecture/lab/tutorial) Day
Associated degrees: B E, Grad Cert App Sc (Enviro Sci), Grad Cert E, M Appl Sc (Env Sc), M P E.

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: hydrological 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, bio remediation and phytoremediation techniques. The topics mentioned above will be covered in both a qualitative and quantitative aspects.

CIVL5670
Reservoir Stream & Coastal Eng
Engineering and Information Technologies
Credit points: 6 Session: Semester 1 Classes: Lectures 2 hours per week, Tutorials 2 hours per week. Assumed knowledge: CIVL3612 AND MATH2061. Assessment: Through semester assessment (40%), Final Exam (60%). Campus: Camperdown/Darlington. Mode of delivery: Normal (lecture/lab/tutorial) Day
Note: Students who have previously studied CIVL3613 will only be permitted to enrol in this unit by approval of the Director of Undergraduate Studies.

Associated degrees: B E, Grad Cert E, M P E, PG Coursework Exchange.

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
Engineering and Information Technologies
Credit points: 6 Session: Semester 1 Classes: Lectures 2hrs per week, Project Work - in class 1hr per week. Assessment: Through semester assessment (60%), Final Exam (40%). Campus: Camperdown/Darlington. Mode of delivery: Normal (lecture/lab/tutorial) Day
Associated degrees: B E, Grad Cert E, M P E.

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
Engineering and Information Technologies
Credit points: 6 Teacher/Coordinator: Dr G Ranzi Session: Semester 2 Classes: Lectures 2hrs per week, Tutorial 1hr per week. Assessment: Through semester assessment (100%). Campus: Camperdown/Darlington. Mode of delivery: Normal (lecture/lab/tutorial) Day
Associated degrees: B E, Grad Cert E, M P E, PG Coursework Exchange.

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

CIVL5267
Steel Structures - Advanced Design
Engineering and Information Technologies
Credit points: 6 Session: Semester 1 Classes: 3-hr combined lecture and tutorial per week. Assessment: Through semester assessment (50%), Final Exam (50%). Campus: Camperdown/Darlington. Mode of delivery: Normal (lecture/lab/tutorial) Day
Associated degrees: B E, Grad Cert E, M P E, PG Coursework Exchange.

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
Engineering and Information Technologies
Credit points: 6 Session: Semester 2 Classes: 3-hr combined lecture and tutorial per week. Assessment: 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%). Campus: Camperdown/Darlington. Mode of delivery: Normal (lecture/lab/tutorial) Day
Associated degrees: B E, Grad Cert E, M P E, PG Coursework Exchange.

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 Parts 4 of the Australian loading standard AS1170 for determining earthquake loads.

Outcomes: This Unit will provide students with the following knowledge and skills:

- Understanding of the fundamental concepts and definitions used in structural dynamics
- Ability to calculate the natural frequency of a system using equilibrium or energy methods
- Ability to determine the effect of viscous damping on the response of a freely vibrating system
- Ability to determine the response of a system to a harmonic excitation
- 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
Engineering and Information Technologies

Credit points: 6 Session: Semester 1 Classes: 3 hours of lecture/project work in class per week. 3 hours of laboratory work per semester. Assessment: Through semester assessment (100%). Campus: Camperdown/Darlington Mode of delivery: Normal (lecture/lab/tutorial) Day

Associated degrees: B E, Grad Cert E, M P E.

Objectives: To develop an understanding of the modern principles of design of pile foundations and the application of those principles to practice.

Expected outcomes: Students should gain an advanced understanding of the types of pile foundations used in practice, and the procedures for analysis of pile foundations under various types of loading, and gain experience in carrying out pile design for real geotechnical profiles.

Syllabus summary: Types of piles and their uses, effects of pile installation, axial capacity of piles and pile groups, settlement of pile foundations, ultimate lateral capacity, lateral deformations, analysis of pile groups subjected to general loading conditions, piled raft foundations, piles subjected to ground movements, pile load testing, code provisions for pile design.

CIVL5451
Computer Methods in Geotechnical Eng
Engineering and Information Technologies

Credit points: 6 Session: Semester 1 Classes: 3-hr combined lecture and tutorial per week. Assessment: Through semester assessment (100%). Campus: Camperdown/Darlington Mode of delivery: Normal (lecture/lab/tutorial) Day

Associated degrees: Grad Cert E, M P E.

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 develop students ability at critically assessing assumptions behind computer models and critically evaluating the quality of numerical results.

CIVL5454
Rock Engineering
Engineering and Information Technologies

Credit points: 6 Session: Semester 2 Classes: 3 hours of project work in class per week. Assumed knowledge: Undergraduate geology and soil mechanics. Assessment: Through semester assessment (100%). Campus: Camperdown/Darlington Mode of delivery: Normal (lecture/lab/tutorial) Day

Associated degrees: B E, Grad Cert E, M P E.

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

Expected outcomes: Students will have learnt how to classify and characterise rocks and rock masses for engineering purposes and developed an understanding of basic rock mechanics etc.


CIVL5455
Engineering Behaviour of Soils
Engineering and Information Technologies

Credit points: 6 Session: Semester 2 Classes: Independent Study 4 hrs per week. Lectures 2hrs per week 12 weeks of semester. Tutorials 1hr per week.

Assumed knowledge: 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 (80%), Final Exam (20%). Campus: Camperdown/Darlington Mode of delivery: Supervision

Associated degrees: B E, Grad Cert E, M P E.

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
Engineering and Information Technologies

Credit points: 6 Session: Semester 1, Semester 2 Classes: Independent project work. Prerequisites: 48 credits from MPE degree program. Assessment: Through semester assessment (100%). Campus: Camperdown/Darlington Mode of delivery: Supervision

Note: Department permission required for enrolment.

Associated degrees: M E, M P E.

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
Engineering and Information Technologies

Credit points: 6 Session: Semester 1, Semester 2 Classes: Independent project work. Corequisites: CIVL5020. Assessment: Through semester assessment (100%). Campus: Camperdown/Darlington Mode of delivery: Supervision

Note: Department permission required for enrolment.

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Dissertation B

produce a well-argued, in-depth thesis. 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.

CIVL5022
Capstone Project B Extended

Engineering and Information Technologys

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 Assessment: Through semester assessment (100%) Campus: Camperdown/Darlington Mode of delivery: Supervision Note: Department permission required for enrolment.

Associated degrees: M E, M P E.

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.

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

Engineering and Information Technologies

Credit points: 12 Session: Semester 1, Semester 2 Classes: no formal classes Prerequisites: ENGG5220, ENGG5221 Assessment: Through semester assessment (100%) Campus: Camperdown/Darlington 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.

Associated degrees: M E, M P E.

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.

CIVL5223
Dissertation B

Engineering and Information Technologies

Credit points: 12 Session: Semester 1, Semester 2 Classes: no formal classes Prerequisites: ENGG5220, ENGG5221 Assessment: Through semester assessment (100%) Campus: Camperdown/Darlington 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.

Associated degrees: M E, M P E.

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.

ENGG5231
Engineering Graduate Exchange A

Engineering and Information Technologies


Associated degrees: M E, M Inf Tech, M Info Tech Man, M P E, M P L, M P M.

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

Engineering and Information Technologies


Associated degrees: M E, M Inf Tech, M Inf Tech Man, M P E, M P L, M P M.

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.
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 in order 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.
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).
### 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

<table>
<thead>
<tr>
<th>Unit of study</th>
<th>Credit points</th>
<th>A: Assumed knowledge</th>
<th>P: Prerequisites</th>
<th>C: Corequisites</th>
<th>N: Prohibition</th>
<th>Session</th>
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</thead>
<tbody>
<tr>
<td>ENGG5802 Foundations of Engineering Mechanics</td>
<td>6</td>
<td></td>
<td></td>
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<td></td>
<td>Semester 2</td>
</tr>
<tr>
<td>CIVL5501 Foundations of Materials</td>
<td>6</td>
<td>This UoS is only available to students in the MPE degree who do not have a Civil Engineering background.</td>
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<td>Summer Main</td>
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<tr>
<td>CIVL5502 Foundations of Structural Mechanics</td>
<td>6</td>
<td>A 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 in 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. This UoS is only available to students in the MPE degree who do not have a Civil Engineering background.</td>
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<td>Semester 1</td>
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<tr>
<td>CIVL5506 Foundations-Eng Construction &amp; Surveying</td>
<td>6</td>
<td>This UoS is only available to students in the MPE degree who do not have a Civil Engineering background. 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 Webb's 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)</td>
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<td>Semester 1</td>
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</table>

#### Year One - Semester Two

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<tr>
<th>Unit of study</th>
<th>Credit points</th>
<th>A: Assumed knowledge</th>
<th>P: Prerequisites</th>
<th>C: Corequisites</th>
<th>N: Prohibition</th>
<th>Session</th>
</tr>
</thead>
<tbody>
<tr>
<td>CIVL5504 Foundations of Soil Mechanics</td>
<td>6</td>
<td>A 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 ENGG 1802 Engineering Mechanics, CIVL5502 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 ENGS1801 Engineering Computing. Familiarity with partial differential equations, and their analytical and numerical solution. This UoS is only available to students in the MPE degree who do not have a Civil Engineering background.</td>
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<td>Semester 2</td>
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<tr>
<td>CIVL5505 Foundations of Intro. Fluid Mechanics</td>
<td>6</td>
<td>A CIVL5502. 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. This UoS is only available to students in the MPE degree who do not have a Civil Engineering background.</td>
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<td>Semester 2</td>
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<tr>
<td>CIVL5509 Foundations of Struct Concepts &amp; Design</td>
<td>6</td>
<td>A Structural mechanics, first year mathematics, but these are not prerequisites Basic structural elements include beams, columns slabs and simple frames</td>
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<td>Semester 2</td>
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<tr>
<td>ENGG5011 Foundation Engineering Studies A</td>
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<td>Semester 2</td>
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<td>Semester 2</td>
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</table>

#### Year Two - Semester One

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<tr>
<th>Unit of study</th>
<th>Credit points</th>
<th>A: Assumed knowledge</th>
<th>P: Prerequisites</th>
<th>C: Corequisites</th>
<th>N: Prohibition</th>
<th>Session</th>
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</thead>
<tbody>
<tr>
<td>CIVL5507 Foundations of Concrete Structures 1</td>
<td>6</td>
<td>A Knowledge: CIVL2110 AND CIVL2201 AND CIVL2230. basic concepts of solid mechanics and structural mechanics, including: compatibility 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).</td>
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<td>Semester 1</td>
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<tr>
<td>CIVL5511 Foundations of Fluid Mechanics</td>
<td>6</td>
<td>A CIVL2201 AND CIVL2611 AND ENGG1802 AND MATH2081. This unit of study follows on from Fluid Mechanics CIVL2611, which provides the essential fundamental fluid mechanics background and theory, and is assumed to be known and fully understood.</td>
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<td>Semester 1</td>
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<tr>
<td>CIVL5512 Foundation of Eng Design &amp; Construction</td>
<td>6</td>
<td>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.</td>
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<td>Semester 1</td>
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<tr>
<td>ENGG5204 Engineering Professional Practice</td>
<td>6</td>
<td>A Competences and experience in engineering obtained during an accepted engineering degree</td>
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<td>Semester 1</td>
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<tr>
<td>Unit of study</td>
<td>Credit points</td>
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<td>Year Two - Semester Two</td>
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<tr>
<td>CIVL5455 Engineering Behaviour of Soils</td>
<td>6</td>
<td>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.</td>
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<td>Semester 2</td>
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<tr>
<td>CIVL5508 Foundations of Steel Structures 1</td>
<td>6</td>
<td>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.</td>
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<td>Semester 2</td>
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<tr>
<td>ENGG5205 Professional Practice in PM</td>
<td>6</td>
<td>A Basic engineering or science knowledge. At least 2-3 years of work experience preferred. 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.</td>
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<td>Semester 1 Semester 2</td>
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<tr>
<td>Select 6 credit points from the Specialist electives block.</td>
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<td>Year Three - Semester One</td>
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<tr>
<td>CIVL5459 Analysis and Design of Pile Foundations</td>
<td>6</td>
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<td>Semester 1</td>
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<tr>
<td>CIVL5451 Computer Methods in Geotechnical Engineering</td>
<td>6</td>
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<td>Semester 1</td>
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<tr>
<td>ENGG5217 Practical Experience</td>
<td></td>
<td>Students should have completed one year of their MPE program before enrolling in this unit.</td>
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<td>Semester 1 Semester 2</td>
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<tr>
<td>CIVL5200 Capstone Project A</td>
<td>6</td>
<td>P 48 credits from MPE degree program Note: Department permission required for enrolment</td>
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<td>Semester 1 Semester 2</td>
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<tr>
<td>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.</td>
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<tr>
<td>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.</td>
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<tr>
<td>Select 6 credit points from the Specialist electives block.</td>
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<td>Year Three - Semester Two</td>
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<tr>
<td>CIVL5454 Rock Engineering</td>
<td>6</td>
<td>A Undergraduate geology and soil mechanics.</td>
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<td>Semester 2</td>
</tr>
<tr>
<td>CIVL5510 Foundations of Civil Engineering Design</td>
<td>6</td>
<td>A CIVL3205 AND CIVL3206.</td>
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<td>Semester 2</td>
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<tr>
<td>CIVL5201 Capstone Project B</td>
<td>6</td>
<td>C CIVL5020 Note: Department permission required for enrolment</td>
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<td>Semester 1 Semester 2</td>
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<tr>
<td>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.</td>
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<tr>
<td>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.</td>
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<tr>
<td>Select 6 credit points from the Electives block.</td>
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<tr>
<td>Specialist Elective units</td>
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<tr>
<td>Candidates must complete 12 credit points from the following Specialist elective units of study.</td>
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<tr>
<td>CIVL5351 Geoenvironmental Engineering</td>
<td>6</td>
<td></td>
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<td>Semester 1</td>
</tr>
<tr>
<td>CIVL5452 Foundation Engineering</td>
<td>6</td>
<td>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)</td>
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<td>Semester 2</td>
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<tr>
<td>CIVL5458 Numerical Methods in Civil Engineering</td>
<td>6</td>
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<td>Semester 1</td>
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<tr>
<td>Elective units</td>
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<tr>
<td>Candidates must complete 6 credit points from the following Elective units of study.</td>
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<tr>
<td>CHNG5005 Wastewater Eng - Systems and Practice</td>
<td>6</td>
<td>A Ability to conduct mass and energy balances, and the integration of these concepts to solve <code>real</code> 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.</td>
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<td>Semester 1</td>
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<tr>
<td>CIVL5257 Concrete Structures: Prestressed</td>
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<td>Semester 1</td>
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<tr>
<td>CIVL5264 Composite Steel-Concrete Structures</td>
<td>6</td>
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<td>Semester 2</td>
</tr>
<tr>
<td>Unit of study</td>
<td>Credit points</td>
<td>A: Assumed knowledge</td>
<td>P: Prerequisites</td>
<td>C: Corequisites</td>
<td>N: Prohibition</td>
<td>Session</td>
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<tr>
<td>CIVL5267 Steel Structures - Advanced Design</td>
<td>6</td>
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<td>Semester 1</td>
</tr>
<tr>
<td>CIVL5268 Structural Dynamics</td>
<td>6</td>
<td>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.</td>
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<td>Semester 2</td>
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<tr>
<td>CIVL5666 Open Channel Flow &amp; Hydraulic Structures</td>
<td>6</td>
<td>A CIVL3612</td>
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<td>Semester 1</td>
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<tr>
<td>CIVL5668 Wind Engineering for Design-Fundamentals</td>
<td>6</td>
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<td>Semester 1</td>
</tr>
<tr>
<td>CIVL5669 Applied Fluid Engineering Computing</td>
<td>6</td>
<td>A CIVL5511: 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.</td>
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<td>Semester 2</td>
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</tbody>
</table>

## 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.

<table>
<thead>
<tr>
<th>CIVL5020 Capstone Project A</th>
<th>6</th>
<th>P 48 credits from MPE degree program Note: Department permission required for enrolment</th>
<th></th>
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<th>Semester 1</th>
</tr>
</thead>
<tbody>
<tr>
<td>CIVL5021 Capstone Project B</td>
<td>6</td>
<td>C CIVL5020 Note: Department permission required for enrolment</td>
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<td>Semester 1</td>
</tr>
<tr>
<td>CIVL5022 Capstone Project B Extended</td>
<td>12</td>
<td>P 42 credit points in the Master of Engineering and WAM &gt;70, or 66 credit points in the Master of Professional Engineering and WAM &gt;70 or exemption Note: Department permission required for enrolment</td>
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<td>Semester 1</td>
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</tbody>
</table>

## 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.

<table>
<thead>
<tr>
<th>CIVL5222 Dissertation A</th>
<th>12</th>
<th>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.</th>
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<th>Semester 1</th>
</tr>
</thead>
<tbody>
<tr>
<td>CIVL5223 Dissertation B</td>
<td>12</td>
<td>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.</td>
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<td>Semester 2</td>
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</tbody>
</table>

## 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.

<table>
<thead>
<tr>
<th>ENGG5231 Engineering Graduate Exchange A</th>
<th>6</th>
<th>P Permission from faculty and school. Note: Department permission required for enrolment</th>
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<th>Int January</th>
</tr>
</thead>
<tbody>
<tr>
<td>ENGG5232 Engineering Graduate Exchange B</td>
<td>6</td>
<td>P Permission from faculty and school. Note: Department permission required for enrolment</td>
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<td>Int January Int July</td>
</tr>
</tbody>
</table>

For more information on degree program requirements visit CUSP.
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

ENGG5802
Foundations of Engineering Mechanics

Engineering and Information Technologies

Credit points: 6 Session: Semester 2, Summer Main Classes: 2 hrs Lectures per week, 3hrs tutorial per week. Assessment: Through semester assessment (100%) Campus: Camperdown/Darlington Mode of delivery: Normal (lecture/lab/tutorial) Day

Associated degrees: M P E.

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.

CIVL5501
Foundations of Materials

Engineering and Information Technologies

Credit points: 6 Session: Semester 1 Classes: 4 hours of lectures and 2 hours of tutorials per week. Assessment: Through semester assessment (50%), Final Exam (50%) Campus: Camperdown/Darlington Mode of delivery: Normal (lecture/lab/tutorial) Day

Note: This UoS is only available to students in the MPE degree who do not have a Civil Engineering background.

Associated degrees: Grad Dip E (Prof Eng), M P E.

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

CIVL5502
Foundations of Structural Mechanics

Engineering and Information Technologies

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. Assumed knowledge: Students should be competent in the following areas. 1. The concept of force and momentum equilibrium in two and three dimensions. 2. Drawing free body diagrams. 3. Establishing and solving the equations of equilibrium from the FBD. 4. Setting out solutions logically, clearly and neatly. Students should be competent in certain 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%) Campus: Camperdown/Darlington Mode of delivery: Normal (lecture/lab/tutorial) Day

Note: This UoS is only available to students in the MPE degree who do not have a Civil Engineering background.

Associated degrees: Grad Dip E (Prof Eng), M P E.

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.

CIVL5506
Foundations-Eng Construction & Surveying

Engineering and Information Technologies

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. Assessment: Through semester assessment (55%), Final Exam (45%) Campus: Camperdown/Darlington Mode of delivery: Normal (lecture/lab/tutorial) Day

Note: This UoS is only available to students in the MPE degree who do not have a Civil Engineering background. This 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)

Associated degrees: Grad Dip E (Prof Eng), M P E.

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.

Year One - Semester Two

CIVL5504 Foundations of Soil Mechanics

Engineering and Information Technologies

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. Assumed knowledge: 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 ENGG 1802 Engineering Mechanics, CIVL5502 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 ENGG1801 Engineering Computing. Familiarity with partial differential equations, and their analytical and numerical solution. Assessment: Through semester assessment (50%), Final Exam (50%) Campus: Camperdown/Darlington Mode of delivery: Normal (lecture/lab/tutorial) Day Note: This UoS is only available to students in the MPE degree who do not have a Civil Engineering background.

Associated degrees: Grad Dip E (Prof Eng), M P E.

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

CIVL5505

Foundations of Intro. Fluid Mechanics

Engineering and Information Technologies

Credit points: 6 Session: Semester 2 Classes: 2 hours of lectures and 2 hours of tutorials per week. 8 hours of laboratory work per semester. Assumed knowledge: CIVL5502. 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 (45%), Final Exam (55%) Campus: Camperdown/Darlington Mode of delivery: Normal (lecture/lab/tutorial) Day Note: This UoS is only available to students in the MPE degree who do not have a Civil Engineering background.

Associated degrees: Grad Dip E (Prof Eng), M P E.

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.

CIVL5509

Foundations of Struct Concepts & Design

Engineering and Information Technologies

Credit points: 6 Session: Semester 2 Classes: 4 hours of lectures and 2 hours of tutorials per week. Assumed knowledge: Structural mechanics, first year mathematics, first year physics, first year mechanics, and first year engineering. Assessment: Through semester assessment (25%), Final Exam (75%) Campus: Camperdown/Darlington Mode of delivery: Normal (lecture/lab/tutorial) Day Note: Basic structural elements include beams, columns slabs and simple frames

Associated degrees: Grad Dip E (Prof Eng), M P E.

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.

ENGG5011

Foundation Engineering Studies A

Engineering and Information Technologies

Credit points: 6 Session: Semester 1, Semester 2 Classes: no formal classes. regular meetings with supervisor will be required. Assessment: Through semester assessment (100%) Campus: Camperdown/Darlington Mode of delivery: Supervision

Associated degrees: Grad Dip E (Prof Eng), M P E.

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 Two - Semester One

CIVL5507

Foundations of Concrete Structures 1

Engineering and Information Technologies

Credit points: 6 Session: Semester 1 Classes: 3 hours of lectures and 3 hours of project work in class per week. 2 hours of laboratory demonstration per semester. Assumed knowledge: Knowledge: CIVL2110 AND CIVL2201 AND CIVL2230. basic concepts of solid mechanics and structural mechanics, including: compatibility of strains; stress-strain relationships; equilibrium; flexure, shear and torsion; statically determine load effects (reactions, bending moments, shear forces); elastic beam theory (strains, stresses and beam deflections). Assessment: Through semester assessment (60%), Final Exam (40%) Campus: Camperdown/Darlington Mode of delivery: Normal (lecture/lab/tutorial) Day

Associated degrees: M P E.

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

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

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

CIVL5511

Foundations of Fluid Mechanics

Engineering and Information Technologies

Credit points: 6 Session: Semester 1 Classes: Lecture 2hrs per week, Tutorial 2hrs per week, Laboratory 2hrs per week. Assumed knowledge: CIVL2201 AND CIVL2611 AND ENGG1802 AND MATH2601. This unit of study follows on Fluid Mechanics CIVL2611, which provides the essential fundamental fluid mechanics background and theory, and is assumed to be known and fully understood. Assessment: Through semester assessment (60%), Final Exam
This unit of study aims to provide an understanding of the conservation of mass and momentum in differential terms for viscous fluid flows. It provides the foundation for advanced study of turbulence, flow around immersed bodies, open channel flow, and turbo-machinery.

CIVL5512 Foundation of Eng Design & Construction Engineering and Information Technologies
Credit points: 6 Session: Semester 1 Classes: Workshop 3 hours per week. Lecture/Presentation 2 hrs per week. Assumed knowledge: Basic knowledge of construction operations including excavation, embankments and other earthworks, hauling and associated procedures - drilling and blasting, survey, reinforced concrete construction (including formwork and formwork substitutes), interpretation of engineering drawings. Assessment: Through semester assessment (50%), Final Exam (50%) Mode of delivery: Normal (lecture/lab/tutorial) Day

The objectives of this unit are to develop an understanding of construction methods, strategies, equipment and machinery in a range of construction activities and an understanding of the principles involved in the design for those construction activities.

At the end of this unit, students will have developed a familiarity with a variety of construction methods, strategies, equipment and machinery in a range of construction activities such that they will be able, if and when the opportunity arises, to participate as site engineers (or similar role) in the planning and execution of those construction activities, with supervision and guidance from experienced professionals. Students will also have developed an understanding of the design principles and techniques involved in the planning for those construction activities such that they are able, if and when the opportunity arises, to participate as design engineers, in the planning and design for those construction activities, with supervision and guidance from experienced professionals. The range of topics covered in this course is such that the learning outcomes form a basis for later development of more detailed knowledge, dependent on the future career experiences of the student. The course does not prepare a student for immediate, unsupervised participation in construction and design work associated with the topics covered.

The construction topics covered in this course have not been previously addressed in CIVL5506 (Foundations of Engineering Construction and Survey) or equivalent introductory study of construction and surveying techniques. The topics may vary dependent on current and planned projects in Sydney, NSW and Australia. At this stage the topics are hard rock tunnelling and general hard rock underground excavation; soft ground tunnelling; underground construction; micro tunnelling; cut and cover (cover and cut) tunnelling; earth retaining systems; piling; formwork and falsework (incl Tilt up, Ultrafooth, 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 locations (project based); construction methods in bridge engineering; OA documentation on a typical project; timber engineering; 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.

ENGS5204 Engineering Professional Practice Engineering and Information Technologies
Credit points: 6 Session: Semester 1 Classes: Lecture 1 hour per week, Tutorial 1 hour per week, Workgroup 1 hour per 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

CIVL5455 Engineering Behaviour of Soils Engineering and Information Technologies
Credit points: 6 Session: Semester 2 Classes: Independent Study 4 hrs per week, Lectures 12 hrs per week, Tutorials 1hr per week. Assumed knowledge: CIVL2410 AND CIVL3411. A knowledge of basic concepts and terminology of soil mechanics is assumed. Experience with geotechnical parameters in est and laboratory based laboratories would be useful but not essential. Assessment: Through semester assessment (80%), Final Exam (20%) Mode of delivery: Normal (lecture/lab/tutorial) Day

The objectives of this 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 Engineering and Information Technologies
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, rz, ry, J, Ag; knowledge of the basic elastic-plastic material properties of steel, E, G, v, fu, and knowledge of loading of structures. Assessment: Through semester assessment (50%), Final Exam (50%) Mode of delivery: Normal (lecture/lab/tutorial) Day

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 materials. 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.

ENGS5205
Professional Practice in PM
Engineering and Information Technologies
Credit points: 6 Session: Semester 1. Semester 2 Classes: Lecture 3hrs per week, E-Learning 1 hr per week. Assumed knowledge: Basic engineering or science knowledge. At least 2-3 years of work experience preferred. Assessment: Through semester assessment (60%), Final Exam (40%) Campus: Camperdown/Darlington 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.
Associated degrees: Grad Cert P M, Grad Dip E, M P E.

This UoS teaches the fundamental knowledge on the importance, organizational context and professional practice in project management. It serves as an introduction to project management practices for non-PM students. For PM students, this UoS lays the foundation to progress to advanced PM subjects. Although serving as a general introduction unit, the focus has been placed on scope, time, cost, and integration related issues. Specifically, the UoS aims to
1. introduce students to the institutional, organisational and professional environment for today's project management practitioners as well as typical challenges and issues facing them;
2. demonstrate the importance of project management to engineering and organizations;
3. demonstrate the progression from strategy formulation to execution of the project;
4. provide a set of tools and techniques at different stages of a project's lifecycle with emphasis on scope, time, cost and integration related issues;
5. highlight examples of project success/failures in project management and to take lessons from these;
6. consider the roles of project manager in the organization and management of people;
7. provide a path for students seeking improvements in their project management expertise.

Select 6 credit points from the Specialist electives block.

Year Three - Semester One

CIVL5450
Analysis and Design of Pile Foundations
Engineering and Information Technologies
Credit points: 6 Session: Semester 1 Classes: 3 hours of lecture/project work in class per week. 3 hours of laboratory work per semester. Assessment: Through semester assessment (100%) Campus: Camperdown/Darlington Mode of delivery: Normal (lecture/lab/tutorial) Day
Associated degrees: B E, Grad Cert E, M P E.

Objectives: To develop an understanding of the modern principles of design of pile foundations and the application of those principles to practice.
Expected outcomes: Students should gain an advanced understanding of the types of pile foundations used in practice, and the procedures for analysis of pile foundations under various types of loading, and gain experience in carrying out pile design for real geotechnical profiles.

Syllabus summary: Types of piles and their uses, effects of pile installation, axial capacity of piles and pile groups, settlement of pile foundations, ultimate lateral capacity, lateral deformations, analysis of pile groups subjected to general loading conditions, piled raft foundations, piles subjected to ground movements, pile load testing, code provisions for pile design.

CIVL5451
Computer Methods in Geotechnical Engineering and Information Technologies
Credit points: 6 Session: Semester 1 Classes: 3 hr combined lecture and tutorial per week Assessment: Through semester assessment (100%) Campus: Camperdown/Darlington Mode of delivery: Normal (lecture/lab/tutorial) Day
Associated degrees: Grad Cert E, M P E.

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.

ENGS5217
Practical Experience Engineering and Information Technologies
Session: Semester 1, Semester 2 Classes: no formal classes Assessment: Students will write reports on their industrial experiences and maintain a portfolio of work. Portfolio (100%) Campus: Camperdown/Darlington Mode of delivery: Professional Practice
Note: Students should have completed one year of their MPE program before enrolling in this unit.
Associated degrees: M P E.

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

CIVL5020
Capstone Project A
Engineering and Information Technologies
Credit points: 6 Session: Semester 1, Semester 2 Classes: Independent project work. Prerequisites: 48 credits from MPE degree program Assessment: Through semester assessment (100%) Campus: Camperdown/Darlington Mode of delivery: Supervision
Note: Department permission required for enrolment.
Associated degrees: M E, M P E.

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, 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. 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 Elective electives block.

Year Three - Semester Two

CIVL5454 Rock Engineering
Engineering and Information Technologies
Credit points: 6 Session: Semester 2 Classes: 3 hours of project work in class per week. Assumed knowledge: Undergraduate geology and soil mechanics. Assessment: Through semester assessment (100%) Campus: Camperdown/Darlington Mode of delivery: Normal (lecture/lab/tutorial) Day
Selected degrees: B E, Grad Cert E, M P E.
Objectives: to develop an understanding of the behaviour and design of engineering structures in rock masses.
Expected outcomes: Students will have learnt how to classify and characterise rocks and rock masses for engineering purposes and developed an understanding of basic rock mechanics etc.

CIVL5510 Foundations of Civil Engineering Design
Engineering and Information Technologies
Credit points: 6 Session: Semester 2 Classes: 1 hour of lectures and 3 hours of tutorials per week. Assumed knowledge: CIVL3205 AND CIVL3206. Assessment: Through semester assessment (75%), Final Exam (25%) Campus: Camperdown/Darlington Mode of delivery: Normal (lecture/lab/tutorial) Day
Selected degrees: M P E.
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.

CIVL5021 Capstone Project B
Engineering and Information Technologies
Credit points: 6 Session: Semester 1 Classes: Independent project work. Corequisites: CIVL5020 Assessment: Through semester assessment (100%) Mode of delivery: Supervision
Note: Department permission required for enrolment.
Selected degrees: M E, M P E.
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.
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
Engineering and Information Technologies
Credit points: 6 Session: Semester 2 Classes: 4 hours of lectures/project work per week. Assessment: Through semester assessment (100%) Campus: Camperdown/Darlington Mode of delivery: Normal (lecture/lab/tutorial) Day
Selected degrees: B E, Grad Cert E, M P E.
Objectives: To develop an understanding of the geotechnical aspects of the design and management of industrial and domestic waste disposal systems.
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
Engineering and Information Technologies
Credit points: 6 Session: Semester 2 Classes: Lectures 3 hrs per week, presented in 2 sessions per week for 11 weeks of semester. Tutorials 1hr per week. Assumed knowledge: 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%)
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 the technical literature and to synthesise arguments based on such literature. Ability to write coherent reports and essays based on information from diverse sources. Assessed: Through semester assessment (50%), Final Exam (50%)

CIVL5267

Steel Structures - Advanced Design Engineering and Information Technologies
Credit points: 6 Session: Semester 1 Classes: 3-hr combined lecture and tutorial per week Assessment: Through semester assessment (50%), Final Exam (50%) Campus: Camperdown/Darlington Mode of delivery: Normal (lecture/lab/tutorial) Day
Associated degrees: B E, Grad Cert E, M P E, PG Coursework Exchange.

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 Engineering and Information Technologies
Credit points: 6
Assessment: Normal (lecture/lab/tutorial) Day 3-hr combined lecture and tutorial per week
CIVL5268 Structural Dynamics Engineering and Information Technologies
Credit points: 6
Assessment: Normal (lecture/lab/tutorial) Day 3-hr combined lecture and tutorial per week

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 Engineering and Information Technologies
Credit points: 6
Session: Semester 1, Semester 2
Classes: Lecture 1 hr per week, Tutorial 1 hr per week, Laboratory 2 hrs per week
Assessment: Normal (lecture/lab/tutorial) Day

Independent project work. Prerequisites: 48 credits from MPE degree program

Assessment:
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
Engineering and Information Technologies
Credit points: 12 Session: Semester 1, Semester 2 Classes: no formal classes Prohibitions: ENGG5220, ENGG5221 Assessment: Through semester assessment (100%) Campus: Camperdown/Darlington 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.

Associated degrees: M E, M P E.

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.

CIVL5223
Dissertation B
Engineering and Information Technologies
Credit points: 12 Session: Semester 1, Semester 2 Classes: no formal classes Prohibitions: ENGG5220, ENGG5221 Assessment: Through semester assessment (100%) Campus: Camperdown/Darlington 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.

Associated degrees: M E, M P E.

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.

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
Engineering and Information Technologies
Note: Department permission required for enrolment.

Associated degrees: M E, M Inf Tech, M Inf Tech Man, M P E, M P L, M P M.

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 supervision or coursework and work 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
Engineering and Information Technologies
Note: Department permission required for enrolment.
Associated degrees: M E, M Inf Tech, M Inf Tech Man, M P E, M P L, M P M.
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.
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 http://www.engineersaustralia.org.au/.

Course requirements
Candidates for the Master of Professional Engineering (Mechanical 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

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

<table>
<thead>
<tr>
<th>Code</th>
<th>Title</th>
<th>Credit Points</th>
<th>A: Assumed knowledge</th>
<th>P: Prerequisites</th>
<th>C: Corequisites</th>
<th>N: Prohibition</th>
<th>Session</th>
</tr>
</thead>
<tbody>
<tr>
<td>AMME5302</td>
<td>Foundations of Materials 1</td>
<td>6</td>
<td>N</td>
<td></td>
<td></td>
<td></td>
<td>Semester 1</td>
</tr>
<tr>
<td>AMME5500</td>
<td>Foundations of Engineering Dynamics</td>
<td>6</td>
<td>A</td>
<td>Physics, statics, Particle dynamics, Differential Calculus, Linear Algebra, Integral Calculus and Modelling</td>
<td></td>
<td></td>
<td>Semester 1</td>
</tr>
<tr>
<td>AMME5700</td>
<td>Foundations of Instrumentation</td>
<td>6</td>
<td>A</td>
<td>ENGG1801. Programming Skills, 1st Year maths skills, familiarity with fundamental Aerospace concepts</td>
<td>P AERO1560 OR MECH1560 OR MTRX1701 OR ENGG1800</td>
<td></td>
<td>Semester 1</td>
</tr>
<tr>
<td>ENGG5801</td>
<td>Foundations of Engineering Computing</td>
<td>6</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Semester 1</td>
</tr>
</tbody>
</table>

Year One - Semester Two

<table>
<thead>
<tr>
<th>Code</th>
<th>Title</th>
<th>Credit Points</th>
<th>A: Assumed knowledge</th>
<th>P: Prerequisites</th>
<th>C: Corequisites</th>
<th>N: Prohibition</th>
<th>Session</th>
</tr>
</thead>
<tbody>
<tr>
<td>AMME5200</td>
<td>Foundations of Thermodynamics and Fluids</td>
<td>6</td>
<td>A</td>
<td>Students are expected to be familiar with basic, first year, integral calculus, differential calculus and linear algebra.</td>
<td></td>
<td></td>
<td>Semester 2</td>
</tr>
<tr>
<td>ENGG5802</td>
<td>Foundations of Engineering Mechanics</td>
<td>6</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Summer Main</td>
</tr>
<tr>
<td>MECH5400</td>
<td>Foundations of Mechanical Design 1</td>
<td>6</td>
<td>A</td>
<td>Knowledge of programming in MATLAB and a knowledge of Engineering Mechanics (statics)</td>
<td>N MECH2400</td>
<td></td>
<td>Semester 2</td>
</tr>
</tbody>
</table>

Year Two - Semester One

<table>
<thead>
<tr>
<th>Code</th>
<th>Title</th>
<th>Credit Points</th>
<th>A: Assumed knowledge</th>
<th>P: Prerequisites</th>
<th>C: Corequisites</th>
<th>N: Prohibition</th>
<th>Session</th>
</tr>
</thead>
<tbody>
<tr>
<td>AMME5501</td>
<td>Foundations: System Dynamics and Control</td>
<td>6</td>
<td>A</td>
<td>AMME5500</td>
<td></td>
<td></td>
<td>Semester 1</td>
</tr>
<tr>
<td>MECH5261</td>
<td>Foundations of Fluid Mechanics</td>
<td>6</td>
<td>A</td>
<td>Linear Mathematics, Vector Calculus, Differential Equations and Fourier Series, Thermo Fluids fundamentals</td>
<td>N MECH3261</td>
<td>Note: Department permission required for enrolment</td>
<td>Semester 1</td>
</tr>
<tr>
<td>MECH5362</td>
<td>Foundations of Materials 2</td>
<td>6</td>
<td>A</td>
<td>Mechanics of solids: statics, stress, strain</td>
<td>P AMME5302 N MECH3362</td>
<td></td>
<td>Semester 1</td>
</tr>
<tr>
<td>MECH5660</td>
<td>Foundations of Manufacturing Engineering</td>
<td>6</td>
<td>P</td>
<td>MECH5400</td>
<td></td>
<td></td>
<td>Semester 1</td>
</tr>
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</table>

Year Two - Semester Two

<table>
<thead>
<tr>
<th>Code</th>
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<th>Credit Points</th>
<th>A: Assumed knowledge</th>
<th>P: Prerequisites</th>
<th>C: Corequisites</th>
<th>N: Prohibition</th>
<th>Session</th>
</tr>
</thead>
<tbody>
<tr>
<td>MECH5262</td>
<td>Foundations of Thermal Engineering</td>
<td>6</td>
<td>A</td>
<td>Fundamentals of thermodynamics are needed to begin this more advanced course.</td>
<td>P AMME5200 N MECH3260</td>
<td>Note: Department permission required for enrolment</td>
<td>Semester 2</td>
</tr>
</tbody>
</table>

Select 12 credit points from Mechanical recommended electives block.

Year Three - Semester One

<table>
<thead>
<tr>
<th>Code</th>
<th>Title</th>
<th>Credit Points</th>
<th>A: Assumed knowledge</th>
<th>P: Prerequisites</th>
<th>C: Corequisites</th>
<th>N: Prohibition</th>
<th>Session</th>
</tr>
</thead>
<tbody>
<tr>
<td>AMME5801</td>
<td>Professional Engineering</td>
<td>6</td>
<td>A</td>
<td>Experience in a professional engineering related field is desirable to aid in group tutorial discussion.</td>
<td></td>
<td></td>
<td>Semester 1</td>
</tr>
</tbody>
</table>
## Unit of study table

<table>
<thead>
<tr>
<th>Unit of study</th>
<th>Credit points</th>
<th>A: Assumed knowledge</th>
<th>P: Prerequisites</th>
<th>C: Corequisites</th>
<th>N: Prohibition</th>
<th>Session</th>
</tr>
</thead>
<tbody>
<tr>
<td>ENGG5217 Practical Experience</td>
<td></td>
<td>Students should have completed one year of their MPE program before enrolling in this unit.</td>
<td></td>
<td></td>
<td></td>
<td>Semester 1, Semester 2</td>
</tr>
<tr>
<td>AMME5020 Capstone Project A</td>
<td>6</td>
<td>P 48 cp from MPE degree program or 24 cp from the ME program. Note: Department permission required for enrolment</td>
<td></td>
<td></td>
<td></td>
<td>Semester 1, Semester 2</td>
</tr>
<tr>
<td>AMME5021 Safety Systems and Risk Analysis</td>
<td>6</td>
<td>C AMME5020</td>
<td></td>
<td></td>
<td></td>
<td>Semester 2</td>
</tr>
<tr>
<td>AMME5022 Advanced Computational Fluid Dynamics</td>
<td>6</td>
<td>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.</td>
<td></td>
<td></td>
<td></td>
<td>Semester 1</td>
</tr>
<tr>
<td>AMME5027 Computational Nanotechnology</td>
<td>6</td>
<td>A Students are required to have an understanding of basic principles of quantum 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</td>
<td></td>
<td></td>
<td></td>
<td>Semester 2</td>
</tr>
<tr>
<td>ENGG5020 Sustainable Design, Eng and Mgt</td>
<td>6</td>
<td>A General knowledge in science and calculus and understanding of basic principles of chemistry, physics and mechanics</td>
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<td></td>
<td></td>
<td>Semester 2</td>
</tr>
<tr>
<td>AERO5010 Optimisation Methods in Engineering</td>
<td>6</td>
<td>A BE in the area of Aerospace or related Engineering field. Note: Department permission required for enrolment</td>
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<td></td>
<td>Semester 2</td>
</tr>
<tr>
<td>AMME5010 Energy and the Environment</td>
<td>6</td>
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<td></td>
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</tr>
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<td>Semester 2</td>
</tr>
<tr>
<td>ENGG5020 Sustainable Design, Eng and Mgt</td>
<td>6</td>
<td>A General knowledge in science and calculus and understanding of basic principles of chemistry, physics and mechanics</td>
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<td>Semester 2</td>
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<td>AERO5010 Optimisation Methods in Engineering</td>
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<td>A BE in the area of Aerospace or related Engineering field. Note: Department permission required for enrolment</td>
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<td></td>
<td>Semester 2</td>
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<td>AMME5010 Energy and the Environment</td>
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<td></td>
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<td>Semester 1</td>
</tr>
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<td>AMME5022 Advanced Computational Fluid Dynamics</td>
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<td>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.</td>
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<td></td>
<td>Semester 1</td>
</tr>
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<td>AMME5027 Computational Nanotechnology</td>
<td>6</td>
<td>A Students are required to have an understanding of basic principles of quantum 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</td>
<td></td>
<td></td>
<td></td>
<td>Semester 2</td>
</tr>
<tr>
<td>ENGG5020 Sustainable Design, Eng and Mgt</td>
<td>6</td>
<td>A General knowledge in science and calculus and understanding of basic principles of chemistry, physics and mechanics</td>
<td></td>
<td></td>
<td></td>
<td>Semester 2</td>
</tr>
<tr>
<td>AERO5010 Optimisation Methods in Engineering</td>
<td>6</td>
<td>A BE in the area of Aerospace or related Engineering field. Note: Department permission required for enrolment</td>
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<td></td>
<td></td>
<td>Semester 2</td>
</tr>
<tr>
<td>AMME5010 Energy and the Environment</td>
<td>6</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Semester 1</td>
</tr>
<tr>
<td>MECH5265 Advanced Combustion</td>
<td>6</td>
<td>P (MECH5262 or MECH5260) and (MECH5261 or MECH3261)</td>
<td></td>
<td></td>
<td></td>
<td>Semester 2</td>
</tr>
<tr>
<td>MECH5275 Advanced Renewable Energy</td>
<td>6</td>
<td>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 MECH5262 or MECH3260</td>
<td></td>
<td></td>
<td></td>
<td>Semester 2</td>
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</table>
Dissertation B
AMME5223

Dissertation A
AMME5222
Research pathway candidates take Dissertation units AMME5222 and AMME5223 (total 24 cp) in place of Capstone Project units and 12 cp of elective units.

AMME5510 Engineering Tribology
6
A AMME5301 or BE in area of Aerospace Engineering or related Engineering field.
P AERO5310 OR MECH5361

AMME5510 Vibration and Acoustics
6
A (AMME2302 OR AMME5302) AND (AMME2301 OR AMME5301) AND (MECH3261 OR AMME5361).

AMME56502 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.

AME42522 Advanced Computer Aided Manufacturing
6

AME43012 Crash Analysis and Design
6
A Computer Aided Drafting, Basic FEA principles and Solid Mechanics

ENGG5202 Sustainable Design, Eng and Mgt
6
A General knowledge in science and calculus and understanding of basic principles of chemistry, physics and mechanics

MECH5416 Advanced Design and Analysis
6
A Eng Mechanics, balance of forces and moments Mechanics of Solids, 2 and 3 dimensional stress and strain Engineering Dynamics - dynamic forces and moments. Mechanical Design, approach to design problems and report writing, and preparation of engineering drawing Mechanical design intermediate, means of applying fatigue analysis to a wide range of machine components

Mechatronics

AERO5710 Spacecraft and Satellite Design
6
Note: Department permission required for enrolment

AMME5550 Advanced Control and Optimisation
6
P AMME3500 OR AMME5550.

AMME55602 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.

AMME55902 Advanced Computer Aided Manufacturing
6

AMME55951 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:

ENGG5520 Sustainable Design, Eng and Mgt
6
A General knowledge in science and calculus and understanding of basic principles of chemistry, physics and mechanics

MECH5416 Advanced Design and Analysis
6
A Eng Mechanics, balance of forces and moments Mechanics of Solids, 2 and 3 dimensional stress and strain Engineering Dynamics - dynamic forces and moments. Mechanical Design, approach to design problems and report writing, and preparation of engineering drawing Mechanical design intermediate, means of applying fatigue analysis to a wide range of machine components

MECH5720 Sensors and Signals
6
A Strong MATLAB skills
P MECH4720

MTRX5700 Experimental Robotics
6
A Knowledge of statics and dynamics, rotation matrices, programming and some electronic and mechanical design experience is assumed.

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 AMME5020 and 6 cp of elective units.

AMME5020 Capstone Project A
6
P 48 cp from MPE degree program or 24 cp from the ME program.
Note: Department permission required for enrolment

AMME5021 Capstone Project B
6
C AMME5020
Note: Department permission required for enrolment

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

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
N AMME5020, AMME5021, ENGG5220, ENGG5221
Note: Department permission required for enrolment

AMME5223 Dissertation B
12
N AMME5020, AMME5021, ENGG5220, ENGG5221
Note: Department permission required for enrolment
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.

<table>
<thead>
<tr>
<th>Unit of study</th>
<th>Credit points</th>
<th>A: Assumed knowledge</th>
<th>P: Prerequisites</th>
<th>C: Corequisites</th>
<th>N: Prohibition</th>
<th>Session</th>
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<td>ENGG5231 Engineering Graduate Exchange A</td>
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For more information on degree program requirements visit CUSP.
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

AMME5302 Foundations of Materials 1

Engineering and Information Technologies

Credit points: 6 Session: Semester 1 Classes: Lectures: 3 hours per week; Tutorials: 2 hour per week. Prohibitions: CIVL2110 Assessment: Through semester assessment (45%), Final Exam (55%) Campus: Camperdown/Darlington Mode of delivery: Normal (lecture/lab/tutorial) Day

Associated degrees: Grad Dip E (Prof Eng), M P E.

This UoS 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.

AMME5500 Foundations of Engineering Dynamics

Engineering and Information Technologies

Credit points: 6 Session: Semester 1 Classes: Lectures: 3 hours per week; Tutorials: 2 hours per week; Lab Sessions 6 hours per semester. Assumed knowledge: Physics, statics, Particle dynamics, Differential Calculus, Linear Algebra, Integral Calculus and Modeling. Assessment: Through semester assessment (40%), Final Exam (60%) Campus: Camperdown/Darlington Mode of delivery: Normal (lecture/lab/tutorial) Day

Associated degrees: Grad Dip E (Prof Eng), M P E.

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.

AMME5700 Foundations of Instrumentation

Engineering and Information Technologies

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. Prerequisites: AERO1550 OR MECH1560 OR MTRX1701 OR ENGG1800 Assumed knowledge: ENGG1801. Programming Skills, 1st Year maths skills, familiarity with fundamental Aerospace concepts. Assessment: Through semester assessment (40%). Final Exam (60%) Campus: Camperdown/Darlington Mode of delivery: Normal (lecture/lab/tutorial) Day

Associated degrees: M P E.

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.

ENGG5801 Foundations of Engineering Computing

Engineering and Information Technologies

Credit points: 6 Session: Semester 1 Classes: 2hrs Lectures per week, 2hrs of Lab session per week. Assessment: Through semester assessment (50%), Final Exam (50%) Campus: Camperdown/Darlington Mode of delivery: Normal (lecture/lab/tutorial) Day

Associated degrees: M P E.

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

AMME5200 Foundations of Thermodynamics and Fluids

Engineering and Information Technologies

Credit points: 6 Session: Semester 2 Classes: Lectures: 3hr per week; Tutorials: 2 hours per week Assumed knowledge: Students are expected to be familiar with basic, first year, integral calculus, differential calculus and linear algebra. Assessment: Through semester assessment (35%), Final Exam (65%) Campus: Camperdown/Darlington Mode of delivery: Normal (lecture/lab/tutorial) Day

Associated degrees: Grad Dip E (Prof Eng), M E, M P E.

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

**AMME5301 Foundations of Mechanics of Solids 1**

**Engineering and Information Technologies**

**Credit points:** 6  **Session:** Semester 2  **Classes:** Lectures: 3 hours per week; Tutorials: 2 hours per week.  **Assumed knowledge:** Physics, statics, Differential Calculus, Linear Algebra, Integral Calculus and Modelling.  **Assessment:** Through semester assessment (35%), Final Exam (65%)  **Campus:** Camperdown/Darlington  **Mode of delivery:** Normal (lecture/lab/tutorial) Day

**Associated degrees:** Grad Dip E (Prof Eng), M P E.

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.

**ENGS5802 Foundations of Engineering Mechanics**

**Engineering and Information Technologies**

**Credit points:** 6  **Session:** Semester 2, Summer Main  **Classes:** 2 hrs Lectures per week, 3hrs tutorial per week.  **Assessment:** Through semester assessment (100%)  **Campus:** Camperdown/Darlington  **Mode of delivery:** Normal (lecture/lab/tutorial) Day

**Associated degrees:** M P E.

The aim of this unit is 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.

**MECH5400 Foundations of Mechanical Design 1**

**Engineering and Information Technologies**

**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%)  **Campus:** Camperdown/Darlington  **Mode of delivery:** Normal (lecture/lab/tutorial) Day

**Associated degrees:** Grad Dip E (Prof Eng), M P E.

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**

**AMME5501 Foundations: System Dynamics and Control**

**Engineering and Information Technologies**

**Credit points:** 6  **Session:** Semester 1  **Classes:** Lectures: 2 hours per week; Tutorials: 3 hours per week.  **Assumed knowledge:** AMME5500  **Assessment:** Through semester assessment (40%), Final Exam (60%)  **Campus:** Camperdown/Darlington  **Mode of delivery:** Normal (lecture/lab/tutorial) Day

**Associated degrees:** M P E.

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.

**MECH5261 Foundations of Fluid Mechanics**

**Engineering and Information Technologies**

**Credit points:** 6  **Session:** Semester 1  **Classes:** 2 hours of lectures and 2 hours of tutorials per week.  **Prohibitions:** MECH5261  **Assumed knowledge:** Linear Mathematics, Vector Calculus, Differential Equations and Fourier Series; Thermo Fluids fundamentals  **Assessment:** Through semester assessment (60%), Final Exam (40%)  **Campus:** Camperdown/Darlington  **Mode of delivery:** Normal (lecture/lab/tutorial) Day

**Note:** Department permission required for enrolment.

**Associated degrees:** Grad Dip E (Prof Eng), M P E.

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.

MECH5362 Foundations of Materials 2
Engineering and Information Technologies
Credit points: 6 Session: Semester 1 Classes: 3 hours of lectures and 2 hours of tutorials per week. Prerequisites: AMME5302 Prohibitions: MECH5362 Assumed knowledge: Mechanics of solids: statics, stress, strain analysis; materials science; principles of developing new technologies; to invent new manufacturing systems for direct engineering applications; 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
MECH5262 Foundations of Thermal Engineering
Engineering and Information Technologies
Credit points: 6 Session: Semester 2 Classes: 3 hours of lectures and 2 hours of tutorials per week. Prerequisites: AMME5300 Prohibitions: MECH5360 Assumed knowledge: Fundamentals of thermodynamics are needed to begin this more advanced course. Assessment: Through semester assessment(60%), Final Exam (40%) Campus: Camperdown/Darlington Mode of delivery: Normal (lecture/lab/tutorial) Day
Associated degrees: M P E.
This unit aims to develop an understanding of: the principles of thermodynamic cycles, gas mixtures, combustion and thermochistry 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, humidly, psychrometry, air-conditioning, combustion: stoichiometry, gas analysis, combustion, thermochromy, 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.
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

AMME5601

Professional Engineering

Engineering and Information Technologies

Credit points: 6 Session: Semester 1 Classes: Lectures 2 hrs per week and tutorials 2 hrs per week. Assumed knowledge: Experience in a professional engineering related field is desirable to aid in group tutorial discussion. Assessment: Through semester assessment (100%) Campus: Camperdown/Darlington Mode of delivery: Normal (lecture/lab/tutorial) Day

Associated degrees: M E, M P E.

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

Engineering and Information Technologies

Session: Semester 1, Semester 2 Classes: no formal classes Assessment: Students will write reports on their industrial experiences and maintain a portfolio of work. Portfolio (100%) Campus: Camperdown/Darlington Mode of delivery: Professional Practice

Note: Students should have completed one year of their MPE program before enrolling in this unit.

Associated degrees: M P E.

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. It is expected that this thesis will represent a significant contribution to new knowledge; nor is it expected that theses will resolve great intellectual problems. The timeframe available for the thesis is simply too short to permit students to tackle complex or difficult problems. Indeed, a key aim of the thesis is to specify a research topic that arises 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.

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

ENGG5103

Safety Systems and Risk Analysis

Engineering and Information Technologies

Credit points: 6 Session: Semester 2 Classes: 2hrs of Lectures per week, 2hrs of Tutorials per week. Assessment: Through semester assessment (100%) Campus: Camperdown/Darlington Mode of delivery: Normal (lecture/lab/tutorial) Day

Associated degrees: Grad Cert E, M P E.

To develop an understanding of principles of safety systems management and risk management, as applied to engineering
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.

Candidates achieving an average mark of 70% or higher over 48 credit points should demonstrate their research skills. Equally important is that the task not be so demanding as to elude completion.

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.

ammE5021

Capstone Project B

Engineering and Information Technologies

Credit points: 6
Session: Semester 1, Semester 2
Classes: Independent work
Corequisites: AMME5020
Assessment: Through semester assessment (100%)
Campus: Camperdown/Darlington
Mode of delivery: Supervision
Note: Department permission required for enrolment.

Associated degrees: M E, M P E.

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. Each Capstone Project B 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 thesis itself. The final thesis must be the student's individual work, although research is sometimes conducted in the framework of a group project shared with others. Students undertaking research on this basis will need to take care in ensuring the individual quality of their own research work and the final thesis submission. The thesis will be judged on the extent and quality of the student's original work and particularly how critical, perceptive and constructive he or she has been in assessing his/her work and that of others. Students will also be required to present the results of their findings to their peers and supervisors as part of a seminar program.

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

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

ammE5101

Energy and the Environment

Engineering and Information Technologies

Credit points: 6
Session: Semester 1
Classes: 2hrs lectures and 2hrs tutorials per week.
Assessment: Through semester assessment (100%)
Campus: Camperdown/Darlington
Mode of delivery: Normal (lecture/lab/tutorial) Day
Note: Department permission required for enrolment.

Associated degrees: Grad Cert E, M P E, PG Coursework Exchange.

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.

ammE5202

Advanced Computational Fluid Dynamics

Engineering and Information Technologies

Credit points: 6
Session: Semester 1
Classes: Lectures: 1 hour per week; Tutorials: 1 hour per week; Laboratory Sessions: 2 hours per week
Assumed knowledge: Partial differential equations; Finite difference methods; Taylor series; Basic fluid mechanics including pressure, velocity, boundary layers,
this course is to provide a comprehensive overview of the nature and the planet are facing and how these have given rise to the practice of environmental and sustainability challenges that Australia and. The aim of this UoS is to give students an insight and 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. A set of laboratory tasks will take the student through a series of increasingly complex flow simulations, requiring an understanding of the basic theory of computational fluid dynamics (CFD). The laboratory tasks will be complemented by a series of lectures in which the basic theory is covered, including: governing equations; finite difference methods accuracy and stability for the advection equation, diffusion equation; direct and iterative solution techniques; solution of the full Navier-Stokes equations; turbulent flow; Cartesian tensors; turbulence models.

AMME5271
Computational Nanotechnology

Engineering and Information Technologies

Credit points: 6
Session: Semester 2
Classes: Lectures; 2 hours per week;
Tutorials: 3 hours per week
Assumed knowledge: Students are required to have an understanding of basic principles of Newtonian mechanics, physics and chemistry, fluid mechanics and solid mechanics. General knowledge of how to operate a computer and work with different software is also required.
Assessment: Through semester assessment (100%) Campus: Camperdown/Darlington Mode of delivery: Normal (lecture/lab/tutorial) Day
Note: Department permission required for enrolment.

Associated degrees: B E, M E, M P E.

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, nanotechnology, nanobiology 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.

ENGG5020
Sustainable Design, Eng and Mgt

Engineering and Information Technologies

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

Associated degrees: Grad Cert E, M P E.

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)

Engineering and Information Technologies

Credit points: 6
Session: Semester 2
Classes: 2 hours of lectures and 1 hour of tutorials per week
Prerequisites: MECH3260 or MECH3261 Prohibitions: MECH4255
Assessment: Through semester assessment (50%), Final Exam (40%)
Campus: Camperdown/Darlington Mode of delivery: Normal (lecture/lab/tutorial) Day

Associated degrees: B E, Grad Cert E, M P E.

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 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

Engineering and Information Technologies

Credit points: 6
Session: Semester 2
Classes: 2 hours of lectures and 1 hour of tutorials per week
Prerequisites: MECH3262 or MECH3260 and (MECH3261 or MECH3261) Prohibitions: MECH4255
Assessment: Through semester assessment (60%), Final Exam (40%)
Campus: Camperdown/Darlington Mode of delivery: Normal (lecture/lab/tutorial) Day

Associated degrees: B E, Grad Cert E, M P E.

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

Engineering and Information Technologies

Credit points: 6
Session: Semester 2
Classes: 2 hours of lectures and 1 hour of tutorials per week
Prerequisites: MECH3262 or MECH3260 and (MECH3261 or MECH3261) Prohibitions: MECH4255
Assessment: Through semester assessment (60%), Final Exam (40%)
Campus: Camperdown/Darlington Mode of delivery: Normal (lecture/lab/tutorial) Day

Associated degrees: B E, Grad Cert E, M P E.

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.
Engineering and Information Technologies

Credit points: 6 Session: Semester 2 Classes: 2 hours of lectures and 3 hours of tutorials per week. Prerequisites: MECH3252 or MECH3260 Assumed knowledge: The course 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%) Campus: Camperdown/Darlington Mode of delivery: Normal (lecture/lab/tutorial) Day

Associated degrees: B E, Grad Cert E, M P E.

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

AERO5301

Applied Finite Element Analysis

Engineering and Information Technologies

Credit points: 6 Session: Semester 1 Classes: 2.5 hours of lectures and 3 hours of workgroup session per week Prerequisites: AERO5310 OR MECHS361 Assumed knowledge: AERO5301 or BE in area of Aerospace Engineering or related Engineering field. Assessment: Through semester assessment (55%), Final Exam (45%) Campus: Camperdown/Darlington Mode of delivery: Normal (lecture/lab/tutorial) Day

Associated degrees: B E, Grad Cert E, M P E.


AMME5271

Computational Nanotechnology

Engineering and Information Technologies

Credit points: 6 Session: Semester 2 Classes: Lectures: 2 hours per week; Tutorials: 3 hours per week. Assumed knowledge: Students are required to have an understanding of basic principles of Newtonian mechanics, physics and chemistry, fluid mechanics and solid mechanics. General knowledge of how to operate a computer and work with different software is also required. Assessment: Through semester assessment (100%) Campus: Camperdown/Darlington Mode of delivery: Normal (lecture/lab/tutorial) Day

Note: Department permission required for enrolment.

Associated degrees: B E, M E, M P E.

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.

AMME5961

Biomaterials Engineering

Engineering and Information Technologies

Credit points: 6 Session: Semester 2 Classes: Lectures: 3 hours per week. Assumed knowledge: For 6 credit point students: 3 years full-time equivalents of senior engineering science. For 4 credit point students: recommended 3 years full-time equivalents of senior engineering science. Assessment: Through semester assessment (80%), Final Exam (20%) Campus: Camperdown/Darlington Mode of delivery: Normal (lecture/lab/tutorial) Day

Associated degrees: M E, M P E.

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.

ENGS5202

Sustainable Design, Eng and Mgt

Engineering and Information Technologies

Credit points: 6 Session: Semester 1 Classes: 2 lectures per week, tutorials 2 hours per week and projects and self assisted learning (4 hours per 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%) Campus: Camperdown/Darlington Mode of delivery: Normal (lecture/lab/tutorial) Day

Associated degrees: Grad Cert E, M P E.

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, technolgies that minimise energy and water consumption, consider recycling and reducing waste disposal using advanced design will also be discussed during this course.

MECH3304

Materials Failure

Engineering and Information Technologies

Credit points: 6 Session: Semester 2 Classes: Lecture 1 hour per week, Tutorial 1 hour per week, Laboratory 3 hours per week. Assumed knowledge: Fundamental knowledge in materials science and engineering: 1) atomic and crystal structures 2) metallurgy 3) structure-property relationship 4) mechanics of engineering materials 5) solid mechanics. Assessment: Through semester assessment (100%) Campus: Camperdown/Darlington Mode of delivery: Normal (lecture/lab/tutorial) Day

Note: An elective unit of study for the degree of Master of Engineering

Associated degrees: Engineering PG Non-Degree, Grad Cert E, M P E, PG Coursework Exchange.

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.

MECH3305

Smart Materials
Engineering and Information Technologies

Optimisation Methods in Engineering

AERO5010

- Credit points: 6
- Session: Semester 2
- Classes: 1 hour of lectures, 1 hour of tutorials and 3 hours of laboratory work per week.
- Assumed knowledge: BE in the area of Aerospace or related Engineering field.
- Assessment: Through semester assessment (100%)
  - Campus: Camperdown/Darlington
  - Mode of delivery: Normal (lecture/lab/tutorial)
  - Day: Note: Department permission required for enrolment.

- Associated degrees: Grad Cert E, M P E, PG Coursework Exchange.
  - 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.

MECH5310

Advanced Engineering Materials

- Credit points: 6
- Session: Semester 1
- Classes: 2 hours of lectures and 3 hours of tutorials per week.
- Prohibitions: MECH4310
- Assessment: Through semester assessment (100%)
  - Campus: Camperdown/Darlington
  - Mode of delivery: Normal (lecture/lab/tutorial)

- Associated degrees: B E, Grad Cert E, M P E.
  - 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: 2 hrs of lectures, 2hrs of tutorial per week.
- Assumed knowledge: Eng Mechanics, balance of forces and moments Mechanics of Solids, 2 and 3 dimensional stress and strain
- Engineering Dynamics - dynamic forces and moments.
- Mechanical Design, approach to design problems and report writing, and preparation of engineering drawing Mechanical design intermediate, means of applying fatigue analysis to a wide range of machine components
- Assessment: Through semester assessment (100%)
  - Campus: Camperdown/Darlington
  - Mode of delivery: Normal (lecture/lab/tutorial)

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

Design and Manufacturing

AERO5001

Optimisation Methods in Engineering

- Credit points: 6
- Session: Semester 2
- Classes: Project work - own time.
- Assumed knowledge: BE in the area of Aerospace or related Engineering field.
- Assessment: Through semester assessment (100%)
  - Campus: Camperdown/Darlington
  - Mode of delivery: Normal (lecture/lab/tutorial)
  - Day: Note: Department permission required for enrolment.

- Associated degrees: Grad Cert E, M P E, PG Coursework Exchange.
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
Engineering and Information Technologies
Credit points: 6 Session: Semester 2 Classes: Project Work in Class: 5 hours per week. Assumed knowledge: Some knowledge of product and process design is assumed and a basic understanding of business activity will also be helpful. Assessment: Through semester assessment (100%) Campus: Camperdown/Darlington Mode of delivery: Normal (lecture/lab/tutorial) Day
Associated degrees: Grad Cert E, M P E.
This unit cover the following topics: 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
Engineering and Information Technologies
Credit points: 6 Session: Semester 2 Classes: Lectures: 2 hours per week; Tutorials: 2 hours per week; Laboratory: 3 hours per semester. Assessment: Through semester assessment (100%) Campus: Camperdown/Darlington Mode of delivery: Normal (lecture/lab/tutorial) Day
Associated degrees: B E, Grad Cert E, M P E.
The aim of this course is to enhance the student’s manufacturing engineering skills in the CAD/CAM area. The course focuses on CNC milling as a manufacturing automation process applied to a project. The management, planning and marketing of a typical engineering project are also discussed. Objectives: Through integrated project-based learning and hands-on-machine training, you will learn
* How to successfully complete a CAD/CAM and CNC mill based project.
* Manufacturing management and system skills, such as product planning, manufacturing sequence, time and cost;
* The science in designing and selecting a manufacturing method.
* How to effectively present your ideas and outcomes using oral and report based methods.
It is expected that through your hard work in the semester, you will find
* Enhanced learning by real-world problems.
* Improved comprehensive skill in manufacturing design.

AMME5912
Crash Analysis and Design
Engineering and Information Technologies
Credit points: 6 Session: Semester 1 Classes: Lectures 2 hours per week, Tutorials 2 hours per week. Assumed knowledge: Computer Aided Drafting, Basic FEA principles and Solid Mechanics. Assessment: Through semester assessment (100%) Campus: Camperdown/Darlington Mode of delivery: Normal (lecture/lab/tutorial) Day
Associated degrees: B E, Grad Cert E, M P E.
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.

Engineering and Information Technologies
Credit points: 6 Session: Semester 1 Classes: 2 lectures per week, tutorials 2 hour per week and projects and self assisted learning (4 hours per week) Assumed knowledge: General knowledge in science and calculus and understanding of basic principles of chemistry, physics and mechanics Assessment: Through semester assessment (70%), Final Exam (30%) Campus: Camperdown/Darlington Mode of delivery: Normal (lecture/lab/tutorial) Day
Associated degrees: Grad Cert E, M P E.
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
Engineering and Information Technologies
Credit points: 6 Session: Semester 1 Classes: 2 hrs of lectures, 2hrs of tutorial per week. Assumed knowledge: Eng Mechanics, balance of forces and moments Mechanics of Solids, 2 and 3 dimensional stress and strain Engineering Dynamics - dynamic forces and moments. Mechanical Design, approach to design problems and report writing, and preparation of engineering drawing Mechanical design intermediate, means of applying fatigue analysis to a wide range of machine components Assessment: Through semester assessment (100%) Campus: Camperdown/Darlington Mode of delivery: Normal (lecture/lab/tutorial) Day
Associated degrees: B E, Grad Cert E, M P E.
This UoS utilises assumed theoretical knowledge and skills to elucidate the stresses and strains that exit in the different categories of machine parts. It sets out to make the students familiar with the simplifications that are applied to arrive at the analytic expressions commonly used to analyse each individual categories parts. These simplifications usually begin by assuming that only particular types of loads are carried by teh parts in that category. The resulting analyses provide approximations to the actual stresses. It is possible to have different degrees of simplifications, requiring more or less work, giving better or poorer approximations. Should a part be used to carry loads that were not allowed for in the traditional method then some more appropriate method must be found or developed. An important aspect is to make the student practiced in a range of modern concepts, techniques and tools, and to be made aware of their strengths and limitations.
This UoS teaches the student how to recognise where and how their theoretical skills can be applied to the practical situations that they may encounter in this field of design.
Options may be provided in the choice of design assignments. Biomedical engineering and vehicle design problems may be provided as options to more general machine design problems.

Mechatronics
AERO5760
Spacecraft and Satellite Design
Engineering and Information Technologies
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%) Campus: Camperdown/Darlington Mode of delivery: Normal (lecture/lab/tutorial) Day

ENGS5202
Sustainable Design, Eng and Mgt
AMME5520
Advanced Control and Optimisation
Engineering and Information Technologies
Credit points: 6
Session: Semester 1 Classes: 2hr lectures per week; 2h tutorial per week
Prerequisites: AMME3500 OR AMME5501
Assessment: Through semester assessment (50%), Final exam (50%)
Campus: Camperdown/Darlington
Mode of delivery: Normal (lecture/lab/tutorial) Day
Associated degrees: B E, Grad Cert E, M P E.

This course aims to introduce 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.

AMME5602
Product Life Cycle Design
Engineering and Information Technologies
Credit points: 6
Session: Semester 2 Classes: Project Work in Class: 5 hours per week
Assumed knowledge: Some knowledge of product and process design is assumed and a basic understanding of business activity will also be helpful.
Assessment: Through semester assessment (100%)
Campus: Camperdown/Darlington
Mode of delivery: Normal (lecture/lab/tutorial) Day
Associated degrees: Grad Cert E, M P E.

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 noised-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
Engineering and Information Technologies
Credit points: 6
Session: Semester 1 Classes: 2 lectures per week, tutorials 2 hour per week and projects and self assisted learning (4 hours per week)
Assumed knowledge: General knowledge in science and calculus and understanding of basic principles of chemistry, physics and mechanics
Assessment: Through semester assessment (70%), Final Exam (30%)
Campus: Camperdown/Darlington
Mode of delivery: Normal (lecture/lab/tutorial) Day
Associated degrees: Grad Cert E, M P E.

The aim of this course is to enhance the student’s manufacturing engineering skills in the CAD/CAM area. The course focuses on CNC milling as a manufacturing automation process applied to a project. The management, planning and marketing of a typical engineering project are also discussed.

Objectives: Through integrated project-based learning and hands-on-machine training, you will learn

* How to successfully complete a CAD/CAM and CNC mill based project.
* Manufacturing management and system skills, such as product planning, manufacturing sequence, time and cost;

* The science in designing and selecting a manufacturing method.
* How to effectively present your ideas and outcomes using oral and report based methods.

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

* Improved comprehensive skill in manufacturing design.
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
Engineering and Information Technologies
Credit points: 6
Session: Semester 1
Classes: 2hrs lectures and 3hrs of laboratory work per week
Prohibitions: MTRX4700
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%).
Campus: Camperdown/Darlington
Mode of delivery: Normal (lecture/lab/tutorial) Day

Associated degrees: B E, Grad Cert E, M P E.

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

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

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

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 units AMME5021 and 6 cp of elective units.

AMME5020
Capstone Project A
Engineering and Information Technologies
Credit points: 6
Session: Semester 1, Semester 2
Classes: Independent project work.
Prerequisites: 48 cp from MPE degree program or 24 cp from the ME program.
Assessment: Through semester assessment (100%)
Campus: Camperdown/Darlington
Mode of delivery: Supervision
Note: Department permission required for enrolment.

Associated degrees: M E, M P E.

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.
Students are asked to write a thesis based on a research project, which is very often related to some aspect of a staff member's research interests. Some projects will be experimental in nature, others may involve computer-based simulation, feasibility studies or the design, construction and testing of equipment. Direction of thesis work may be determined by the supervisor or be of an original nature, but in either case the student is responsible for the execution of the practical work and the general layout and content of the thesis itself. The final thesis must be the student's individual work, although research is sometimes conducted in the framework of a group project shared with others. Students undertaking research on this basis will need to take care in ensuring the individual quality of their own research work and the final thesis submission. The thesis will be judged on the extent and quality of the student’s original work and particularly how critical, perceptive and constructive he or she has been in assessing his/her work and that of others. Students will also be required to present the results of their findings to their peers and supervisors as part of a seminar program.

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

AMME5021
Capstone Project B
Engineering and Information Technologies

Credit points: 6
Session: Semester 1, Semester 2
Classes: Independent project work
Corequisites: AMME5020
Assessment: Through semester assessment (100%)
Campus: Camperdown/Darlington
Mode of delivery: Supervision

Note: Department permission required for enrolment.

Associated degrees: M E, M P E.

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 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. 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.

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AMME5022
Capstone Project B Extended
Engineering and Information Technologies

Credit points: 12
Session: Semester 1, Semester 2
Classes: Self paced research
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%)
Campus: Camperdown/Darlington
Mode of delivery: Supervision

Note: Department permission required for enrolment.

Associated degrees: M E, M P E.

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 timeframe available for the thesis is simply too short to permit students to tackle complex or difficult problems. Indeed, a key aim of the thesis is to specify a research topic that arouses sufficient intellectual curiosity, and presents an appropriate range and diversity of technical and conceptual challenges, while remaining manageable and allowing achievable outcomes within the time and resources available. It is important that the topic be of sufficient scope and complexity to allow a student to learn their craft and demonstrate their research skills. Equally imperative is that the task not be so demanding as to elude completion.
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 AMME5222 and AMME5223 (total 24 cp) in place of Capstone Project units and 12 cp of elective units.

**AMME5222**
Dissertation A
Engineering and Information Technologies

- **Credit points:** 12
- **Session:** Semester 1, Semester 2
- **Classes:** no formal classwork
- **Prohibitions:** AMME5020, AMME5021, ENGG5220, ENGG5221
- **Assessment:** Through semester assessment (100%)
- **Campus:** Camperdown/Darlington
- **Mode of delivery:** Supervision
- **Note:** Department permission required for enrolment.

**Associated degrees:** M E, M P E.

**Aim:** 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.

**AMME5223**
Dissertation B
Engineering and Information Technologies

- **Credit points:** 12
- **Session:** Semester 1, Semester 2
- **Classes:** no formal classwork
- **Prohibitions:** AMME5020, AMME5021, ENGG5220, ENGG5221
- **Assessment:** Through semester assessment (100%)
- **Campus:** Camperdown/Darlington
- **Mode of delivery:** Supervision
- **Note:** Department permission required for enrolment.

**Associated degrees:** M E, M P E.

**Aim:** 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.

Exchange units

Exchange units require the approval of the Program Director. With approval, up to 12 credit points of Exchange units may be taken in place of other units, towards the requirements of the degree.

**ENGG5231**
Engineering Graduate Exchange A
Engineering and Information Technologies

- **Credit points:** 6
- **Session:** Int January, Int July
- **Classes:** overseas short-course
- **Prerequisites:** Permission from faculty and school.
- **Assessment:** Through semester assessment (100%)
- **Campus:** Camperdown/Darlington
- **Mode of delivery:** Normal (lecture/lab/tutorial) Day
- **Note:** Department permission required for enrolment.

**Associated degrees:** M E, M Inf Tech, M Inf Tech Man, M P E, M P L, M P M.

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.

**ENGG5232**
Engineering Graduate Exchange B
Engineering and Information Technologies

- **Credit points:** 6
- **Session:** Int January, Int July
- **Classes:** overseas short-course
- **Prerequisites:** Permission from faculty and school.
- **Assessment:** Through
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 http://www.engineeraustralia.org.au/.

Course requirements
Candidates for the Master of Professional Engineering (Power 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

## 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

<table>
<thead>
<tr>
<th>Unit of study</th>
<th>Credit points</th>
<th>A: Assumed knowledge</th>
<th>P: Prerequisites</th>
<th>C: Corequisites</th>
<th>N: Prohibition</th>
<th>Session</th>
</tr>
</thead>
<tbody>
<tr>
<td>COMP5212 Software Construction</td>
<td>6</td>
<td>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. Note: Department permission required for enrolment</td>
<td></td>
<td></td>
<td></td>
<td>Semester 1</td>
</tr>
<tr>
<td>ELEC5710 Electrical &amp; Electronic Engi (Fund)</td>
<td>6</td>
<td>A Basic knowledge of differentiation &amp; integration, and HSC Physics</td>
<td></td>
<td></td>
<td></td>
<td>Semester 1</td>
</tr>
<tr>
<td>ELEC5722 Foundations of Digital Systems Design</td>
<td>6</td>
<td>A ELEC1601. This unit of study assumes some knowledge of digital data representation and basic computer organisation.</td>
<td></td>
<td></td>
<td></td>
<td>Semester 1</td>
</tr>
<tr>
<td>ENGG5011 Foundation Engineering Studies A</td>
<td>6</td>
<td>A HSC Mathematics extension 1 or 2</td>
<td></td>
<td></td>
<td></td>
<td>Semester 1 Semester 2</td>
</tr>
</tbody>
</table>

#### Year One - Semester Two

<table>
<thead>
<tr>
<th>Unit of study</th>
<th>Credit points</th>
<th>A: Assumed knowledge</th>
<th>P: Prerequisites</th>
<th>C: Corequisites</th>
<th>N: Prohibition</th>
<th>Session</th>
</tr>
</thead>
<tbody>
<tr>
<td>ELEC5711 Foundations of Computer Systems</td>
<td>6</td>
<td>A Ohm's Law and Kirchhoff'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 ELEC2104</td>
<td></td>
<td></td>
<td></td>
<td>Semester 2</td>
</tr>
<tr>
<td>ELEC5720 Foundations Electronic Devs and Circuits</td>
<td>6</td>
<td>A Basic knowledge of differentiation &amp; integration, differential equations, and linear algebra.</td>
<td></td>
<td></td>
<td></td>
<td>Semester 2</td>
</tr>
<tr>
<td>ELEC5721 Foundations of Signals and Systems</td>
<td>6</td>
<td>A ELEC1103. Understanding of the fundamental concepts and building blocks of electrical and electronics circuits and aspects of professional project management, team work, and ethics. N COCS1001 and COCS1901</td>
<td></td>
<td></td>
<td></td>
<td>Semester 2</td>
</tr>
</tbody>
</table>

#### Year Two - Semester One

<table>
<thead>
<tr>
<th>Unit of study</th>
<th>Credit points</th>
<th>A: Assumed knowledge</th>
<th>P: Prerequisites</th>
<th>C: Corequisites</th>
<th>N: Prohibition</th>
<th>Session</th>
</tr>
</thead>
<tbody>
<tr>
<td>ENGG5202 Sustainable Design, Eng and Mgt</td>
<td>6</td>
<td>A General knowledge in science and calculus and understanding of basic principles of chemistry, physics and mechanics</td>
<td></td>
<td></td>
<td></td>
<td>Semester 1</td>
</tr>
<tr>
<td>ENGG5204 Engineering Professional Practice</td>
<td>6</td>
<td>A Competences and experience in engineering obtained during an accepted engineering degree</td>
<td></td>
<td></td>
<td></td>
<td>Semester 1</td>
</tr>
</tbody>
</table>

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

<table>
<thead>
<tr>
<th>Unit of study</th>
<th>Credit points</th>
<th>A: Assumed knowledge</th>
<th>P: Prerequisites</th>
<th>C: Corequisites</th>
<th>N: Prohibition</th>
<th>Session</th>
</tr>
</thead>
<tbody>
<tr>
<td>ENGG5217 Practical Experience</td>
<td></td>
<td>Students should have completed one year of their MPE program before enrolling in this unit.</td>
<td></td>
<td></td>
<td></td>
<td>Semester 1 Semester 2</td>
</tr>
<tr>
<td>ELEC5020 Capstone Project A</td>
<td>6</td>
<td>P 48 credits from MPE degree program Note: Department permission required for enrolment</td>
<td></td>
<td></td>
<td></td>
<td>Semester 2</td>
</tr>
</tbody>
</table>

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 recommened electives with ELEC5222 Dissertation A.
## Unit of study table

<table>
<thead>
<tr>
<th>Unit of study</th>
<th>Credit points</th>
<th>A: Assumed knowledge</th>
<th>P: Prerequisites</th>
<th>C: Corequisites</th>
<th>N: Prohibition</th>
<th>Session</th>
</tr>
</thead>
</table>

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 speciality units, 12 credit points of Electives and 12 credit points of Management Electives across Year Two and Year Three.

### Year Three - Semester Two

<table>
<thead>
<tr>
<th>ELEC5021</th>
<th>Capstone Project B</th>
<th>6</th>
<th>C ELEC5020</th>
<th>Note: Department permission required for enrolment</th>
<th>Semester 1</th>
<th>Semester 2</th>
</tr>
</thead>
</table>

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 speciality 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.

<table>
<thead>
<tr>
<th>ELEC5732</th>
<th>Foundations of Electricity Networks</th>
<th>6</th>
<th>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</th>
<th>N ELEC5203</th>
<th>This Unit of Study is only available to Master of Professional Engineering degree students with a Non- Electrical Engineering Bachelor's degree.</th>
<th>Semester 1</th>
<th>Semester 2</th>
</tr>
</thead>
</table>

| ELEC5733 | Foundations of Power Electronics & Apps | 6 | A Differential equations, linear algebra, complex variables, analysis of linear circuits, Fourier theory applied to periodic and non-periodic signals. Software such as MATLAB to perform signal analysis and filter design. Familiarity with the use of basic laboratory equipment such as oscilloscope, function generator, power supply, etc. | Semester 1 |
|----------|----------------------------------------|---|------------------------|-----------------|-----------------------------------------------|----------|

| ELEC5734 | Foundations Elec Energy & Conversion Sys | 6 | A Following concepts are assumed knowledge for this unit of study: familiarity with circuit theory, electronic devices, ac power, capacitors and inductors, and electric circuits such as three-phase circuits and circuits with switches, the use of basic laboratory equipment such as oscilloscope and power supply | Semester 2 |
|----------|----------------------------------------|---|------------------------|-----------------|-----------------------------------------------|----------|

| ELEC5735 | Foundations of Control | 6 | A Specifically the following concepts are assumed knowledge for this unit: familiarity with Basic Algebra, Differential and Integral Calculus, Physics; solution of linear differential equations, Matrix Theory, eigenvalues and eigenvectors; linear electrical circuits, ideal op-amps; continuous linear time-invariant systems and their time and frequency domain representations, Laplace transform, Fourier transform. ELEC2302 and MATH2061 or equivalent. | 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, 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 | P ELEC3203. The following previous knowledge is assumed for this unit: Circuit analysis techniques, electricity networks, power system fundamentals. | 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 Fundamentals of Power Electronics and Applications | Semester 2 |
|----------|----------------------------------------|---|------------------------|-----------------|-----------------------------------------------|----------|

| ELEC5208 | Intelligent Electricity Networks | 6 | A Fundamentals of Electricity Networks, Control Systems and Telecommunications | Semester 1 |
|----------|-----------------------------------|---|------------------------|-----------------|-----------------------------------------------|----------|

<table>
<thead>
<tr>
<th>ELEC5211</th>
<th>Power Systems Dynamics and Control</th>
<th>6</th>
<th>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.</th>
<th>P ELEC3203 or ELEC5732 or equivalent</th>
<th>Note: Department permission required for enrolment</th>
<th>Semester 1</th>
</tr>
</thead>
</table>

| ELEC5212 | Power Systems Planning and Markets | 6 | P ELEC3203 or ELEC5732 or equivalent | 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. | 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 Communications) and (ELEC3405 Communications Electronics and Photonics) | 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 or equivalent | Semester 2 |
|----------|--------------------------|---|------------------------|-----------------|-----------------------------------------------|----------|
Management Elective units
Candidates must complete 12 credit points from the following Management Elective units of study.

<table>
<thead>
<tr>
<th>Unit of study</th>
<th>Credit points</th>
<th>A: Assumed knowledge</th>
<th>P: Prerequisites</th>
<th>C: Corequisites</th>
<th>N: Prohibition</th>
<th>Session</th>
</tr>
</thead>
<tbody>
<tr>
<td>ENGG5203 Quality Engineering and Management</td>
<td>6</td>
<td>A First degree in Engineering or a related discipline,</td>
<td></td>
<td></td>
<td></td>
<td>Semester 2</td>
</tr>
<tr>
<td>ENGG5205 Professional Practice in PM</td>
<td>6</td>
<td>A Basic engineering or science knowledge. At least 2-3 years of work experience preferred. 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).</td>
<td>No prerequisite or assumed knowledge.</td>
<td></td>
<td></td>
<td>Semester 1</td>
</tr>
<tr>
<td>ENGG5214 Management of Technology</td>
<td>6</td>
<td>A Sound competence in all aspects of engineering, and some understanding of issues of engineering management</td>
<td></td>
<td></td>
<td></td>
<td>Semester 2, Winter Main</td>
</tr>
<tr>
<td>ENGG5215 International Eng Strategy &amp; Operations</td>
<td>6</td>
<td>A Sound competence in all aspects of engineering, and some understanding of issues of engineering management and globalisation</td>
<td></td>
<td></td>
<td></td>
<td>Semester 2</td>
</tr>
<tr>
<td>ENGG5216 Management of Engineering Innovation</td>
<td>6</td>
<td>A Sound competence in all aspects of engineering, and some understanding of issues of</td>
<td></td>
<td></td>
<td></td>
<td>Semester 1</td>
</tr>
</tbody>
</table>

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.

<table>
<thead>
<tr>
<th>Unit of study</th>
<th>Credit points</th>
<th>A: Assumed knowledge</th>
<th>P: Prerequisites</th>
<th>C: Corequisites</th>
<th>N: Prohibition</th>
<th>Session</th>
</tr>
</thead>
<tbody>
<tr>
<td>ELEC5020 Capstone Project A</td>
<td>6</td>
<td>P 48 credits from MPE degree program</td>
<td>Note: Department permission required for enrolment</td>
<td></td>
<td></td>
<td>Semester 1, Semester 2</td>
</tr>
<tr>
<td>ELEC5021 Capstone Project B</td>
<td>6</td>
<td>C ELEC5020</td>
<td>Note: Department permission required for enrolment</td>
<td></td>
<td></td>
<td>Semester 1, Semester 2</td>
</tr>
<tr>
<td>ELEC5022 Capstone Project B Extended</td>
<td>12</td>
<td>P 42 credit points in the Master of Engineering and WAM &gt;70, or 66 credit points in the Master of Professional Engineering and WAM &gt;70 or exemption</td>
<td>Note: Department permission required for enrolment</td>
<td></td>
<td></td>
<td>Semester 1, Semester 2</td>
</tr>
</tbody>
</table>

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.

<table>
<thead>
<tr>
<th>Unit of study</th>
<th>Credit points</th>
<th>A: Assumed knowledge</th>
<th>P: Prerequisites</th>
<th>C: Corequisites</th>
<th>N: Prohibition</th>
<th>Session</th>
</tr>
</thead>
<tbody>
<tr>
<td>ELEC5222 Dissertation A</td>
<td>12</td>
<td>N ELEC8901, ELEC8902, ENGG5222, ENGG5223</td>
<td>Note: Department permission required for enrolment</td>
<td></td>
<td></td>
<td>Semester 1, Semester 2</td>
</tr>
<tr>
<td>ELEC5223 Dissertation B</td>
<td>12</td>
<td>N ELEC8901, ELEC8902, ENGG5222, ENGG5223</td>
<td>Note: Department permission required for enrolment</td>
<td></td>
<td></td>
<td>Semester 1, Semester 2</td>
</tr>
</tbody>
</table>

Exchange units
Exchange units require the approval of the Program Director. With approval, up to 12 credit points of Exchange units may be taken in place of other units, towards the requirements of the degree.

<table>
<thead>
<tr>
<th>Unit of study</th>
<th>Credit points</th>
<th>A: Assumed knowledge</th>
<th>P: Prerequisites</th>
<th>C: Corequisites</th>
<th>N: Prohibition</th>
<th>Session</th>
</tr>
</thead>
<tbody>
<tr>
<td>ENGG5231 Engineering Graduate Exchange A</td>
<td>6</td>
<td>P Permission from faculty and school.</td>
<td>Note: Department permission required for enrolment</td>
<td></td>
<td></td>
<td>Int January, Int July</td>
</tr>
<tr>
<td>ENGG5232 Engineering Graduate Exchange B</td>
<td>6</td>
<td>P Permission from faculty and school.</td>
<td>Note: Department permission required for enrolment</td>
<td></td>
<td></td>
<td>Int January, Int July</td>
</tr>
</tbody>
</table>

For more information on degree program requirements visit CUSP.
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

COMP5212
Software Construction

Engineering and Information Technologies

Credit points: 6 Session: Semester 1 Classes: One 2 hour lecture and one 2 hour tutorial per week. 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%) Campus: Camperdown/Darlington Mode of delivery: Normal (lecture/lab/tutorial) Day

Note: Department permission required for enrolment.

Associated degrees: B E, Grad Dip Comp, M I D M, M P E, PG Coursework Exchange.

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.

ELEC5710
Electrical & Electronic Engi (Fund)

Engineering and Information Technologies

Credit points: 6 Session: Semester 1 Classes: 3hrs lectures/labs/tutorials per week. Assumed knowledge: Basic knowledge of differentiation & integration, and HSC Physics. Assessment: Through semester assessment (50%), Final Exam (50%) Campus: Camperdown/Darlington Mode of delivery: Normal (lecture/lab/tutorial) Day

Associated degrees: M P E.

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

ELEC5722
Foundations of Digital Systems Design

Engineering and Information Technologies

Credit points: 6 Session: Semester 1 Classes: 2 hours of lectures, 2 hours of tutorials and 3 hours of laboratory work per week. Assumed knowledge: ELEC1601. This unit of study assumes some knowledge of digital data representation and basic computer organisation. Assessment: Through semester assessment (40%), Final Exam (60%) Campus: Camperdown/Darlington Mode of delivery: Normal (lecture/lab/tutorial) Day

Associated degrees: Grad Dip E (Prof Eng), M P E.

This 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.

Year One - Semester Two

ELEC5711
Foundations of Computer Systems

Engineering and Information Technologies

Credit points: 6 Session: Semester 2 Classes: 2hrs of Lectures per week, 8 hrs of project work in class per semester. Assumed knowledge: HSC Mathematics extension 1 or 2 Assessment: Through semester assessment (59%), Final Exam (41%) Campus: Camperdown/Darlington Mode of delivery: Normal (lecture/lab/tutorial) Day

Associated degrees: M P E.

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.
ELEC5720 Foundations Electronic Devs and Circuits
Engineering and Information Technologies
Credit points: 6 Session: Semester 2 Classes: 2 hours of lectures per week, and a 2 hours tutorial and 2 hours lab per fortnight. Prohibitions: ELEC2104 Assumed knowledge: Ohm's Law and Kirchoff's Laws; action of Current and Voltage sources; network analysis and the superposition theorem; Thévenin 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%). Campus: Camperdown/Darlington Mode of delivery: Normal (lecture/lab/tutorial) Day
Associated degrees: Grad Dip E (Prof Eng), M P E.

Modern Electronics has come to be known as microelectronics which refers to the Integrated Circuits (ICs) containing millions of discrete devices. This course introduces some of the basic electronic devices like diodes and different types of transistors. It also aims to introduce students the analysis and design techniques of circuits involving these discrete devices as well as the integrated circuits. Completion of this course is essential to specialize in Electrical, Telecommunication or Computer Engineering stream. The knowledge of ELEC1103 is assumed.

ELEC5721 Foundations of Signals and Systems
Engineering and Information Technologies
Credit points: 6 Session: Semester 2 Classes: 2 hours of lectures, 2 hours lab/tutorial per week and 1 hour of eLearning session per week. Assumed knowledge: Basic knowledge of differentiation & integration, differential equations, and linear algebra. Assessment: Through semester assessment (30%), Final Exam (70%) Campus: Camperdown/Darlington Mode of delivery: Normal (lecture/lab/tutorial) Day
Associated degrees: Grad Dip E (Prof Eng), M P E.

This unit aims to teach some of the basic properties of many engineering signals and systems and the necessary mathematical tools that aid in this process. The particular emphasis is on the time and frequency domain modeling of linear time invariant systems. The concepts learnt in this unit will be heavily used in many units of study (in later years) in the areas of communication, control, power systems and signal processing. A basic knowledge of differentiation and integration, differential equations, and linear algebra is assumed.

ELEC5723 Foundations of Signals and Systems
Engineering and Information Technologies
Credit points: 6 Session: Semester 2 Classes: Lecture 1 hours per week, Laboratory 3 hours per week. Prohibitions: COSC1001 and COSC1901 Assumed knowledge: ELEC1103. 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 assessment (25%), Final Exam (75%) Campus: Camperdown/Darlington Mode of delivery: Normal (lecture/lab/tutorial) Day
Associated degrees: Grad Dip E, M P E.

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.


Year Two - Semester One
ENGG5202 Sustainable Design, Eng and Mgt
Engineering and Information Technologies
Credit points: 6 Session: Semester 1 Classes: 2 lectures per week, tutorials 2 hour per week and projects and self assisted learning (4 hours per week). Assumed knowledge: General knowledge in science and calculus and understanding of basic principles of chemistry, physics and mechanics Assessment: Through semester assessment (70%), Final Exam (30%) Campus: Camperdown/Darlington Mode of delivery: Normal (lecture/lab/tutorial) Day
Associated degrees: Grad Cert E, M P E.

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
Engineering and Information Technologies
Credit points: 6 Session: Semester 1 Classes: Lecture 1 hour per week, Tutorial 1 hour per week, Workgroup 1 hour per week. Assumed knowledge: Competences and experience in engineering obtained during an accepted engineering degree Assessment: Through semester assessment (100%) Campus: Camperdown/Darlington Mode of delivery: Normal (lecture/lab/tutorial) Day
Associated degrees: Grad Dip E, M P E.

his 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.

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Year Three - Semester One

ENGG5217
Practical Experience
Engineering and Information Technologies

Session: Semester 1, Semester 2
Classes: no formal classes
Assessment: Students will write reports on their industrial experiences and maintain a portfolio of work. Portfolio (100%)
Campus: Camperdown/Darlington
Mode of delivery: Professional Practice
Note: Students should have completed one year of their MPE program before enrolling in this unit.

Associated degrees: M E, M P E.

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. 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

ELEC5020
Capstone Project A
Engineering and Information Technologies

Credit points: 6
Session: Semester 1
Prerequisites: 48 credits from MPE degree program
Assessment: Through semester assessment (100%)
Campus: Camperdown/Darlington
Mode of delivery: Supervision
Note: Department permission required for enrolment.

Associated degrees: M E, M P E.

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 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 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.

ELEC5732
Foundations of Electricity Networks
Engineering and Information Technologies

Credit points: 6
Session: Semester 1
Prerequisites: 48 credits from MPE degree program
Assessment: Through semester assessment (60%), Final Exam (40%)
Campus: Camperdown/Darlington
Mode of delivery: Normal (lecture/lab/tutorial) Day
Note: This Unit of Study is only available to Master of Professional Engineering degree students with a Non- Electrical Engineering Bachelor's degree.

Associated degrees: M E, M P E.

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.

ELEC5733
Foundations of Power Electronics & Appa Engineering and Information Technologies

Credit points: 6
Session: Semester 1
Prerequisites: 48 credits from MPE degree program
Assessment: Through semester assessment (45%), Final Exam (55%)
Campus: Camperdown/Darlington
Mode of delivery: Normal (lecture/lab/tutorial) Day
Note: This Unit of Study is only available to Master of Professional Engineering degree students with a Non- Electrical Engineering Bachelor's degree.

Associated degrees: M E, M P E.

This unit of study aims to teach the fundamentals of advanced energy conversion systems based on power electronics. It provides description of the operation principles and control of these blocks. Through
analysis and design methodologies, it delivers an in depth understanding of modern enabling technologies associated with energy conversion. Through laboratory hands-on experience on actual industrial systems, such electrical motor drives, robotic arms, and power supplies, it enhances the link between the theory and the "real" engineering world. The unit clarifies unambiguously the role these imperative technologies play in every human activity; from mobile telephone chargers to energy electricity grids; from electric vehicles and industrial automation to wind energy conversion to name just few. The following topics are covered: 

Introduction to power electronic converters and systems; applications of power electronic converters; power semiconductor devices; uncontrolled rectifiers: single- and three-phase; non-isolated dc-dc converters: buck, boost and buck-boost; isolated dc-dc converters; inverters: single- and three-phase; uninterruptible power supplies; battery chargers and renewable energy systems; electric and hybrid electric vehicles technologies, design of converters and systems.

ELEC5734 Foundations Elec Energy & Conversion Sys Engineering and Information Technologies
Credit points: 6 Session: Semester 2 Classes: 2 hours of lectures per week and 3 hours of labs and one hour of tutorial per fortnight. Assumed knowledge: Following concepts are assumed knowledge for this unit of study: familiarity with circuit theory, electronic devices, ac power, capacitors and inductors, and electric circuits such as three-phase circuits and circuits with switches, the use of basic laboratory equipment such as oscilloscope and power supply. Assessment: Through semester assessment (40%), Final Exam (60%) Mode of delivery: Normal (lecture/lab/tutorial) Day

Campus: Camperdown/Darlington Associated degrees: M P E.

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, series excitation, shunt excitation, and doubly-excited systems, transformers, single-phase; uninterruptible power supplies; battery chargers and renewable energy systems; electric and hybrid electric vehicles technologies, design of converters and systems.

ELEC5735 Foundations of Control Engineering and Information Technologies
Credit points: 6 Session: Semester 2 Classes: 2 hours of lectures and a 3 hours lab/tutorial per week. 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 transforms, Fourier transform, ELG1072 and MATH2061 or equivalent. Assessment: Through semester assessment (43%), Final Exam (57%) Mode of delivery: Normal (lecture/lab/tutorial) Day

Campus: Camperdown/Darlington Associated degrees: M P E.

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 Engineering and Information Technologies
Credit points: 6 Session: Semester 2 Classes: 2 hours of lectures and 2 hour tutorial/lab per 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; fundamentals of power electronic technologies. Assessment: Through semester assessment (40%), Final Exam (60%) Mode of delivery: Normal (lecture/lab/tutorial) Day

Campus: Camperdown/Darlington Associated degrees: B E, Grad Cert E, M P E, UG Study Abroad Program.

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 Engineering and Information Technologies
Credit points: 6 Session: Semester 1 Classes: 2 hours of lectures and a 1 hour tutorial per 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 (40%), Final Exam (60%) Mode of delivery: Normal (lecture/lab/tutorial) Day

Campus: Camperdown/Darlington Associated degrees: B E, Grad Cert E, M P E, UG Study Abroad Program.

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 unbalanced 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
Engineering and Information Technologies
Credit points: 6  Session: Semester 2  Classes: 2 hours lecture and 2 hours tutorial/lab per week. Prerequisites: ELEC3203. 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%)  Campus: Camperdown/Darlington  Mode of delivery: Normal (lecture/lab/tutorial) Day
Associated degrees: B E, Grad Cert E, M P E, UG Study Abroad Program.

ELEC5206
Sustainable Energy Systems
Engineering and Information Technologies
Credit points: 6  Session: Semester 2  Classes: 2 hours of lectures per week and 2 hours of labs and 2 hours of tutorials per fortnight. Assumed knowledge: Following concepts are assumed knowledge for this unit of study: familiarity with transformers, ac power, capacitors and inductors, electric circuits such as three-phase circuits and circuits with switches, and basic electronic circuit theory. Assessment: Through semester assessment (50%), Final Exam (50%)  Campus: Camperdown/Darlington  Mode of delivery: Normal (lecture/lab/tutorial) Day
Associated degrees: B E, B E, B A, B E, B Com, B E, B Sc; B E, LL B, Grad Cert E, M P E.

ELEC5207
Advanced Power Conversion Technologies
Engineering and Information Technologies
Credit points: 6  Session: Semester 2  Classes: 2hr Lecture per week, 1 hr of tutorial per week. Assumed knowledge: Fundamentals of Power Electronics and Applications Assessment: Through semester assessment (45%), Final Exam (55%)  Campus: Camperdown/Darlington  Mode of delivery: Normal (lecture/lab/tutorial) Day
Associated degrees: B E, Grad Cert E, M P E, PG Coursework Exchange.

The unit aims to cover advanced topics in power electronics and its 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, dc-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
Engineering and Information Technologies
Credit points: 6  Session: Semester 1  Classes: 2hr lectures per week, 1 hr of tutorial per week. Assumed knowledge: Fundamentals of Electricity Networks, Control Systems and Telecommunications Assessment: Through semester assessment (40%), Final Exam (60%)  Campus: Camperdown/Darlington  Mode of delivery: Normal (lecture/lab/tutorial) Day  Note: Department permission required for enrolment.
Associated degrees: B E, Grad Cert E, M P E.

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
Unit of study descriptions
Engineering and Information Technologies
Credit points: 6  
Session: Semester 1  
Classes: 2hr lecture per week; 2hr tutorial per week; 2hr laboratory per fortnight  
Prerequisites: ELEC3203 or ELEC5732 or equivalent  
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 (40%), Final Exam (60%)  
Campus: Camperdown/Darlington  
Mode of delivery: Normal (lecture/lab/tutorial) Day  
Note: Department permission required for enrolment.  
Associated degrees: B E, Grad Cert E, M P E.  
The unit deals with power systems modelling, analysis and simulation under transient conditions. The unit will cover the following topics:  
- 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; Voltage stability; Frequency stability; Small signal stability.  
- Power system control: Voltage control; Frequency control; Power system stabilizers; 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  
Engineering and Information Technologies  
Credit points: 6  
Session: Semester 2  
Classes: 2hr lecture per week; 2hr tutorial per week; 2hr laboratory per fortnight  
Prerequisites: ELEC3203 or ELEC5732 or equivalent  
Assessment: Through semester assessment (55%), Final Exam (45%)  
Campus: Camperdown/Darlington  
Mode of delivery: Normal (lecture/lab/tutorial) Day  
Associated degrees: B E, Grad Cert E, M P E.  
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. The increasing penetration of intermittent renewable energy sources has further increased the complexity. To equip the student with the 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 and unit commitment; Power system reliability.  
- Drivers for the restructuring of the electricity industry.  
- Electricity market design: Market structures (spot, bilateral, hybrid); Energy market; Ancillary services market.  
- Electricity industry in Australia and the National Electricity Market  
- Power system expansion planning: Transmission planning; Generation planning; Power system adequacy assessment.  
- Distribution systems: Modern developments (distributed generation, demand management).  
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).  

Elective units
Candidates must complete 12 credit points from the following Elective units of study.  

ELEC5303  
Computer Control System Design  
Engineering and Information Technologies  
Credit points: 6  
Session: Semester 1  
Classes: 2 hours of lectures and a 2 hours lab/tutorial per 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%)  
Campus: Camperdown/Darlington  
Mode of delivery: Normal (lecture/lab/tutorial) Day  
Associated degrees: B E, Grad Cert E, Grad Cert I T, M P E, PG Coursework Exchange.  
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.  
Approximating continuous time controllers. Finite word length implementations.  

ELEC5508  
Wireless Engineering  
Engineering and Information Technologies  
Credit points: 6  
Session: Semester 2  
Classes: 2 hours of lectures and a 1 hour tutorial per 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%)  
Campus: Camperdown/Darlington  
Mode of delivery: Normal (lecture/lab/tutorial) Day  
Associated degrees: B C S T (Hons), B E, B I T (Hons), Grad Cert E, Grad Cert I T, M P E, PG Coursework Exchange.  
This unit will introduce the key ideas in modern wireless telecommunications networks. It will address both physical 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-a 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  
Engineering and Information Technologies  
Credit points: 6  
Session: Semester 1  
Classes: 2 hours of lectures and 2 hours laboratory/tutorial per week.  
Assumed knowledge: (ELEC3505 Communications) and (ELEC3405 Communications Electronics and Photonics) or equivalent  
Assessment: Through semester assessment (25%), Final Exam (75%)  
Campus: Camperdown/Darlington  
Mode of delivery: Normal (lecture/lab/tutorial) Day  
Associated degrees: B C S T (Hons), B E, Grad Cert I T, M P E, PG Coursework Exchange.  
This unit will introduce the key ideas in modern wireless telecommunications networks. It will address both physical 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 multiple access, reservation-based MAC schemes, polling, spread-a 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.
Associated degrees: B E, Grad Cert E, Grad Cert I T, M P E, PG Coursework Exchange.

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

Engineering and Information Technologies

Credit points: 6 Session: Semester 2 Classes: 2 hours of lectures and 1 hour laboratory/tutorial per week. Assumed knowledge: Knowledge of digital communications, wave propagation, and fundamental optics Assessment: Through semester assessment (25%), Final Exam (75%) Campus: Camperdown/Darlington Mode of delivery: Normal (lecture/lab/tutorial) Day

Associated degrees: B E, Grad Cert E, Grad Cert I T, M P E, PG Coursework Exchange.

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, sub-carrier 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

Engineering and Information Technologies

Credit points: 6 Session: Semester 2 Classes: 2 hours lecture and 2 hours lab per week. Assumed knowledge: ELEC3305, ELEC3506, ELEC3607 and ELEC5508 or equivalent Assessment: Through semester assessment (60%), Final Exam (40%) Campus: Camperdown/Darlington Mode of delivery: Normal (lecture/lab/tutorial) Day

Associated degrees: B C S T (Hons), B E, B I T (Hons), Grad Cert E, Grad Cert I T, M P E, PG Coursework Exchange.

This unit aims to teach the fundamentals concepts associated with:

*Networked Embedded Systems, wireless sensor networks
*Wireless channel propagation and radio power consumption
*Wireless networks, ZigBee, Bluetooth, etc.
*Sensor principle, data fusion, source detection and identification
*Multiple source detection, multiple access communications.
*Network topology, routing, network information theory
*Distributed source channel coding for sensor networks
*Power-aware and energy-aware communication protocols.
*Distributed 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.

*Ability to identify the main issues and trade-offs in networked embedded systems.
*Understanding of the state-of-the-art solutions in the area
*Based on the above understanding, ability to analyze requirements and devise first-order solutions for particular networked embedded systems problems.
*Familiarization with a simulator platform and real hardware platforms for network embedded systems through the Students involvement in projects.

ELEC5614 Real-Time Computing

Engineering and Information Technologies

Credit points: 6 Session: Semester 1 Classes: 2 hours of lectures, 1 hour tutorial per week, 2 hours labs per week. 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%) Campus: Camperdown/Darlington Mode of delivery: Normal (lecture/lab/tutorial) Day

Associated degrees: B C S T (Hons), B E, B I T (Hons), Grad Cert E, Grad Cert I T, M P E, PG Coursework Exchange.

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

Engineering and Information Technologies

Credit points: 6 Session: Semester 1 Classes: 2 hours of lectures, 1 hour of tutorial and 2 hours labs per week. Assumed knowledge: A programming language, basic maths. Assessment: Through semester assessment (50%), Final Exam (50%) Campus: Camperdown/Darlington Mode of delivery: Normal (lecture/lab/tutorial) Day

Associated degrees: B C S T (Hons), B E, B I T (Hons), Grad Cert E, Grad Cert I T, M P E, PG Coursework Exchange.

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  
Engineering and Information Technologies  
Credit points: 6  
Session: Semester 2  
Classes: 2 hours lectures, 1 hour of tutorial and 2 hours of lab/project work per week.  
Assumed knowledge: A programming language, basic maths  
Assessment: Through semester assessment (50%), Final Exam (50%)  
Campus: Camperdown/Darlington  
Mode of delivery: Normal (lecture/lab/tutorial) Day  
Note: Department permission required for enrolment.  
Associated degrees: B E, B I T, Grad Cert E, M P E.  

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 internal 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 SOE and strengthens a key area in the program.

ELEC5621  
Digital Systems Design  
Engineering and Information Technologies  
This unit of study is not available in 2014  
Credit points: 6  
Session: Semester 2  
Classes: Lecture 2 hours per week, Laboratory 3 hours per week.  
Assumed knowledge: Basic knowledge of digital logic, computer architecture and microprocessor systems is required. Equivalent to ELEC3602 and ELEC3603.  
Assessment: Assignment (20%), Project Report (30%), Final Exam (50%)  
Campus: Camperdown/Darlington  
Mode of delivery: Normal (lecture/lab/tutorial) Day  
Note: Department permission required for enrolment.  
Associated degrees: Grad Dip E, M P E.  

This unit of study explores the design of digital computing systems using hardware description languages. Topics covered include field programmable gate array (FPGA) architectures, computer arithmetic, high-speed digital logic, interfacing, computer architectures and case studies. Emphasis will be on how to design high-performance digital systems at the algorithmic, system and logic level. Students are required to implement, test and report on a digital design of moderate complexity.

Management Elective units  
Candidates must complete 12 credit points from the following Management Elective units of study.  
ENGG5203  
Quality Engineering and Management  
Engineering and Information Technologies  
Credit points: 6  
Session: Semester 2  
Classes: Presentation 2.00 hours per week, Project Work - in class 2.00 hours per week.  
Assumed knowledge: First degree in Engineering or a related discipline.  
Assessment: Through semester assessment (100%)  
Campus: Camperdown/Darlington  
Mode of delivery: Normal (lecture/lab/tutorial) Day  
Associated degrees: Grad Dip E, M P E, M P L, M P M.  

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.

ENGS5205  
Professional Practice in PM  
Engineering and Information Technologies  
Credit points: 6  
Session: Semester 1, Semester 2  
Classes: Lecture 3hrs per week, E-Learning 1 hr per week.  
Assumed knowledge: Basic engineering or science knowledge. At least 2-3 years of work experience preferred.  
Assessment: Through semester assessment (60%), Final Exam (40%)  
Campus: Camperdown/Darlington  
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.  
Associated degrees: Grad Cert P M, Grad Dip E, M P E.  

This UoS teaches the fundamental knowledge on the importance, organizational context and professional practice in project management. It serves as an introduction to project management practices for non-PM students. For PM students, this UoS lays the foundation to progress to advanced PM subjects. Although serving as a general introduction unit, the focus has been placed on scope, time, cost, and integration related issues. Specifically, the UoS aims to:  
1. introduce students to the institutional, organisational and professional environment for today's project management practitioners as well as typical challenges and issues facing them;  
2. demonstrate the importance of project management to engineering and organizations;  
3. demonstrate the progression from strategy formulation to execution of the project;  
4. provide a set of tools and techniques at different stages of a project's lifecycle with emphasis on scope, time, cost and integration related issues;  
5. highlight examples of project success/failures in project management and to take lessons from these;  
6. consider the roles of project manager in the organization and management of people;  
7. provide a path for students seeking improvements in their project management expertise.

ENGS5214  
Management of Technology  
Engineering and Information Technologies  
Credit points: 6  
Session: Semester 2, Winter Main  
Classes: 1 hr Lecture per week, 1 hr Tutorial per week, 2hr Project work in class per week.  
Assumed knowledge: Sound competence in all aspects of engineering, and some understanding of issues of engineering management  
Assessment: Through semester assessment (100%)  
Campus: Camperdown/Darlington  
Mode of delivery: Normal (lecture/lab/tutorial) Day  
Associated degrees: Grad Dip E, M P E.  

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.
ENGS5215
International Eng Strategy & Operations
Engineering and Information Technologies
Credit points: 6 Session: Semester 1, Semester 2 Classes: Independent project work. Prerequisites: ELEC8901, ELEC8902, ENGG5222, ENGG5223 Assessment: Through semester assessment (100%) Campus: Camperdown/Darlington Mode of delivery: Supervision
Note: Department permission required for enrolment.
Associated degrees: M E, M P E.

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.

ELEC5020
Capstone Project A
Engineering and Information Technologies
Credit points: 6 Session: Semester 1, Semester 2 Classes: Independent project work. Corequisites: ELEC5020 Assessment: Through semester assessment (100%) Campus: Camperdown/Darlington Mode of delivery: Supervision
Note: Department permission required for enrolment.
Associated degrees: M E, M P E.

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.

ENGS5216
Management of Engineering Innovation
Engineering and Information Technologies
Credit points: 6 Session: Semester 1 Classes: 1hr Lecture per week, 1 hr Tutorials per week, 2 hr Project work in class per week for first half of semester. Assumed knowledge: Sound competence in all aspects of engineering and some understanding of issues of engineering management Assessment: Through semester assessment (100%) Campus: Camperdown/Darlington Mode of delivery: Normal (lecture/lab/tutorial) Day
Associated degrees: Grad Dip E, M P E.

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.

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
Engineering and Information Technologies
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 Assessment: Through semester assessment (100%) Campus: Camperdown/Darlington Mode of delivery: Supervision
Note: Department permission required for enrolment.
Associated degrees: M E, M P E.

To complete a substantial research project and successfully analyse a problem, devise appropriate experiments, analyse the results and produce a well-argued, in-depth thesis.

Department permission required for enrolment in the following session(s): 1,2

ELEC5223
Dissertation B
Engineering and Information Technologies
Credit points: 12 Session: Semester 1, Semester 2 Classes: no formal classes Prohibitions: ELEC8901, ELEC8902, ENGG5222, ENGG5223 Assessment: Through semester assessment (100%) Campus: Camperdown/Darlington 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.
Associated degrees: M E, M P E.

To complete a substantial research project and successfully analyse a problem, devise appropriate experiments, analyse the results and produce a well-argued, in-depth thesis.
Department permission required for enrolment in the following session(s): 1, 2

Exchange units
Exchange units require the approval of the Program Director. With approval, up to 12 credit points of Exchange units may be taken in place of other units, towards the requirements of the degree.

ENGG5231 Engineering Graduate Exchange A Engineering and Information Technologies
Prerequisites: Permission from faculty and school.  Assessment: Through semester assessment (100%)  Campus: Camperdown/Darlington  Mode of delivery: Normal (lecture/lab/tutorial) Day
Note: Department permission required for enrolment.
Associated degrees: M E, M Inf Tech, M Inf Tech Man, M P E, M P L, M P M.
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 Engineering and Information Technologies
Credit points: 6  Session: Int January, Int July  Classes: overseas short-course
Prerequisites: Permission from faculty and school.  Assessment: Through semester assessment (100%)  Campus: Camperdown/Darlington  Mode of delivery: Normal (lecture/lab/tutorial) Day
Note: Department permission required for enrolment.
Associated degrees: M E, M Inf Tech, M Inf Tech Man, M P E, M P L, M P M.
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 http://www.engineersaustralia.org.au/.

Course requirements
Candidates for the Master of Professional Engineering (Software 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).
### 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**

<table>
<thead>
<tr>
<th>Unit of Study</th>
<th>Credit Points</th>
<th>A: Assumed knowledge</th>
<th>P: Prerequisites</th>
<th>C: Corequisites</th>
<th>N: Prohibition</th>
<th>Session</th>
</tr>
</thead>
<tbody>
<tr>
<td>COMP5211 Algorithms</td>
<td>6</td>
<td>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.</td>
<td>Semester 1</td>
<td>Semester 2</td>
<td></td>
<td></td>
</tr>
<tr>
<td>ELEC5722 Foundations of Digital Systems Design</td>
<td>6</td>
<td>A ELEC1601. This unit of study assumes some knowledge of digital data representation and basic computer organisation.</td>
<td>Semester 1</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>ENGG5011 Foundation Engineering Studies A</td>
<td>6</td>
<td>Semester 1</td>
<td>Semester 2</td>
<td></td>
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</tr>
<tr>
<td>INFO5301 Information Security Management</td>
<td>6</td>
<td>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.</td>
<td>Semester 1</td>
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</tbody>
</table>

**Year One - Semester Two**

<table>
<thead>
<tr>
<th>Unit of Study</th>
<th>Credit Points</th>
<th>A: Assumed knowledge</th>
<th>P: Prerequisites</th>
<th>C: Corequisites</th>
<th>N: Prohibition</th>
<th>Session</th>
</tr>
</thead>
<tbody>
<tr>
<td>COMP5138 Relational Database Management Systems</td>
<td>6</td>
<td>Some exposure to programming and some familiarity with data model concepts</td>
<td>Semester 1</td>
<td>Semester 2</td>
<td></td>
<td></td>
</tr>
<tr>
<td>ELEC5711 Foundations of Computer Systems</td>
<td>6</td>
<td>A HSC Mathematics extension 1 or 2</td>
<td>Semester 2</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>ELEC5720 Foundations Electronic Devs and Circuits</td>
<td>6</td>
<td>A Ohm’s Law and Kirchhoff’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.</td>
<td>Semester 2</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>ELEC5721 Foundations of Signals and Systems</td>
<td>6</td>
<td>A Basic knowledge of differentiation &amp; integration, differential equations, and linear algebra.</td>
<td>Semester 2</td>
<td></td>
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</tbody>
</table>

**Year Two - Semester One**

<table>
<thead>
<tr>
<th>Unit of Study</th>
<th>Credit Points</th>
<th>A: Assumed knowledge</th>
<th>P: Prerequisites</th>
<th>C: Corequisites</th>
<th>N: Prohibition</th>
<th>Session</th>
</tr>
</thead>
<tbody>
<tr>
<td>COMP5028 Object-Oriented Design</td>
<td>6</td>
<td>Students enrolled in COMP5028 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.</td>
<td>Semester 1</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>COMP5348 Enterprise Scale Software Architecture</td>
<td>6</td>
<td>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.</td>
<td>Semester 1</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>INFO5990 Professional Practice in IT</td>
<td>6</td>
<td>A Student’s enrolled in INFO5990 are assumed to have previously completed a Bachelor’s 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.</td>
<td>Semester 1</td>
<td>Semester 2</td>
<td></td>
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</tr>
</tbody>
</table>

Select 6 credit points from Specialist Electives units block.

**Year Two - Semester Two**

<table>
<thead>
<tr>
<th>Unit of Study</th>
<th>Credit Points</th>
<th>A: Assumed knowledge</th>
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<th>N: Prohibition</th>
<th>Session</th>
</tr>
</thead>
<tbody>
<tr>
<td>COMP5047 Pervasive Computing</td>
<td>6</td>
<td>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.</td>
<td>Semester 2</td>
<td></td>
<td></td>
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</tr>
<tr>
<td>COMP5615 Software Engineering Project</td>
<td>6</td>
<td>P INFO5007</td>
<td>N COMP3615, INFO3600 Note: Department permission required for enrolment</td>
<td>Semester 2</td>
<td></td>
<td></td>
</tr>
<tr>
<td>ELEC5742 Foundations: Internet Software Platforms</td>
<td>6</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Semester 2</td>
</tr>
</tbody>
</table>
## Unit of study table

### Select 6 credit points from Management Electives units block.

#### Year Three - Semester One

<table>
<thead>
<tr>
<th>Unit of study</th>
<th>Credit points</th>
<th>A: Assumed knowledge</th>
<th>P: Prerequisites</th>
<th>C: Corequisites</th>
<th>N: Prohibition</th>
<th>Session</th>
</tr>
</thead>
<tbody>
<tr>
<td>ELEC5618 Software Quality Engineering</td>
<td>6</td>
<td>A You are capable of writing programs with multiple functions or methods in multiple files. You are capable of design complex data structures and combine them in non trivial algorithms. You know how to use an integrated development environment. You are familiar and have worked previously with software version control systems. You know how to distribute the workload derived from the unit of study effectively throughout the week and make sure that time is truly productive.</td>
<td>Semester 1</td>
<td></td>
<td></td>
<td>Semester 1</td>
</tr>
<tr>
<td>ENGG5217 Practical Experience</td>
<td></td>
<td>Students should have completed one year of their MPE program before enrolling in this unit.</td>
<td>Semester 1</td>
<td></td>
<td></td>
<td>Semester 1</td>
</tr>
<tr>
<td>ELEC5620 Capstone Project A</td>
<td>6</td>
<td>P 48 credits from MPE degree program Note: Department permission required for enrolment</td>
<td>Semester 1</td>
<td></td>
<td></td>
<td>Semester 2</td>
</tr>
<tr>
<td>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.</td>
<td></td>
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</tr>
<tr>
<td>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.</td>
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</tbody>
</table>

### Select 6 credit points from Specialist Electives units block.

#### Year Three - Semester Two

<table>
<thead>
<tr>
<th>Unit of study</th>
<th>Credit points</th>
<th>A: Assumed knowledge</th>
<th>P: Prerequisites</th>
<th>C: Corequisites</th>
<th>N: Prohibition</th>
<th>Session</th>
</tr>
</thead>
<tbody>
<tr>
<td>ELEC5619 Object Oriented Application Frameworks</td>
<td>6</td>
<td>A Java programming, and some web development experience are essential. Databases strongly recommended</td>
<td>Semester 2</td>
<td></td>
<td></td>
<td>Semester 2</td>
</tr>
<tr>
<td>ELEC5620 Model Based Software Engineering</td>
<td>6</td>
<td>A A programming language, basic maths Note: Department permission required for enrolment</td>
<td>Semester 2</td>
<td></td>
<td></td>
<td>Semester 2</td>
</tr>
<tr>
<td>ELEC5620 Capstone Project B</td>
<td>6</td>
<td>C ELEC5020 Note: Department permission required for enrolment</td>
<td>Semester 1</td>
<td></td>
<td></td>
<td>Semester 2</td>
</tr>
<tr>
<td>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.</td>
<td></td>
<td></td>
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</tr>
<tr>
<td>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 ELEC5223 Dissertation B.</td>
<td></td>
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</tbody>
</table>

### 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.

<table>
<thead>
<tr>
<th>Unit of study</th>
<th>Credit points</th>
<th>A: Assumed knowledge</th>
<th>P: Prerequisites</th>
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<th>N: Prohibition</th>
<th>Session</th>
</tr>
</thead>
<tbody>
<tr>
<td>COMP5338 Advanced Data Models</td>
<td>6</td>
<td>A This unit of study assumes foundational knowledge of relational database systems as taught in COMP5138 (Relational Database Management Systems) or INFO2120/2820 (Database Systems 1). The Extensible Markup Language (XML) is not a pre-requisite as it will be taught in this unit.</td>
<td>Semester 2</td>
<td></td>
<td></td>
<td>Semester 2</td>
</tr>
<tr>
<td>COMP5426 Parallel and Distributed Computing</td>
<td>6</td>
<td>A COMP5116</td>
<td></td>
<td></td>
<td></td>
<td>Semester 1</td>
</tr>
<tr>
<td>ELEC5614 Real Time Computing</td>
<td>6</td>
<td>A SOFTWARE Construction (or SOFTWARE Development Methods 1) and ELEC507 Embedded Computing (or ELEC2601 Microprocessor Systems)</td>
<td>Semester 1</td>
<td></td>
<td></td>
<td>Semester 1</td>
</tr>
<tr>
<td>ELEC5616 Computer and Network Security</td>
<td>6</td>
<td>A A programming language, basic maths.</td>
<td>Semester 1</td>
<td></td>
<td></td>
<td>Semester 1</td>
</tr>
<tr>
<td>ELEC5622 Signals, Software and Health</td>
<td>6</td>
<td></td>
<td></td>
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<td></td>
<td>Semester 2</td>
</tr>
</tbody>
</table>

### Management Elective units

Candidates must complete 12 credit points from the following Management Elective units of study.

<table>
<thead>
<tr>
<th>Unit of study</th>
<th>Credit points</th>
<th>A: Assumed knowledge</th>
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<th>C: Corequisites</th>
<th>N: Prohibition</th>
<th>Session</th>
</tr>
</thead>
<tbody>
<tr>
<td>ENGG5214 Management of Technology</td>
<td>6</td>
<td>A Sound competence in all aspects of engineering, and some understanding of issues of engineering management</td>
<td>Semester 2</td>
<td></td>
<td></td>
<td>Winter Main</td>
</tr>
<tr>
<td>ENGG5215 International Eng Strategy &amp; Operations</td>
<td>6</td>
<td>A Sound competence in all aspects of engineering, and some understanding of issues of engineering management and globalisation</td>
<td>Semester 2</td>
<td></td>
<td></td>
<td>Semester 2</td>
</tr>
<tr>
<td>ENGG5216 Management of Engineering Innovation</td>
<td>6</td>
<td>A Sound competence in all aspects of engineering, and some understanding of issues of engineering management</td>
<td>Semester 1</td>
<td></td>
<td></td>
<td>Semester 1</td>
</tr>
<tr>
<td>INFO6007 Project Management in IT</td>
<td>6</td>
<td>A Students enrolled in INFO6007 are assumed to have previously completed a Bachelor’s 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.</td>
<td>Semester 1</td>
<td></td>
<td></td>
<td>Semester 2</td>
</tr>
<tr>
<td>N PMGT5871</td>
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</tbody>
</table>

### 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 table

<table>
<thead>
<tr>
<th>Unit of study</th>
<th>Credit points</th>
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<th>P: Prerequisites</th>
<th>C: Corequisites</th>
<th>N: Prohibition</th>
<th>Session</th>
</tr>
</thead>
<tbody>
<tr>
<td>ELEC5020 Capstone Project A</td>
<td>6</td>
<td>P 48 credits from MPE degree program</td>
<td></td>
<td></td>
<td></td>
<td>Semester 1/2</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Note: Department permission required for enrolment</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>ELEC5021 Capstone Project B</td>
<td>6</td>
<td>C ELEC5020</td>
<td>Note: Department permission required for enrolment</td>
<td></td>
<td></td>
<td>Semester 1/2</td>
</tr>
<tr>
<td>ELEC5022 Capstone Project B Extended</td>
<td>12</td>
<td>P 42 credit points in the Master of Engineering and WAM &gt;70, or 66 credit points in the Master of Professional Engineering and WAM &gt;70 or exemption</td>
<td>Note: Department permission required for enrolment</td>
<td></td>
<td></td>
<td>Semester 1/2</td>
</tr>
</tbody>
</table>

**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 ELEC8901, ELEC8902, ENGS5222, ENGS5223 | Note: Department permission required for enrolment | Semester 1/2  |
|                                       |               | 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. |                |               |
| ELEC5223 Dissertation B               | 12            | N ELEC8901, ELEC8902, ENGS5222, ENGS5223 | Note: Department permission required for enrolment | Semester 1/2  |
|                                       |               | 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. |                |               |

**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             | P Permission from faculty and school. | Note: Department permission required for enrolment | Int January/July |
|                                          |               | Note: Department permission required for enrolment |                |               |
| ENGG5232 Engineering Graduate Exchange B | 6             | P Permission from faculty and school. | Note: Department permission required for enrolment | Int January/July |
|                                          |               | Note: Department permission required for enrolment |                |               |

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

COMP5211 Algorithms

Engineering and Information Technologies

Credit points: 6 Session: Semester 1, 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%)

Campus: Camperdown/Darlington Mode of delivery: Normal (lecture/lab/tutorial) Day

Associated degrees: B E, Grad Cert D C C, Grad Cert I T, Grad Dip Comp, Grad Dip E (Prof Eng), M Appl Sc (Bioinformatics), M I D M, M Inf Tech, M P E, PG Coursework Exchange.

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.

ELEC5722 Foundations of Digital Systems Design

Engineering and Information Technologies

Credit points: 6 Session: Semester 1

Classes: Two hours of lectures, two hours of tutorials and 3 hours of laboratory work per week.

Assumed knowledge: ELEC1601. This unit of study assumes some knowledge of digital data representation and basic computer organisation. Assessment: Through semester assessment (40%), Final Exam (60%)

Campus: Camperdown/Darlington Mode of delivery: Normal (lecture/lab/tutorial) Day

Associated degrees: Grad Dip E (Prof Eng), M P E.

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

Engineering and Information Technologies

Credit points: 6 Session: Semester 1, Semester 2

Classes: no normal classes.

Assessment: Through semester assessment (100%)

Campus: Camperdown/Darlington Mode of delivery: Supervision

Associated degrees: Grad Dip E (Prof Eng), M P E.

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

Engineering and Information Technologies

Credit points: 6 Session: Semester 1

Classes: 2 hrs of lecture, 1 hr of lab/tut per 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%)

Campus: Camperdown/Darlington Mode of delivery: Normal (lecture/lab/tutorial) Day

Associated degrees: B E, M Inf Tech, M Inf Tech Man, M P E.

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

COMP5138 Relational Database Management Systems

Engineering and Information Technologies

Credit points: 6 Session: Semester 1, Semester 2

Classes: One 2 hour lecture and one 2 hour tutorial per week.

Assumed knowledge: Some exposure to programming and some familiarity with data model concepts. Assessment: Through semester assessment (50%), Final Exam (50%)

Campus: Camperdown/Darlington Mode of delivery: Normal (lecture/lab/tutorial) Day

Associated degrees: B E, Grad Cert I T, Grad Cert Inf Tech Man, M H I, M P E.

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.

**ELEC5711**

**Foundations of Computer Systems**

**Engineering and Information Technologies**

Credit points: 6  
**Session:** Semester 2  
**Classes:** 2 hrs of Lectures per week, and a 2 hours tutorial and 2 hours lab per fortnight.  
**Prohibitions:** ELEC2104

**Assumed knowledge:** Chalm's Law and Kirchoff's Laws, action of Current and Voltage sources, network analysis and the superposition theorem; Thévenin 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%)  
**Campus:** Camperdown/Darlington  
**Mode of delivery:** Normal (lecture/lab/tutorial) Day

**Associated degrees:** M P E.

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.

**ELEC5720**

**Foundations Electronic Devs and Circuits**

**Engineering and Information Technologies**

Credit points: 6  
**Session:** Semester 2  
**Classes:** 2 hours of lectures per week, and a 2 hours tutorial and 2 hours lab per fortnight.  
**Prohibitions:** ELEC2104

**Assumed knowledge:** Chalm's Law and Kirchoff's Laws, action of Current and Voltage sources, network analysis and the superposition theorem; Thévenin 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%)  
**Campus:** Camperdown/Darlington  
**Mode of delivery:** Normal (lecture/lab/tutorial) Day

**Associated degrees:** Grad Dip E (Prof Eng), M P E.

Modern Electronics has come to be known as microelectronics which refers to the Integrated Circuits (ICs) containing millions of discrete devices. This course introduces some of the basic electronic devices like diodes and different types of transistors. It also aims to introduce students the analysis and design techniques of circuits involving these discrete devices as well as the integrated circuits. Completion of this course is essential to specialize in Electrical, Telecommunication or Computer Engineering stream. The knowledge of ELEC1103 is assumed.

**ELEC5721**

**Foundations of Signals and Systems**

**Engineering and Information Technologies**

Credit points: 6  
**Session:** Semester 2  
**Classes:** 2 hours of lectures, 2 hours lab/tutorial per week and 1 hour of eLearning session per week.  
**Assumed knowledge:** Basic knowledge of differentiation & integration, differential equations, and linear algebra.  
**Assessment:** Through semester assessment (30%), Final Exam (70%)  
**Campus:** Camperdown/Darlington  
**Mode of delivery:** Normal (lecture/lab/tutorial) Day

**Associated degrees:** Grad Dip E (Prof Eng), M P E.

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.

**Year Two - Semester One**

**COMP5028**

**Object-Oriented Design**

**Engineering and Information Technologies**

Credit points: 6  
**Session:** Semester 1  
**Classes:** One 2 hour lecture and one 1 hour tutorial per week.  
**Prohibitions:** INFO3520  
**Assumed knowledge:** Students enrolled in COMP5028 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%)  
**Campus:** Camperdown/Darlington  
**Mode of delivery:** Normal (lecture/lab/tutorial) Day

**Associated degrees:** B E, Grad Cert I T, Grad Cert Inf Tech Man, Grad Dip Comp, M I D M, M P E.

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, 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**

**Engineering and Information Technologies**

Credit points: 6  
**Session:** Semester 1  
**Classes:** (Lec 2hrs & Prac 1hr) per 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%)  
**Campus:** Camperdown/Darlington  
**Mode of delivery:** Normal (lecture/lab/tutorial) Day

**Associated degrees:** B C S T (Hons), B E, B I T (Hons), B Psych (Hons), B Sc (Hons), Grad Cert I T, M P E.

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. The class of systems are built up from several software components, incorporating existing "legacy" code and data stores as well as linking 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**

**Engineering and Information Technologies**

Credit points: 6  
**Session:** Semester 1, Semester 2  
**Classes:** Session 1: Weekly or Block mode or Online Session 2: Weekly or Block mode or Online  
**Assumed knowledge:** Students’ enrolled in INFO5990 are assumed to have previously completed a Bachelor’s 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 session assessment (50%), Final Exam (50%)  
**Campus:** Camperdown/Darlington  
**Mode of delivery:** Block Mode or On-line or Normal (lecture/lab/tutorial) Day

**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.

**Associated degrees:** B E, M P A, Grad Cert I T, Grad Cert Inf Tech Man, Grad Dip P A, M Inf Tech Man, Grad Cert Inf Tech, M P Admin, M P E.

This Unit of Study introduces the students to some of the concepts, standards and techniques associated with the current professional practice of information technology as part of their involvement in professional practice. The students are presented with a wide range of core conceptual ideas, techniques and relevant professional issues associated with the fields of Interpersonal and Organisational Communication, Conflict Management, IT and Sustainability, IT and
Select 6 credit points from Specialist Electives units block.

Year Two - Semester Two

COMP5047
Pervasive Computing
Engineering and Information Technologies

Credit points: 6
Session: Semester 2
Classes: 3hr integrated lecture and practical session
Prohibitions: NET54047
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%)

Campus: Camperdown/Darlington
Mode of delivery: Normal (lecture/lab/tutorial) Day

Associated degrees: B C S T (Hons), B E, B I T (Hons), B Sc (Hons), Grad Cert I T, M P E.

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
Engineering and Information Technologies

Credit points: 6
Session: Semester 2
Classes: One 1-hour meeting with supervisor, one 2-hour class, and meeting with client.
Prerequisites: INFO6007
Prohibitions: COMP3615, INFO3600
Assessment: Through semester assessment (100%)
Campus: Camperdown/Darlington
Mode of delivery: Normal (lecture/lab/tutorial) Day

Note: Department permission required for enrolment.

Associated degrees: M P E.

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.

ELEC5742
Foundations: Internet Software Platforms
Engineering and Information Technologies

Credit points: 6
Session: Semester 2
Classes: 2 hours lecture and 2 hours tutorials per week
Assessment: Through semester assessment (40%), Final Exam (60%)
Campus: Camperdown/Darlington
Mode of delivery: Normal (lecture/lab/tutorial) Day

Associated degrees: M P E.

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

ELEC5618
Software Quality Engineering
Engineering and Information Technologies

Credit points: 6
Session: Semester 1
Classes: 2 hours lecture and 2 hours tutorials per 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 with and have worked previously with software version control systems. You know how to distribute the workload derived from the unit of study effectively throughout the week and make sure that time is truly productive.
Assessment: Through semester assessment (30%), Final Exam (70%)
Campus: Camperdown/Darlington
Mode of delivery: Normal (lecture/lab/tutorial) Day

Associated degrees: B C S T (Hons), B E, B I T (Hons), Grad Cert I T, Grad Dip E, M P E, UG Study Abroad Program.

This unit will cover software quality planning, validation and verification methods and techniques, risk analysis, software review techniques, software standards and software process improvement and software reliability. The unit covers testing and quality assurance from a unit testing/developer-based focus up to an overall quality process overview of the software development life cycle. Students who successfully complete this unit will: understand the fundamental concepts of software quality, be able to assess the quality of a software design, be acquainted with methods of building for quality and be able to verify and test a unit of code through familiarity with unit testing strategies and understanding software quality assurance as a rigorous and structured formal process.

ENGG5217
Practical Experience
Engineering and Information Technologies

Session: Semester 1, Semester 2
Classes: no formal classes
Assessment: Students will write reports on their industrial experiences and maintain a portfolio of work. Portfolio (100%)
Campus: Camperdown/Darlington
Mode of delivery: Professional Practice

Note: Students should have completed one year of their MPE program before enrolling in this unit.

Associated degrees: M P E.

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 improvement with industry. For details of the reporting requirements, go to the faculty's Practical ExperiencePortfolio website

ELEC5020
Capstone Project A
Engineering and Information Technologies

Credit points: 6
Session: Semester 1, Semester 2
Classes: Independent project work.
Prerequisites: 48 credits from MPE degree program
Assessment: Through semester assessment (100%)
Campus: Camperdown/Darlington
Mode of delivery: Supervision

Note: Department permission required for enrolment.
Students will work individually or in groups on an assigned project for the Semester. The concepts covered depend on the nature of the project, but broadly cover research and inquiry, and information literacy.

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**

**ELEC5619**

Object Oriented Application Frameworks

**Engineering and Information Technologies**

Credit points: 6  Session:  Semester 2  Classes: 5 hours project work in class per week.  
Assumed knowledge: Java programming, and some web development experience are essential.  
Databases strongly recommended  
Assessment: Through semester assessment (100%)  
Campus: Camperdown/Darlington  
Mode of delivery: Normal (lecture/lab/tutorial) Day

**Associated degrees:** B E, Grad Cert I T, Grad Dip E, M P E, UG Study Abroad Program.

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

**Engineering and Information Technologies**

Credit points: 6  Session:  Semester 2  Classes: 2 hours lectures, 1 hour of tutorial and 2 hours of lab/project work in class per week.  
Assumed knowledge: A programming language, basic maths  
Assessment: Through semester assessment (50%), Final Exam (50%)  
Campus: Camperdown/Darlington  
Mode of delivery: Normal (lecture/lab/tutorial) Day

**Note:** Department permission required for enrolment.

**Associated degrees:** B E, B IT, Grad Cert E, M P E.

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.

**ELEC5021**

Capstone Project B

**Engineering and Information Technologies**

Credit points: 6  Session:  Semester 1  Classes:  
Corequisites: ELEC5020  
Assessment: Through semester assessment (100%)  
Campus: Camperdown/Darlington  
Mode of delivery: Supervision

**Note:** Department permission required for enrolment.

**Associated degrees:** B E, M P E.

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 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

**Engineering and Information Technologies**

Credit points: 6  Session:  Semester 2  Classes:  
Assumed knowledge: This unit of study assumes foundational knowledge of relational database systems as taught in COMP5138 (Relational Database Management Systems) or INFO2120/2820 (Database Systems 1). The Extensible Markup Language (XML) in not a pre-requisite as it will be taught in this unit.  
Assessment: Through semester assessment (40%), Final Exam (60%)  
Campus: Camperdown/Darlington  
Mode of delivery: Normal (lecture/lab/tutorial) Day

**Note:** Department permission required for enrolment.

**Associated degrees:** B C S T (Hons), B E, B IT (Hons), B Psych (Hons), B Sc (Hons), Grad Cert Appl Sc (B S I S), Grad Cert IT, M P E.

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:2008, 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.

**COMP5425**

Parallel and Distributed Computing

**Engineering and Information Technologies**

Credit points: 6  Session:  Semester 1  Classes:  
Assumed knowledge: COMP5116  
Assessment: Through semester assessment (40%), Final Exam (60%)  
Campus: Camperdown/Darlington  
Mode of delivery: Normal (lecture/lab/tutorial) Day

**Associated degrees:** B C S T (Hons), B E, B IT (Hons), B Psych (Hons), B Sc (Hons), Grad Cert E, Grad Cert IT, M P E.
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

Engineering and Information Technologies

Credit points: 6 Session: Semester 1 Classes: 2 hours of lectures, 1 hour tutorial per week, 2 hours labs per week. 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%) Campus: Camperdown/Darlington Mode of delivery: Normal (lecture/lab/tutorial) Day

Associated degrees: B C S T (Hons), B E, B I T (Hons), Grad Cert E, Grad Cert I T, M P E, PG Coursework Exchange.

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

Engineering and Information Technologies

Credit points: 6 Session: Semester 1 Classes: 2 hours of lectures, 1 hour of tutorial and 2 hours labs per week. Assumed knowledge: A programming language, basic maths. Assessment: Through semester assessment (50%), Final Exam (50%) Campus: Camperdown/Darlington Mode of delivery: Normal (lecture/lab/tutorial) Day

Associated degrees: B C S T (Hons), B E, B I T (Hons), Grad Cert E, Grad Cert I T, M P E, PG Coursework Exchange.

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

Engineering and Information Technologies

Credit points: 6 Session: Semester 2 Classes: 2 hr project work session per week, 3hr tutorials/labs per week. Assessment: Through semester assessment (100%) Campus: Camperdown/Darlington Mode of delivery: Normal (lecture/lab/tutorial) Day

Associated degrees: B E, Grad Cert E, M P E.

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 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

Engineering and Information Technologies

Credit points: 6 Session: Semester 2 Classes: 1 hr Lecture per week, 1 hr Tutorial per week, 2hr Project work in class per week. Assumed knowledge: Sound competence in all aspects of engineering, and some understanding of issues of engineering management and globalisation Assessment: Through semester assessment (100%) Campus: Camperdown/Darlington Mode of delivery: Normal (lecture/lab/tutorial) Day

Associated degrees: Grad Dip E, M P E.

This UoS is designed to introduce students to the global context of much of contemporary engineering and the consequent strategic and operational issues. It will address the nature, characteristics and variety of risks of global businesses, the opportunities and pressures for effective strategies, and the many management challenges in international business. In particular it will focus on Australian consulting, logistics and construction engineering firms that are operating on a global basis.

ENGG5215
International Eng Strategy & Operations

Engineering and Information Technologies

Credit points: 6 Session: Semester 2 Classes: Lecture 2 hours per week, Tutorial 2 hours per week, Project Work - in class 2 hours per week. Assumed knowledge: Sound competence in all aspects of engineering, and some understanding of issues of engineering management and globalisation Assessment: Through semester assessment (100%) Campus: Camperdown/Darlington Mode of delivery: Normal (lecture/lab/tutorial) Day

Associated degrees: Grad Dip E, M P E.

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

Engineering and Information Technologies

Credit points: 6 Session: Semester 1 Classes: 1hr Lecture per week, 1 hr Tutorials per week, 2 hr Project work in class per week for first half of semester. Assumed knowledge: Sound competence in all aspects of engineering, and some understanding of issues of engineering management Assessment: Through semester assessment (100%) Campus: Camperdown/Darlington Mode of delivery: Normal (lecture/lab/tutorial) Day

Associated degrees: Grad Dip E, M P E.

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

Engineering and Information Technologies

Credit points: 6 Session: Semester 1, Semester 2 Classes: One 2 hour lecture and one 1 hour tutorial per week. Prerequisites: PMGT5871 Assumed knowledge: Students enrolled in INFO6007 are assumed to have previously completed a Bachelor's 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%) Campus: Camperdown/Darlington Mode of delivery: Normal (lecture/laboratory) 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

Engineering and Information Technologies

Credit points: 6 Session: Semester 1, Semester 2 Classes: Independent project work. Prerequisites: 48 credits from MPE degree program Assessment: Through semester assessment (100%) Campus: Camperdown/Darlington Mode of delivery: Supervision Note: Department permission required for enrolment.

Associated degrees: M E, M P E.

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

Engineering and Information Technologies

Credit points: 6 Session: Semester 1, Semester 2 Classes: Independent project work. Corequisites: ELEC5020 Assessment: Through semester assessment (100%) Campus: Camperdown/Darlington Mode of delivery: Supervision Note: Department permission required for enrolment.

Associated degrees: M E, M P E.

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

Engineering and Information Technologies

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 46 credit points in the Master of Professional Engineering and WAM >70 or exemption Assessment: Through semester assessment (100%) Campus: Camperdown/Darlington Mode of delivery: Supervision Note: Department permission required for enrolment.

Associated degrees: M E, M P E.

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.

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 candidates take Dissertation units ELEC5222 and ELEC5223 (total 24 cp) in place of Capstone Project units and 12 cp of elective units.

ELEC5222
Dissertation A

Engineering and Information Technologies

Credit points: 12 Session: Semester 1, Semester 2 Classes: no formal classes Prohibitions: ELEC8901, ELEC8902, ENGG5222, ENGG5223 Assessment: Through semester assessment (100%) Campus: Camperdown/Darlington 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.

Associated degrees: M E, M P E.

To complete a substantial research project and successfully analyse a problem, devise appropriate experiments, analyse the results and produce a well-argued, in-depth thesis. Department permission required for enrolment in the following session(s); 1,2

ELEC5223
Dissertation B

Engineering and Information Technologies

Credit points: 12 Session: Semester 1, Semester 2 Classes: no formal classes Prohibitions: ELEC8901, ELEC8902, ENGG5222, ENGG5223 Assessment: Through semester assessment (100%) Campus: Camperdown/Darlington 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.

Associated degrees: M E, M P E.

Students must complete a substantial research project and successfully analyse a problem, devise appropriate experiments, analyse the results and produce a well-argued, in-depth thesis. Department permission required for enrolment in the following session(s); 1,2

Exchange units

Exchange units require the approval of the Program Director. With approval, up to 12 credit points of Exchange units may be taken in place of other units, towards the requirements of the degree.

ENGG5231
Engineering Graduate Exchange A

Engineering and Information Technologies

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
Engineering and Information Technologies

Credit points: 6 Session: Int January, Int July Classes: overseas short-course Prerequisites: Permission from faculty and school. Assessment: Through semester assessment (100%) Mode of delivery: Normal (lecture/lab/tutorial) Day

Note: Department permission required for enrolment.

Associated degrees: M E, M Inf Tech, M Inf Tech Man, M P E, M P L, M P M.

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.
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 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 http://www.engineersaustralia.org.au/.

Course requirements
Candidates for the Master of Professional Engineering (Structural 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

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<td>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.</td>
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<td>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.</td>
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<td>CIVL5502 Foundations of Structural Mechanics</td>
<td>6</td>
<td>A 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 in various 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.</td>
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<tr>
<td>CIVL5506 Foundations-Eng Construction &amp; Surveying</td>
<td>6</td>
<td>This UoS is only available to students in the MPE degree who do not have a Civil Engineering background.</td>
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<td>Semester 1</td>
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<td>Year One - Semester Two</td>
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<tr>
<td>CIVL5504 Foundations of Soil Mechanics</td>
<td>6</td>
<td>A 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 ENGG 1802 Engineering Mechanics, CIVL3502 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 ENGS3801 Engineering Computing. Familiarity with partial differential equations, and their analytical and numerical solution.</td>
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<td>Semester 2</td>
</tr>
<tr>
<td>CIVL5505 Foundations of Intro. Fluid Mechanics</td>
<td>6</td>
<td>A CIVL5502: 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. This UoS is only available to students in the MPE degree who do not have a Civil Engineering background.</td>
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<tr>
<td>CIVL5509 Foundations of Struct Concepts &amp; Design</td>
<td>6</td>
<td>A Structural mechanics, first year mathematics, but these are not prerequisites. Basic structural elements include beams, columns slabs and simple frames</td>
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<td>Semester 2</td>
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<tr>
<td>ENGG5011 Foundation Engineering Studies A</td>
<td>6</td>
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<td>Semester 1 Semester 2</td>
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<td>Year Two - Semester One</td>
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<tr>
<td>CIVL5507 Foundations of Concrete Structures 1</td>
<td>6</td>
<td>A Knowledge: CIVL2110 AND CIVL2201 AND CIVL230; basic concepts of solid mechanics and structural mechanics, including compatibility 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).</td>
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<td>Semester 1</td>
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<tr>
<td>CIVL5511 Foundations of Fluid Mechanics</td>
<td>6</td>
<td>A CIVL2201 AND CIVL2611 AND ENGG1802 AND MATH2061. This unit of study follows on from Fluid Mechanics CIVL2611, which provides the essential fundamental fluid mechanics background and theory, and is assumed to be known and fully understood.</td>
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<td>Semester 2</td>
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<tr>
<td>CIVL5512 Foundation of Eng Design &amp; Construction</td>
<td>6</td>
<td>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.</td>
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<td>Semester 1</td>
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<tr>
<td>ENGG5204 Engineering Professional Practice</td>
<td>6</td>
<td>A Competences and experience in engineering obtained during an accepted engineering degree</td>
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<td>Semester 1</td>
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<tr>
<td>Unit of study</td>
<td>Credit points</td>
<td>A: Assumed knowledge</td>
<td>P: Prerequisites</td>
<td>C: Corequisites</td>
<td>N: Prohibition</td>
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<td><strong>Year Two - Semester Two</strong></td>
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<tr>
<td>CIVL5268 Structural Dynamics</td>
<td>6</td>
<td>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.</td>
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<td>Semester 2</td>
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<tr>
<td>CIVL5508 Foundations of Steel Structures 1</td>
<td>6</td>
<td>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, ly, Zx, Zy, Sx, Sy, nx, ny, J, Ag; knowledge of the basic elastic-plastic material properties of steel, E, G, fy, fu; and knowledge of loading of structures.</td>
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<td>Semester 2</td>
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<tr>
<td>ENGG5205 Professional Practice in PM</td>
<td>6</td>
<td>A Basic engineering or science knowledge. At least 2-3 years of work experience preferred. 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.</td>
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<tr>
<td>Select 6 credit points from the Specialist electives block.</td>
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<tr>
<td><strong>Year Three - Semester One</strong></td>
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<tr>
<td>CIVL5257 Concrete Structures: Prestressed</td>
<td>6</td>
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<td>Semester 1</td>
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<tr>
<td>CIVL5267 Steel Structures - Advanced Design</td>
<td>6</td>
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<td>Semester 1</td>
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<tr>
<td>ENGG5217 Practical Experience</td>
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<td>Students should have completed one year of their MPE program before enrolling in this unit.</td>
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<tr>
<td>CIVL5250 Capstone Project A</td>
<td>6</td>
<td>P 48 credits from MPE degree program</td>
<td>Department permission required for enrolment</td>
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<td>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.</td>
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<td>Semester 2</td>
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<td>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.</td>
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<tr>
<td>Select 6 credit points from the Specialist electives block.</td>
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<tr>
<td><strong>Year Three - Semester Two</strong></td>
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<tr>
<td>CIVL5264 Composite Steel-Concrete Structures</td>
<td>6</td>
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<td>Semester 2</td>
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<tr>
<td>CIVL5510 Foundations of Civil Engineering Design</td>
<td>6</td>
<td>A CIVL3205 AND CIVL3206.</td>
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<td>Semester 2</td>
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<tr>
<td>CIVL5021 Capstone Project B</td>
<td>6</td>
<td>C CIVL5020</td>
<td>Department permission required for enrolment</td>
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<td>Semester 1</td>
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<td>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.</td>
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<td>Semester 2</td>
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<td></td>
<td>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.</td>
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<tr>
<td>Select 6 credit points from the Electives block.</td>
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<tr>
<td><strong>Specialist Elective units</strong></td>
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<tr>
<td>Candidates must complete 12 credit points from the following Specialist elective units of study.</td>
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<tr>
<td>CIVL5266 Steel Structures - Stability</td>
<td>6</td>
<td>A Knowledge: CIVL2201 AND CIVL3206 AND CIVL3235. There are no prerequisites for this unit of study but it is assumed that students are competent in the content covered in CIVL2201 Structural Mechanics, CIVL3206 Steel Structures 1, and CIVL3235 Structural Analysis. Students who have failed previous units of study should note that no special consideration will be given to them if they choose to enrol in this unit of study (on the basis of timetabled clashes or lack of knowledge of basics), and they are discouraged from enrolling in this unit of study. Students who have not yet passed first, second or third year units of study must enrol in those units of study in precedence to any later year units of study.</td>
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<td>Semester 1</td>
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<tr>
<td>CIVL5269 Concrete Structures - Strength &amp; Service</td>
<td>6</td>
<td>P CIVL3205 OR CIVL5507</td>
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<td>Semester 2</td>
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<tr>
<td>CIVL5458 Numerical Methods in Civil Engineering</td>
<td>6</td>
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<tr>
<td><strong>Elective units</strong></td>
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<tr>
<td>Candidates must complete 6 credit points from the following Elective units of study.</td>
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<tr>
<td>CHNG5005 Wastewater Eng - Systems and Practice</td>
<td>6</td>
<td>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.</td>
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<td>Semester 1</td>
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</tbody>
</table>
### Unit of Study Table

<table>
<thead>
<tr>
<th>Unit of Study</th>
<th>Credit Points</th>
<th>A: Assumed knowledge</th>
<th>P: Prerequisites</th>
<th>C: Corequisites</th>
<th>N: Prohibition</th>
<th>Session</th>
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<tbody>
<tr>
<td>CIVL5450 Analysis and Design of Pile Foundations</td>
<td>6</td>
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<td>Semester 1</td>
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<tr>
<td>CIVL5451 Computer Methods in Geotechnical Eng</td>
<td>6</td>
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<td>Semester 1</td>
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<tr>
<td>CIVL5454 Rock Engineering</td>
<td>6</td>
<td>A</td>
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<td>Semester 2</td>
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<tr>
<td>CIVL5455 Engineering Behaviour of Soils</td>
<td>6</td>
<td>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.</td>
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<td>Semester 2</td>
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<tr>
<td>CIVL5666 Open Channel Flow &amp; Hydraulic Structures</td>
<td>6</td>
<td>A CIVL3612</td>
<td></td>
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<td>Semester 1</td>
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<tr>
<td>CIVL5668 Wind Engineering for Design-Fundamentals</td>
<td>6</td>
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<td>Semester 1</td>
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<tr>
<td>CIVL5669 Applied Fluid Engineering Computing</td>
<td>6</td>
<td>A CIVL5511. 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.</td>
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<td>Semester 2</td>
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</table>

### 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.

<table>
<thead>
<tr>
<th>Unit of Study</th>
<th>Credit Points</th>
<th>A: Assumed knowledge</th>
<th>P: Prerequisites</th>
<th>C: Corequisites</th>
<th>N: Prohibition</th>
<th>Session</th>
</tr>
</thead>
<tbody>
<tr>
<td>CIVL5020 Capstone Project A</td>
<td>6</td>
<td>P 48 credits from MPE degree program</td>
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<td>Semester 1</td>
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<tr>
<td>CIVL5021 Capstone Project B</td>
<td>6</td>
<td>C CIVL5020</td>
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<td>Semester 2</td>
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<tr>
<td>CIVL5022 Capstone Project B Extended</td>
<td>12</td>
<td>P 42 credit points in the Master of Engineering and WAM &gt;70, or 66 credit points in the Master of Professional Engineering and WAM &gt;70 or exemption</td>
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<td>Semester 2</td>
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</table>

### 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.

<table>
<thead>
<tr>
<th>Unit of Study</th>
<th>Credit Points</th>
<th>A: Assumed knowledge</th>
<th>P: Prerequisites</th>
<th>C: Corequisites</th>
<th>N: Prohibition</th>
<th>Session</th>
</tr>
</thead>
<tbody>
<tr>
<td>CIVL5222 Dissertation A</td>
<td>12</td>
<td>N ENGG5220, ENGG5221</td>
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<td>Semester 1</td>
</tr>
<tr>
<td>CIVL5223 Dissertation B</td>
<td>12</td>
<td>N ENGG5220, ENGG5221</td>
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<td>Semester 2</td>
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</table>

### 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.

<table>
<thead>
<tr>
<th>Unit of Study</th>
<th>Credit Points</th>
<th>A: Assumed knowledge</th>
<th>P: Prerequisites</th>
<th>C: Corequisites</th>
<th>N: Prohibition</th>
<th>Session</th>
</tr>
</thead>
<tbody>
<tr>
<td>ENGG5231 Engineering Graduate Exchange A</td>
<td>6</td>
<td>P Permission from faculty and school.</td>
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<td>Int January, Int July</td>
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<tr>
<td>ENGG5232 Engineering Graduate Exchange B</td>
<td>6</td>
<td>P Permission from faculty and school.</td>
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<td>Int January, Int July</td>
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</tbody>
</table>

For more information on degree program requirements visit CUSP.
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

ENGG5802 Foundations of Engineering Mechanics Engineering and Information Technologies

Credit points: 6 Session: Semester 2, Summer Main Classes: 2 hrs Lectures per week, 3hrs tutorial per week. Assessment: Through semester assessment (100%) Campus: Camperdown/Darlington Mode of delivery: Normal (lecture/lab/tutorial) Day

Associated degrees: M P E.

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.

CIVL5501 Foundations of Materials Engineering and Information Technologies

Credit points: 6 Session: Semester 1 Classes: 4 hours of lectures and 2 hours of tutorials per week. Assessment: Through semester assessment (50%), Final Exam (50%) Campus: Camperdown/Darlington Mode of delivery: Normal (lecture/lab/tutorial) Day

Associated degrees: Grad Dip E (Prof Eng), M P E.

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

CIVL5502 Foundations of Structural Mechanics Engineering and Information Technologies

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. Assumed knowledge: Students should be competent in the following areas. 1. The concept of force and momentum equilibrium in two and three dimensions. 2. Drawing free body diagrams. 3. Establishing and solving the equations of equilibrium from the FBD. 4. Setting out solutions logically, clearly and neatly. Students should be competent in certain 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%). Campus: Camperdown/Darlington Mode of delivery: Normal (lecture/lab/tutorial) Day

Note: This UoS is only available to students in the MPE degree who do not have a Civil Engineering background.

Associated degrees: Grad Dip E (Prof Eng), M P E.

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.

CIVL5506 Foundations-Eng Construction & Surveying Engineering and Information Technologies

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. Assessment: Through semester assessment (55%), Final Exam (45%) Campus: Camperdown/Darlington Mode of delivery: Normal (lecture/lab/tutorial) Day

Note: This UoS is only available to students in the MPE degree who do not have a Civil Engineering background. This 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)

Associated degrees: Grad Dip E (Prof Eng), M P E.

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.

Year One - Semester Two

CIVL5504 Foundations of Soil Mechanics

Engineering and Information Technologies

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. Assumed knowledge: 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 ENGG1802 Engineering Mechanics, CIVL5502 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 ENGG1801 Engineering Computing. Familiarity with partial differential equations, and their analytical and numerical solution. Assessment: Through semester assessment (50%), Final Exam (50%) Campus: Camperdown/Darlington Mode of delivery: Normal (lecture/lab/tutorial) Day Note: This UoS is only available to students in the MPE degree who do not have a Civil Engineering background.

Associated degrees: Grad Dip E (Prof Eng), MPE.

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

CIVL5505 Foundations of Intro. Fluid Mechanics

Engineering and Information Technologies

Credit points: 6 Session: Semester 2 Classes: 2 hours of lectures and 2 hours of tutorials per week, 8 hours of laboratory work per semester. Assumed knowledge: CIVL5502. 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 (45%), Final Exam (55%) Campus: Camperdown/Darlington Mode of delivery: Normal (lecture/lab/tutorial) Day Note: This UoS is only available to students in the MPE degree who do not have a Civil Engineering background.

Associated degrees: Grad Dip E (Prof Eng), MPE.

The objective of this unit 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.

CIVL5509 Foundations of Struct Concepts & Design

Engineering and Information Technologies

Credit points: 6 Session: Semester 2 Classes: 4 hours of lectures and 2 hours of tutorials per week. Assumed knowledge: Structural mechanics, first year mathematics, but these are not prerequisites Assessment: Through semester assessment (25%), Final Exam (75%) Campus: Camperdown/Darlington Mode of delivery: Normal (lecture/lab/tutorial) Day Note: Basic structural elements include beams, columns slabs and simple frames

Associated degrees: Grad Dip E (Prof Eng), MPE.

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.

ENGG5011 Foundation Engineering Studies A

Engineering and Information Technologies

Credit points: 6 Session: Semester 1, Semester 2 Classes: no formal classes. Regular meetings with supervisor will be required. Assessment: Through semester assessment (100%) Campus: Camperdown/Darlington Mode of delivery: Supervision

Associated degrees: Grad Dip E (Prof Eng), MPE.

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 Two - Semester One

CIVL5507 Foundations of Concrete Structures 1

Engineering and Information Technologies

Credit points: 6 Session: Semester 1 Classes: 3 hours of lectures and 3 hours of project work in class per week, 2 hours of laboratory demonstration per semester. Assumed knowledge: Knowledge: CIVL2110 AND CIVL2201 AND CIVL2230. basic concepts of solid mechanics and structural mechanics, including: compatibility 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%). Campus: Camperdown/Darlington Mode of delivery: Normal (lecture/lab/tutorial) Day

Associated degrees: MPE.

The objectives of this unit are to provide a basic understanding of the behaviour of reinforced concrete members and structures; to provide a basic understanding of standard methods of analysis and design of reinforced concrete behaviour (including an understanding of capabilities and limitations); and to provide basic design training in a simulated professional engineering environment. The syllabus comprises the behaviour of reinforced concrete members and structures, including: material properties, ‘elastic’ analysis (stresses/deformations/time-dependence), ultimate strengths of beams (flexure), ultimate strength of columns (short and slender), behaviour or reinforced concrete slabs. The reinforced concrete truss analogy (shear/torsion/and detailing implications). Design of typical elements of a reinforced concrete building, structural modelling, analysis of load-effects (incl.earthquakes), design criteria (for durability, fire-resistance, serviceability and strength), design calculation procedures, reinforcement detailing, structural drawings. At the end of this unit students will gain proficiency in basic methods of reinforced concrete analysis and design.

CIVL5511 Foundations of Fluid Mechanics

Engineering and Information Technologies

Credit points: 6 Session: Semester 1 Classes: Lecture 2hrs per week, Tutorial 2hrs per week, Laboratory 2hrs per week. Assumed knowledge: CIVL2201 AND CIVL2611 AND ENGG1802 AND MATH2601. This unit of study follows on from Fluid Mechanics CIVL2611, which provides the essential fundamental fluid mechanics background and theory, and is assumed to be known and fully understood. Assessment: Through semester assessment (60%), Final Exam
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.

**CIVL5512 Foundation of Eng Design & Construction**

**Engineering and Information Technologies**

**Credit points:** 6

**Session:** Semester 1 Classes: Workshop 3 hours per week. Lecture/Presentation 2 hrs per week.  
**Assumed knowledge:** Basic knowledge of construction operations including excavation, embeddings 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%)  
**Campus:** Camperdown/Darlington  
**Mode of delivery:** Normal (lecture/lab/tutorial) Day

**Associated degrees:** Grad Dip E (Prof Eng), M P E.

The objectives of this unit are to develop an understanding of construction methods, strategies, equipment and machinery in a range of construction activities and an understanding of the principles involved in the design for those construction activities. At the end of this unit, students will have developed a familiarity with a variety of construction methods, strategies, equipment and machinery in a range of construction activities such that they will be able, if and when the opportunity arises to participate as site engineers (or similar role) in the planning and execution of those construction activities, albeit with supervision and guidance from experienced professionals. Students will also have developed an understanding of the design principles and techniques involved in the planning for those construction activities such that they are able, if and when the opportunity arises, to participate as design engineers, in the planning and design for those construction activities, with supervision and guidance from experienced professionals. The range of topics covered in this course is such that the learning outcomes form a basis for later development of more detailed knowledge, dependent on the future career experiences of the student. The course does not prepare a student for immediate, unsupervised participation in construction and design work associated with the topics covered.

The construction topics covered in this course have not been previously addressed in CIVL5506 (Foundations of Engineering Construction and Survey) or equivalent introductory study of construction and surveying techniques. The topics may vary dependent on current and planned projects in Sydney, NSW and Australia. At this stage the topics are hard rock tunnelling and general hard rock underground excavation; soft ground tunnelling; underground construction; micro tunnelling; cut and cover (cover and cut) tunnelling; earth retaining systems; piling; formwork and falsework (incl Tilt up, Ultrafloor, Sacrificial form); dewatering; pavement design and construction - rigid and flexible (incl and pavement construction materials); stormwater drainage design and construction; marine construction; civil construction in environmentally sensitive areas; contract administration for construction engineers; general engineering in remote locations (project based); construction methods in bridge engineering; OA documentation on a typical project; timber engineering; 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.

**ENGS5204 Engineering Professional Practice**

**Engineering and Information Technologies**

**Credit points:** 6  
**Session:** Semester 1 Classes: Lecture 1 hour per week. Tutorial 1 hour per week. Workgroup 1 hour per week.  
**Assumed knowledge:** Competences and experience in engineering obtained during an accepted engineering degree  
**Assessment:** Through semester assessment (100%)  
**Campus:** Camperdown/Darlington  
**Mode of delivery:** Normal (lecture/lab/tutorial) Day

**Associated degrees:** Grad Dip E, M P E.

**CIVL5268 Structural Dynamics**

**Engineering and Information Technologies**

**Credit points:** 6  
**Session:** Semester 2 Classes: 3 hr combined lecture and tutorial per 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%)  
**Campus:** Camperdown/Darlington  
**Mode of delivery:** Normal (lecture/lab/tutorial) Day

**Associated degrees:** B E, Grad Cert E, M P E, PG Coursework Exchange.

This Unit introduces the fundamental concepts and theory of dynamic analysis. In an initial 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 (SDF0) 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 Parts 4 of the Australian loading standard AS1170 for determining earthquake loads.

**Outcomes:** This Unit will provide students with the following knowledge and skills:

* Understanding of the fundamental concepts and definitions used in structural dynamics  
* Ability to calculate the natural frequency of a system using equilibrium or energy methods  
* Ability to determine the effect of viscous damping on the response of a freely vibrating system  
* Ability to determine the response of a system to a harmonic excitation  
* Ability to apply AS1170 Part 4 in structural design against earthquake actions  
* Understanding of the fundamental concepts of earthquake engineering

**CIVL5508 Foundations of Steel Structures 1**

**Engineering and Information Technologies**

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

**Associated degrees:** M P E.

**Unit of study descriptions**

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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
Engineering and Information Technologies
Credit points: 6 Session: Semester 1, Semester 2 Classes: Lecture 3hrs per week, E-Learning 1 hr per week. Assumed knowledge: Basic engineering or science knowledge. At least 2-3 years of work experience preferred. Assessment: Through semester assessment (60%), Final Exam (40%). Campus: Camperdown/Darlington 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.
Associated degrees: Grad Cert P M, Grad Dip E, M P E.
This UoS teaches the fundamental knowledge on the importance, organizational context and professional practice in project management. It serves as an introduction to project management practices for non-PM students. For PM students, this UoS lays the foundation to progress to advanced PM subjects. Although serving as a general introduction unit, the focus has been placed on scope, time, cost, and integration related issues.
Specifically, the UoS aims to
1. introduce students to the institutional, organisational and professional environment for today's project management practitioners as well as typical challenges and issues facing them;
2. demonstrate the importance of project management to engineering and organizations;
3. demonstrate the progression from strategy formulation to execution of the project;
4. provide a set of tools and techniques at different stages of a project's lifecycle with emphasis on scope, time, cost and integration related issues;
5. highlight examples of project success/failures in project management and to take lessons from these;
6. consider the roles of project manager in the organization and management of people;
7. provide a path for students seeking improvements in their project management expertise.

Select 6 credit points from the Specialist electives block.

Year Three - Semester One

CIVL5257
Concrete Structures: Prestressed Engineering and Information Technologies
Credit points: 6 Session: Semester 1 Classes: Lectures 2hrs per week, Project Work - in class 1hr per week. Assessment: Through semester assessment (60%), Final Exam (40%). Campus: Camperdown/Darlington Mode of delivery: Normal (lecture/lab/tutorial) Day
Associated degrees: B E, Grad Cert E, M P E.
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 Engineering and Information Technologies
Credit points: 6 Session: Semester 1 Classes: 3-hr combined lecture and tutorial per week Assessment: Through semester assessment (50%), Final Exam (50%). Campus: Camperdown/Darlington Mode of delivery: Normal (lecture/lab/tutorial) Day
Associated degrees: B E, Grad Cert E, M P E, PG Coursework Exchange.
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
Engineering and Information Technologies
Session: Semester 1, Semester 2 Classes: no formal classes Assessment: Students will write reports on their industrial experiences and maintain a portfolio
of work, Portfolio (100%)  
Campus: Camperdown/Darlington  
Mode of delivery: Professional Practice  

Note: Students should have completed one year of their MPE program before enrolling in this unit.

Associated degrees: M P E.

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

CIVL5020  
Capstone Project A  
Engineering and Information Technologies  
Credit points: 6  
Session: Semester 1, Semester 2  
Classes: Independent project work.  
Prerequisites: 48 credits from MPE degree program  
Assessment: Through semester assessment (100%)  
Campus: Camperdown/Darlington  
Mode of delivery: Supervision  
Note: Department permission required for enrolment.

Associated degrees: M E, M P E.

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.

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

CIVL5264  
Composite Steel-Concrete Structures  
Engineering and Information Technologies  
Credit points: 6  
Teacher/Coordinator: Dr G Ranzi  
Session: Semester 2  
Classes: Lectures 2hrs per week, Tutorial 1hr per week  
Assessment: Through semester assessment (100%)  
Campus: Camperdown/Darlington  
Mode of delivery: Normal (lecture/lab/tutorial) Day  

Associated degrees: B E, Grad Cert E, M P E, PG Coursework Exchange.

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

CIVL5510  
Foundations of Civil Engineering Design  
Engineering and Information Technologies  
Credit points: 6  
Session: Semester 1, Semester 2  
Classes: 1 hour of lectures and 3 hours of tutorials per week.  
Assumed knowledge: CIVL3205 AND CIVL3206.  
Assessment: Through semester assessment (75%), Final Exam (25%)  
Campus: Camperdown/Darlington  
Mode of delivery: Normal (lecture/lab/tutorial) Day

Associated degrees: M P E.

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.

CIVL5021  
Capstone Project B  
Engineering and Information Technologies  
Credit points: 6  
Session: Semester 1, Semester 2  
Classes: Independent project work.  
Corequisites: CIVL5020  
Assessment: Through semester assessment (100%)  
Campus: Camperdown/Darlington  
Mode of delivery: Supervision  
Note: Department permission required for enrolment.

Associated degrees: M E, M P E.

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.

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 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  
Engineering and Information Technologies  
Credit points: 6  
Session: Semester 1, Semester 2  
Classes: 2 hrs of lecture and 2hrs of tutorial/laboratory per week  
Assumed knowledge: Knowledge: CIVL2201 AND CIVL3206 AND CIVL3235. There are no prerequisites for this unit of study but it is assumed that students are competent in the content covered in CIVL2201 Structural Mechanics, CIVL3206 Steel Structures 1, and CIVL3235 Structural...
Outcomes: 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

Engineering and Information Technologies

Credit points: 6  
Session: Semester 2  
Classes: 4-hr combined lecture and tutorial per week.  
Prerequisites: CIVL3205 OR CIVL5007  
Assessment: Through semester assessment (50%), Final Exam (50%)  
Campus: Camperdown/Darlington  
Mode of delivery: Normal (lecture/lab/tutorial) Day

Objectives:
This Unit reviews the fundamental concepts of ‘elastic’ behaviour of reinforced concrete structures and introduces models of behaviour and methods of analysis related to the time-dependent effects of creep and shrinkage (at service loads). This Unit also examines the non-linear (strain-softening) behaviour of reinforced concrete and the related effects concerning the strength of statically-indeterminate reinforced concrete structures. In particular, this Unit examines the concepts of ductility, moment redistribution and plastic design (for beams and slabs). Strut-and-tie modelling of reinforced concrete members is also described.

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).

CIVL5458  
Numerical Methods in Civil Engineering

Engineering and Information Technologies

Credit points: 6  
Session: Semester 1  
Classes: 2 hrs lecture, 2hr. tutorial and laboratory per week  
Assessment: Through semester assessment (100%)  
Campus: Camperdown/Darlington  
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.
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 Eng - Systems and Practice

Engineering and Information Technologies

Credit points: 6  
Session: Semester 1  
Classes: 4 hours of lectures and tutorials per week.  
Assumed knowledge: Ability to conduct mass and energy balances, and the integration of these concepts to solve ‘real’ chemical engineering problems. Ability to understand basic principles of physical chemistry, physics and mechanics. Ability to use basic calculus and linear algebra, and carry out such computations using Matlab and MS Excel. Ability to read widely outside of the technical literature and to synthesise arguments based on such literature.

Outlines:
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

Engineering and Information Technologies

Credit points: 6 Session: Semester 1 Classes: 3 hours of lecture/project work in class per week. 3 hours of laboratory work per semester. Assessment: Through semester assessment (100%) Campus: Camperdown/Darlington Mode of delivery: Normal (lecture/lab/tutorial) Day

Associated degrees: B E, Grad Cert E, M P E.

Objectives: To develop an understanding of the modern principles of design of pile foundations and the application of these principles to practice.

Expected outcomes: Students should gain an advanced understanding of the types of pile foundations used in practice, and the procedures for analysis of pile foundations under various types of loading, and gain experience in carrying out pile design for real geotechnical profiles.

Syllabus summary: Types of piles and their uses, effects of pile installation, axial capacity of piles and pile groups, settlement of pile foundations, ultimate lateral capacity, lateral deformations, analysis of pile groups subjected to general loading conditions, piled raft foundations, piles subjected to ground movements, pile load testing, code provisions for pile design.

CIVL5451
Computer Methods in Geotechnical Engineering and Information Technologies

Credit points: 6 Session: Semester 1 Classes: 3-hr combined lecture and tutorial per week Assessment: Through semester assessment (100%) Campus: Camperdown/Darlington Mode of delivery: Normal (lecture/lab/tutorial) Day

Associated degrees: Grad Cert E, M P E.

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 in using computer modelling software to solve stress and flow problems in geomechanics.
3. To develop students ability at critically assessing assumptions behind computer models and critically evaluating the quality of numerical results.

CIVL5454
Rock Engineering

Engineering and Information Technologies

Credit points: 6 Session: Semester 2 Classes: 3 hours of project work in class per week. Assessment: Undergraduate geology and soil mechanics. Assessment: Through semester assessment (100%) Campus: Camperdown/Darlington Mode of delivery: Normal (lecture/lab/tutorial) Day

Associated degrees: B E, Grad Cert E, M P E.

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

Expected outcomes: Students will have learnt how to classify and characterise rocks and rock masses for engineering purposes and developed an understanding of basic rock mechanics etc.


CIVL5455
Engineering Behaviour of Soils

Engineering and Information Technologies

Credit points: 6 Session: Semester 2 Classes: Independent Study 4 hrs per week. Lectures 2hrs per week 12 weeks of semester. Tutorials 1hr per week. Assessment: 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 (80%), Final Exam (20%) Campus: Camperdown/Darlington Mode of delivery: Normal (lecture/lab/tutorial) Day

Associated degrees: B E, Grad Cert E, M P E.

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

Engineering and Information Technologies

Credit points: 6 Session: Semester 1 Classes: 3-hr combined lecture and tutorial per week Assessment: Through semester assessment (50%), Final Exam (50%) Campus: Camperdown/Darlington Mode of delivery: Normal (lecture/lab/tutorial) Day

Associated degrees: B E, Grad Cert E, M P E, PG Coursework Exchange.

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 background 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

Engineering and Information Technologies

Credit points: 6 Session: Semester 1 Classes: 3-hr combined lecture and tutorial per week Assessment: Through semester assessment (60%), Final Exam (40%) Campus: Camperdown/Darlington Mode of delivery: Normal (lecture/lab/tutorial) Day

Associated degrees: B E, Grad Cert E, M P E, PG Coursework Exchange.

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


complete Capstone Project. In particular, it should include completion of Project A, should cover the second half of the work required for a complete Capstone Project B (CIVL5021). This particular unit of study, which must be spread over most of the year, in two successive Units of Study of 6 credit points each, Capstone Project A (CIVL5020) and 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, 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.

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.

CIVL5021

Capstone Project A

Engineering and Information Technologies

Credit points: 6
Session: Semester 1, Semester 2
Classes: Independent project work.
Prerequisites: 48 credits from MPE degree program
Assessment: Through semester assessment (100%)
Campus: Camperdown/Darlington
Mode of delivery: Supervision

Note: Department permission required for enrolment.

Associated degrees: M E, M P E.

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

Engineering and Information Technologies

Credit points: 6
Session: Semester 1, Semester 2
Classes: Independent project work.
Corequisites: CIVL5020
Assessment: Through semester assessment (100%)
Campus: Camperdown/Darlington
Mode of delivery: Supervision

Note: Department permission required for enrolment.

Associated degrees: M E, M P E.

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.
Department permission required for enrolment in the following session(s): 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 of the degree.

ENGG5231
Engineering Graduate Exchange A
Engineering and Information Technologies
Prerequisites: Permission from faculty and school.  Assessment: Through semester assessment (100%)  Campus: Camperdown/Darlington  Mode of delivery: Normal (lecture/lab/tutorial) Day
Note: Department permission required for enrolment.
Associated degrees: M E, M Inf Tech, M Inf Tech Man, M P E, M P L, M P M.
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
Engineering and Information Technologies
Credit points: 6  Session: Int January, Int July  Classes: overseas short-course
Prerequisites: Permission from faculty and school.  Assessment: Through semester assessment (100%)  Campus: Camperdown/Darlington  Mode of delivery: Normal (lecture/lab/tutorial) Day
Note: Department permission required for enrolment.
Associated degrees: M E, M Inf Tech, M Inf Tech Man, M P E, M P L, M P M.
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.
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.

The MPE Network and Wireless are both fully accredited by Engineers Australia (http://www.engineersaustralia.org.au/) from 2009. Due to their similarity, from 2013 the faculty has merged these programs into the MPE Telecommunications.

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

## 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.

<table>
<thead>
<tr>
<th>Unit of study</th>
<th>Credit points</th>
<th>A: Assumed knowledge</th>
<th>Session</th>
</tr>
</thead>
<tbody>
<tr>
<td>COMP5212</td>
<td>6</td>
<td>Some prior knowledge of programming is preferred; for students without programming experience, extra assistance is given in the first 6 weeks of the semester. Note: Department permission required for enrolment</td>
<td>Semester 1</td>
</tr>
<tr>
<td>ELEC5710</td>
<td>6</td>
<td>Basic knowledge of differentiation &amp; integration, and HSC Physics</td>
<td>Semester 1</td>
</tr>
<tr>
<td>ELEC5722</td>
<td>6</td>
<td>ELEC1601. This unit of study assumes some knowledge of digital data representation and basic computer organisation.</td>
<td>Semester 1</td>
</tr>
<tr>
<td>ENGG5011</td>
<td>6</td>
<td>ELEC1601. This unit of study assumes some knowledge of digital data representation and basic computer organisation.</td>
<td>Semester 1 Semester 2</td>
</tr>
<tr>
<td>ELEC5711</td>
<td>6</td>
<td>HSC Mathematics extension 1 or 2</td>
<td>Semester 2</td>
</tr>
<tr>
<td>ELEC5720</td>
<td>6</td>
<td>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.</td>
<td>Semester 2</td>
</tr>
<tr>
<td>ELEC5721</td>
<td>6</td>
<td>Basic knowledge of differentiation &amp; integration, differential equations, and linear algebra.</td>
<td>Semester 2</td>
</tr>
<tr>
<td>ELEC5723</td>
<td>6</td>
<td>ELEC1103. Understanding of the fundamental concepts and building blocks of electrical and electronics circuits and aspects of professional project management, teamwork, and ethics. N CCSC1001 and CCSC1101</td>
<td>Semester 2</td>
</tr>
<tr>
<td>ELEC5736</td>
<td>6</td>
<td>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</td>
<td>Semester 1</td>
</tr>
<tr>
<td>ELEC5739</td>
<td>6</td>
<td>Confidence in mathematical operation usually needed to handle telecommunications problems such as Fourier transform, fundamental in signals and systems theory, convolution, and similar techniques.</td>
<td>Semester 1</td>
</tr>
<tr>
<td>ENGG5202</td>
<td>6</td>
<td>General knowledge in science and calculus and understanding of basic principles of chemistry, physics and mechanics</td>
<td>Semester 1</td>
</tr>
<tr>
<td>ELEC5744</td>
<td>6</td>
<td>Foundations of Digital Comm Systems</td>
<td>Semester 1</td>
</tr>
<tr>
<td>ENGG5204</td>
<td>6</td>
<td>Competences and experience in engineering obtained during an accepted engineering degree</td>
<td>Semester 1</td>
</tr>
<tr>
<td>ELEC5740</td>
<td>6</td>
<td>Foundations of Data Comm &amp; the Internet</td>
<td>Semester 2</td>
</tr>
<tr>
<td>ENGG5207</td>
<td>6</td>
<td>Students should have completed one year of their MPE program before enrolling in this unit.</td>
<td>Semester 1 Semester 2</td>
</tr>
<tr>
<td>ELEC5020</td>
<td>6</td>
<td>48 credits from MPE degree program Note: Department permission required for enrolment</td>
<td>Semester 1 Semester 2</td>
</tr>
</tbody>
</table>

Select 18 credit points from the Specialist Electives unit block.

## Year Three - Semester One

<table>
<thead>
<tr>
<th>Unit of study</th>
<th>Credit points</th>
<th>A: Assumed knowledge</th>
<th>Session</th>
</tr>
</thead>
<tbody>
<tr>
<td>ENGG5204</td>
<td>6</td>
<td>Competences and experience in engineering obtained during an accepted engineering degree</td>
<td>Semester 1</td>
</tr>
<tr>
<td>ENGG5207</td>
<td>6</td>
<td>Students should have completed one year of their MPE program before enrolling in this unit.</td>
<td>Semester 1 Semester 2</td>
</tr>
<tr>
<td>ELEC5020</td>
<td>6</td>
<td>48 credits from MPE degree program Note: Department permission required for enrolment</td>
<td>Semester 1 Semester 2</td>
</tr>
</tbody>
</table>
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 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

<table>
<thead>
<tr>
<th>Unit of study</th>
<th>Credit points</th>
<th>A: Assumed knowledge</th>
<th>P: Prerequisites</th>
<th>C: Corequisites</th>
<th>N: Prohibition</th>
<th>Session</th>
</tr>
</thead>
<tbody>
<tr>
<td>ELEC5021 Capstone Project B</td>
<td>6 C ELEC5020 Note: Department permission required for enrolment</td>
<td>Semester 1</td>
<td>Semester 2</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

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.

- **ELEC501** Antennas and Propagation 6 Semester 2
- **ELEC5043** 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
- **ELEC5057** Error Control Coding 6 A Basic knowledge on digital communications. Fundamental mathematics including probability theory and linear algebra. Semester 1
- **ELEC5058** 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
- **ELEC5059** Mobile Networks 6 A Basically, students need to know the concepts of data communications and mobile communications, which could be gained in 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
- **ELEC5010** Satellite Communication Systems 6 A Knowledge of error probabilities, analog and digital modulation techniques and error performance evaluation studied in ELEC3505 Communications and ELEC4005 Digital Communication Systems, is assumed. Semester 2
- **ELEC5011** Optical Communication Systems 6 A (ELEC3505 Communications) and (ELEC3405 Communications and Photonics) or equivalent Semester 1
- **ELEC5012** Optical Networks 6 A Knowledge of digital communications, wave propagation, and fundamental optics Semester 2
- **ELEC5014** Networked Embedded Systems 6 A ELEC3305, ELEC3506, ELEC3607 and ELEC5508 or equivalent Semester 2
- **ELEC5016** 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
- **ELEC5016** 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 A Basic engineering or science knowledge. At least 2-3 years of work experience preferred. 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 Winter Main
- **ENGG5215** International Eng Strategy & Operations 6 A Sound competence in all aspects of engineering, and some understanding of issues of engineering management and globalisation 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 table

<table>
<thead>
<tr>
<th>Unit of study</th>
<th>Credit points</th>
<th>A: Assumed knowledge</th>
<th>P: Prerequisites</th>
<th>C: Corequisites</th>
<th>N: Prohibition</th>
<th>Session</th>
</tr>
</thead>
<tbody>
<tr>
<td>ELEC5020 Capstone Project A</td>
<td>6</td>
<td>P 48 credits from MPE degree program</td>
<td>Note: Department permission required for enrolment</td>
<td>Semester 1 Semester 2</td>
<td></td>
<td></td>
</tr>
<tr>
<td>ELEC5021 Capstone Project B</td>
<td>6</td>
<td>C ELEC5020</td>
<td>Note: Department permission required for enrolment</td>
<td>Semester 1 Semester 2</td>
<td></td>
<td></td>
</tr>
<tr>
<td>ELEC5022 Capstone Project B Extended</td>
<td>12</td>
<td>P 42 credit points in the Master of Engineering and WAM &gt;70, or 66 credit points in the Master of Professional Engineering and WAM &gt;70 or exemption</td>
<td>Note: Department permission required for enrolment</td>
<td>Semester 1 Semester 2</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### 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.

<table>
<thead>
<tr>
<th>Unit of study</th>
<th>Credit points</th>
<th>A: Assumed knowledge</th>
<th>P: Prerequisites</th>
<th>C: Corequisites</th>
<th>N: Prohibition</th>
<th>Session</th>
</tr>
</thead>
<tbody>
<tr>
<td>ELEC5222 Dissertation A</td>
<td>12</td>
<td>N ELEC8901, ELEC8902, ENGS5222, ENGS5223</td>
<td>Note: Department permission required for enrolment</td>
<td>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.</td>
<td>Semester 1 Semester 2</td>
<td></td>
</tr>
<tr>
<td>ELEC5223 Dissertation B</td>
<td>12</td>
<td>N ELEC8901, ELEC8902, ENGS5222, ENGS5223</td>
<td>Note: Department permission required for enrolment</td>
<td>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.</td>
<td>Semester 1 Semester 2</td>
<td></td>
</tr>
</tbody>
</table>

### Exchange units

Exchange units require the approval of the Program Director. With approval, up to 12 credit points of Exchange units may be taken in place of other units, towards the requirements of the degree.

<table>
<thead>
<tr>
<th>Unit of study</th>
<th>Credit points</th>
<th>A: Assumed knowledge</th>
<th>P: Prerequisites</th>
<th>C: Corequisites</th>
<th>N: Prohibition</th>
<th>Session</th>
</tr>
</thead>
<tbody>
<tr>
<td>ENG5231 Engineering Graduate Exchange A</td>
<td>6</td>
<td>P Permission from faculty and school.</td>
<td>Note: Department permission required for enrolment</td>
<td>Semester 1 Semester 2</td>
<td></td>
<td></td>
</tr>
<tr>
<td>ENG5232 Engineering Graduate Exchange B</td>
<td>6</td>
<td>P Permission from faculty and school.</td>
<td>Note: Department permission required for enrolment</td>
<td>Semester 1 Semester 2</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

For more information on degree program requirements visit CUSP.
Unit of study table
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

COMP5212
Software Construction
Engineering and Information Technologies

Credit points: 6

Session: Semester 1
Classes: One 2 hour lecture and one 2 hour tutorial per week. 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 assessment (100%) Campus: Camperdown/Darlington Mode of delivery: Normal (lecture/lab/tutorial) Day

Note: Department permission required for enrolment.

Associated degrees: B E, Grad Dip Comp, M I D M, M P E, PG Coursework Exchange.

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.

ELEC5710
Electrical & Electronic Engi (Fund)
Engineering and Information Technologies

Credit points: 6

Session: Semester 1
Classes: 3hrs lectures/labs/tutorials per week. Assumed knowledge: Basic knowledge of differentiation & integration, and HSC Physics. Assessment: Through semester assessment (50%), Final Exam (50%) Campus: Camperdown/Darlington Mode of delivery: Normal (lecture/lab/tutorial) Day

Associated degrees: M P E.

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

ELEC5722
Foundations of Digital Systems Design
Engineering and Information Technologies

Credit points: 6

Session: Semester 1
Classes: 2 hours of lectures, 2 hours of tutorials and 3 hours of laboratory work per week. Assumed knowledge: ELEC1601. This unit of study assumes some knowledge of digital data representation and basic computer organisation. Assessment: Through semester assessment (40%), Final Exam (60%) Campus: Camperdown/Darlington Mode of delivery: Normal (lecture/lab/tutorial) Day

Associated degrees: Grad Dip E (Prof Eng), M P E.

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
Engineering and Information Technologies

Credit points: 6

Session: Semester 1, Semester 2
Classes: no formal classes. regular meetings with supervisor will be required. Assessment: Through semester assessment (100%) Campus: Camperdown/Darlington Mode of delivery: Supervision

Associated degrees: Grad Dip E (Prof Eng), M P E.

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

ELEC5711
Foundations of Computer Systems
Engineering and Information Technologies

Credit points: 6

Session: Semester 2
Classes: 2hr of Lectures per week, 8 hrs of project work in class per semester. Assumed knowledge: HSC Mathematics extension 1 or 2 Assessment: Through semester assessment (59%), Final Exam (41%) Campus: Camperdown/Darlington Mode of delivery: Normal (lecture/lab/tutorial) Day

Associated degrees: M P E.

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.
ELEC5720
Foundations Electronic Devs and Circuits
Engineering and Information Technologies
Credit points: 6  Session: Semester 2  Classes: 2 hours of lectures per week, and a 2 hours tutorial and 2 hours lab per fortnight. Prohibitions: ELEC2104
Assumed knowledge: Ohm's Law and Kirchoff's Laws; action of Current and Voltage sources; network analysis and the superposition theorem; Thévenin 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%)  Campus: Camperdown/Darlington  Mode of delivery: Normal (lecture/lab/tutorial) Day
Associated degrees: Grad Dip E (Prof Eng), M P E.
Modern Electronics has come to be known as microelectronics which refers to the Integrated Circuits (ICs) containing millions of discrete devices. This course introduces some of the basic electronic devices like diodes and different types of transistors. It also aims to introduce students the analysis and design techniques of circuits involving these discrete devices as well as the integrated circuits. Completion of this course is essential to specialize in Electrical, Telecommunication or Computer Engineering stream. The knowledge of ELEC1103 is assumed.

ELEC5721
Foundations of Signals and Systems
Engineering and Information Technologies
Credit points: 6  Session: Semester 2  Classes: 2 hours of lectures, 2 hours lab/tutorial per week and 1 hour of eLearning session per week. Assumed knowledge: Basic knowledge of differentiation and integration, differential equations, and linear algebra. Assessment: Through semester assessment (30%), Final Exam (70%)  Campus: Camperdown/Darlington  Mode of delivery: Normal (lecture/lab/tutorial) Day
Associated degrees: Grad Dip E (Prof Eng), M P E.
This unit aims to teach some of the basic properties of many engineering signals and systems and the necessary mathematical tools that aid in this process. The particular emphasis is on the time and frequency domain modeling of linear time invariant systems. The concepts learnt in this unit will be heavily used in many units of study (in later years) in the areas of communication, control, power systems and signal processing. A basic knowledge of differentiation and integration, differential equations, and linear algebra is assumed.

ELEC5723
Found: Simulations & Numerical Solutions
Engineering and Information Technologies
Credit points: 6  Session: Semester 2  Classes: Lecture 1 hour per week, Laboratory 3 hours per week. Prohibitions: COSC1001 and COSC1901
Assumed knowledge: ELEC1103. 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 assessment (25%), Final Exam (75%)  Campus: Camperdown/Darlington  Mode of delivery: Normal (lecture/lab/tutorial) Day
Associated degrees: Grad Dip E, M P E.
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.


Year Two - Semester One
ELEC5736
Foundations of Digital Signal Processing
Engineering and Information Technologies
Credit points: 6  Session: Semester 1  Classes: 2 hours of lectures and a 2 hours lab/tutorial per week. 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%)  Campus: Camperdown/Darlington  Mode of delivery: Normal (lecture/lab/tutorial) Day
Associated degrees: M P E.
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.


ELEC5739
Foundations of Communications
Engineering and Information Technologies
Credit points: 6  Session: Semester 1  Classes: 2 hours of lectures and a 3 hours lab and tutorial per week. 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%)  Campus: Camperdown/Darlington  Mode of delivery: Normal (lecture/lab/tutorial) Day
Associated degrees: M P E.
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, students 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, correlation 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.

ELEC5744  
Foundations of Digital Comm Systems  
Engineering and Information Technologies  
Credit points: 6 Session: Semester 1 Classes: 2 hours of lectures and a 2 hours lab/tutorial per week. Assessment: Through semester assessment (45%), Final Exam (55%) Campus: Camperdown/Darlington Mode of delivery: Normal (lecture/lab/tutorial) Day  
Associated degrees: M P E.  
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.

ENGS5202  
Sustainable Design, Eng and Mgt  
Engineering and Information Technologies  
Credit points: 6 Session: Semester 1 Classes: 2 lectures per week, tutorials 2 hour per week and projects and self assisted learning (4 hours per week)  
Assumed knowledge: General knowledge in science and calculus and understanding of basic principles of chemistry, physics and mechanics  
Assessment: Through semester assessment (70%), Final Exam (30%) Campus: Camperdown/Darlington Mode of delivery: Normal (lecture/lab/tutorial) Day  
Associated degrees: Grad Cert E, M P E.  
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  
ELEC5740  
Foundations of Data Comm & the Internet  
Engineering and Information Technologies  
Credit points: 6 Session: Semester 2 Classes: 2 hours of lectures, 2 hours tutorial per week, 2 hours of labs per fortnight. Assessment: Through semester assessment (40%), Final Exam (60%) Campus: Camperdown/Darlington Mode of delivery: Normal (lecture/lab/tutorial) Day  
Associated degrees: M P E.  
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  
ENGS5204  
Engineering Professional Practice  
Engineering and Information Technologies  
Credit points: 6 Session: Semester 1 Classes: Lecture 1 hour per week, Tutorial 1 hour per week, Workgroup 1 hour per week.  
Assumed knowledge: Competences and experience in engineering obtained during an accepted engineering degree Assessment: Through semester assessment (100%)  
Campus: Camperdown/Darlington Mode of delivery: Normal (lecture/lab/tutorial) Day  
Associated degrees: Grad Dip E, M P E.  
his 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.

ENGS5217  
Practical Experience  
Engineering and Information Technologies  
Session: Semester 1, Semester 2 Classes: no formal classes  
Assessment: Students will write reports on their industrial experiences and maintain a portfolio of work. Portfolio (100%)  
Campus: Camperdown/Darlington Mode of delivery: Professional Practice  
Note: Students should have completed one year of their MPE program before enrolling in this unit.  
Associated degrees: M P E.  
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. 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

ELEC5020  
Capstone Project A  
Engineering and Information Technologies  
Credit points: 6 Session: Semester 1, Semester 2 Classes: Independent project work.  
Prerequisites: 48 credits from MPE degree program  
Assessment: Through semester assessment (100%)  
Campus: Camperdown/Darlington Mode of delivery: Supervision  
Note: Department permission required for enrolment.  
Associated degrees: M E, M P E.  
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 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
Engineering and Information Technologies
Credit points: 6 Session: Semester 1, Semester 2 Classes: Independent project work. Corequisites: ELEC5020 Assessment: Through semester assessment (100%) Campus: Camperdown/Darlington Mode of delivery: Supervision
Note: Department permission required for enrolment.

Associated degrees: M E, M P E.

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
Engineering and Information Technologies
Credit points: 6 Session: Semester 2 Classes: 2 hours of lectures and a 3 hours laboratory each week. Assessment: Through semester assessment (40%), Final Exam (60%) Campus: Camperdown/Darlington Mode of delivery: Normal (lecture/lab/tutorial) Day

Associated degrees: B E, Grad Cert E, M P E, PG Coursework Exchange.

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 broadening techniques are introduced. Ionospheric propagation is discussed and also 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
Engineering and Information Technologies
Credit points: 6 Session: Semester 1 Classes: 2 hours of lectures and 2 hours lab/tutorial per 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%) Campus: Camperdown/Darlington Mode of delivery: Normal (lecture/lab/tutorial) Day

Associated degrees: B E, Grad Cert E, M P E, PG Coursework Exchange.

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
Engineering and Information Technologies
Credit points: 6 Session: Semester 1 Classes: 2 hours of lectures and a 1 hour tutorial per week. Assumed knowledge: Basic knowledge on digital communications. Fundamental mathematics including probability theory and linear algebra. Assessment: Through semester assessment (50%), Final Exam (50%) Campus: Camperdown/Darlington Mode of delivery: Normal (lecture/lab/tutorial) Day

Associated degrees: B E, Grad Cert E, Grad Cert I T, M P E, PG Coursework Exchange.

This unit deals with the principles of error control coding techniques and their applications in various communication and data storage systems. Its aim is to present the fundamentals of error control coding techniques and develop theoretical and practical skills in the design of error control encoders/decoders. Successful completion of this unit will facilitate progression to advanced study or to work in the fields of telecommunications and computer engineering. It is assumed that the students have some background in communications principles and probability theory.

The following topics are covered. Introduction to error control coding, linear algebra. Linear block codes, cyclic codes, BCH codes, Reed-Solomon codes, burst-error correcting codes, design of codecs for block codes, applications of block codes in communications and digital recording. Convolutional codes, Viterbi algorithm, design of codecs for convolutional codes, applications of convolutional codes in communications, soft decision decoding of block and convolutional codes, trellis coded modulation, block coded modulation, design of codecs for trellis codes, applications of trellis codes in data transmission. Turbo codes and applications to space and mobile communications.

ELEC5508
Wireless Engineering
Engineering and Information Technologies
Credit points: 6 Session: Semester 2 Classes: 2 hours of lectures and a 1 hour tutorial per 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%) Campus: Camperdown/Darlington Mode of delivery: Normal (lecture/lab/tutorial) Day

Associated degrees: B C S T (Hons), B E, B I T (Hons), Grad Cert E, Grad Cert I T, M P E, PG Coursework Exchange.

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 Engineering and Information Technologies Credit points: 6 Session: Semester 1 Classes: 2 hours of lecture and a 2 hour tutorial/project meeting per week. Academic knowledge: Students need to know the concepts of data communications and mobile communications, which could be gained in one of the following units of study: ELEC3305 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%) Campus: Camperdown/Darlington Mode of delivery: Normal (lecture/lab/tutorial) Day

Associated degrees: B C S T (Hons), B E, B I T (Hons), Grad Cert E, Grad Cert I T, M P E, PG Coursework Exchange.

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 Engineering and Information Technologies Credit points: 6 Session: Semester 2 Classes: 2 hours of lectures, 1 hour tutorial per week. 3 hour site visit during semester. Academic knowledge: Knowledge of error probabilities, analog and digital modulation techniques and error performance evaluation studied in ELEC3305 Communications and ELEC4505 Digital Communication Systems, is assumed. Assessment: Through semester assessment (30%), Final Exam (70%) Campus: Camperdown/Darlington Mode of delivery: Normal (lecture/lab/tutorial) Day

Associated degrees: B E, Grad Cert E, Grad Cert I T, M P E, PG Coursework Exchange.

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 Engineering and Information Technologies Credit points: 6 Session: Semester 1 Classes: 2 hours of lectures and 2 hours laboratory/tutorial per week. Academic knowledge: ELEC3305 Communications and ELEC4305 Optical Communications are assumed. Assessment: Through semester assessment (40%), Final Exam (60%) Campus: Camperdown/Darlington Mode of delivery: Normal (lecture/lab/tutorial) Day

Associated degrees: B E, Grad Cert E, Grad Cert I T, M P E, PG Coursework Exchange.

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.

ELEC5512 Optical Networks Engineering and Information Technologies Credit points: 6 Session: Semester 2 Classes: 2 hours of lectures and 1 hour laboratory/tutorial per week. Academic knowledge: Knowledge of digital communications, wave propagation, and fundamental optics Assessment: Through semester assessment (25%), Final Exam (75%) Campus: Camperdown/Darlington Mode of delivery: Normal (lecture/lab/tutorial) Day

Associated degrees: B E, Grad Cert E, Grad Cert I T, M P E, PG Coursework Exchange.

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.
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

Engineering and Information Technologies

Credit points: 6 Session: Semester 2 Classes: Presentation 2.00 hours per week, Project Work - in class 2.00 hours per week. Assumed knowledge: First degree in Engineering or a related discipline. Assessment: Through semester assessment (100%) Campus: Camperdown/Darlington Mode of delivery: Normal (lecture/lab/tutorial) Day

Associated degrees: Grad Dip E, M P E, M P L, M P M.

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

Engineering and Information Technologies

Credit points: 6 Session: Semester 1, Semester 2 Classes: Lecture 3hrs per week, E-Learning 1 hr per week. Assumed knowledge: Basic engineering or science knowledge. At least 2-3 years of work experience preferred. Assessment: Through semester assessment (60%), Final Exam (40%) Campus: Camperdown/Darlington 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.

Associated degrees: Grad Cert P M, Grad Dip E, M P E.

This UoS teaches the fundamental knowledge on the importance, organizational context and professional practice in project management. It serves as an introduction to project management practices for non-PM students. For PM students, this UoS lays the foundation to progress to advanced PM subjects. Although serving as a general introduction unit, the focus has been placed on scope, time, cost, and integration related issues.

Specifically, the UoS aims to:
1. introduce students to the institutional, organisational and professional environment for today's project management practitioners as well as typical challenges and issues facing them;
2. demonstrate the importance of project management to engineering and organizations;
3. demonstrate the progression from strategy formulation to execution of the project;
4. provide a set of tools and techniques at different stages of a project's lifecycle with emphasis on scope, time, cost and integration related issues;
5. highlight examples of project success/failures in project management and to take lessons from these;
6. consider the roles of project manager in the organization and management of people;
7. provide a path for students seeking improvements in their project management expertise.
ENGG5214 Management of Technology
Engineering and Information Technologies
Credit points: 6 Session: Semester 2, Winter Main Classes: 1 hr Lecture per week, 1 hr Tutorial per week, 2hr Project work in class per week. Assumed knowledge: Sound competence in all aspects of engineering, and some understanding of issues of engineering management. Assessment: Through semester assessment (100%) Campus: Camperdown/Darlington Mode of delivery: Normal (lecture/lab/tutorial) Day
Associated degrees: Grad Dip E, M P E.

This UoS is designed to introduce students to the global context of much of contemporary engineering and the consequent strategic and operational issues. It will address the nature, characteristics and variety of risks of global businesses, the opportunities and pressures for effective strategies, and the many management challenges in international business. In particular it will focus on Australian consulting, logistics and construction engineering firms that are operating on a global basis.

ENGG5215 International Eng Strategy & Operations
Engineering and Information Technologies
Credit points: 6 Session: Semester 2 Classes: Lecture 2 hours per week, Tutorial 2 hours per week, Project Work - in class 2 hours per week. Assumed knowledge: Sound competence in all aspects of engineering, and some understanding of issues of engineering management and globalisation. Assessment: Through semester assessment (100%) Campus: Camperdown/Darlington Mode of delivery: Normal (lecture/lab/tutorial) Day
Associated degrees: Grad Dip E, M P E.

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
Engineering and Information Technologies
Credit points: 6 Session: Semester 1 Classes: 1hr Lecture per week, 1 hr Tutorials per week, 2 hr Project work in class per week for first half of semester. Assumed knowledge: Sound competence in all aspects of engineering, and some understanding of issues of engineering management. Assessment: Through semester assessment (100%) Campus: Camperdown/Darlington Mode of delivery: Normal (lecture/lab/tutorial) Day
Associated degrees: Grad Dip E, M P E.

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 75% 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
Engineering and Information Technologies
Credit points: 6 Session: Semester 1, Semester 2 Classes: Independent project work. Prerequisites: 48 credits from MPE degree program. Assessment: Through semester assessment (100%) Campus: Camperdown/Darlington Mode of delivery: Supervision
Note: Department permission required for enrolment.
Associated degrees: M E, M P E.

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
Engineering and Information Technologies
Credit points: 6 Session: Semester 1, Semester 2 Classes: Independent project work. Corequisites: ELEC5020. Assessment: Through semester assessment (100%) Campus: Camperdown/Darlington Mode of delivery: Supervision
Note: Department permission required for enrolment.
Associated degrees: M E, M P E.

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
Engineering and Information Technologies
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 for exemption. Assessment: Through semester assessment (100%) Campus: Camperdown/Darlington Mode of delivery: Supervision
Note: Department permission required for enrolment.
Associated degrees: M E, M P E.

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.

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
Engineering and Information Technologies
Credit points: 12 Session: Semester 1, Semester 2 Classes: no formal classes. Prohibitions: ELEC8901, ELEC8902, ENGG5222, ELEC5223 Assessment: Through semester assessment (100%) Campus: Camperdown/Darlington 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.
Associated degrees: M E, M P E.

To complete a substantial research project and successfully analyse a problem, devise appropriate experiments, analyse the results and produce a well-argued, in-depth thesis.
Department permission required for enrolment in the following session(s): 1, 2

**ELEC5223**

**Dissertation B**

**Engineering and Information Technologies**

**Credit points:** 12  
**Session:** Semester 1, Semester 2  
**Classes:** no formal classes  
**Prohibitions:** ELEC8901, ELEC8902, ENGG5222, ENGG5223  
**Assessment:** Through semester assessment (100%)  
**Campus:** Camperdown/Darlington  
**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.

**Associated degrees:** M E, M P E.

To complete a substantial research project and successfully analyse a problem, devise appropriate experiments, analyse the results and produce a well-argued, in-depth thesis.

Department permission required for enrolment in the following session(s): 1, 2

**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**

**Engineering and Information Technologies**

**Credit points:** 6  
**Session:** Int January, Int July  
**Classes:** overseas short-course.  
**Prerequisites:** Permission from faculty and school.  
**Assessment:** Through semester assessment (100%)  
**Campus:** Camperdown/Darlington  
**Mode of delivery:** Normal (lecture/lab/tutorial) Day  
**Note:** Department permission required for enrolment.

**Associated degrees:** M E, M Inf Tech, M Inf Tech Man, M P E, M P L, M P M.

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**

**Engineering and Information Technologies**

**Credit points:** 6  
**Session:** Int January, Int July  
**Classes:** overseas short-course  
**Prerequisites:** Permission from faculty and school.  
**Assessment:** Through semester assessment (100%)  
**Campus:** Camperdown/Darlington  
**Mode of delivery:** Normal (lecture/lab/tutorial) Day  
**Note:** Department permission required for enrolment.

**Associated degrees:** M E, M Inf Tech, M Inf Tech Man, M P E, M P L, M P M.

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.

For more information on units of study visit CUSP.
Information Technology and Information Technology Management

The School of IT offers three distinct postgraduate coursework programs for specific stages in your professional career: the Graduate Diploma in Computing, the Master of Information Technology and the 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 like project management, team communication and analytical thinking.
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 must complete a defined major. Majors are available in: software engineering; computer science; computer networks; multimedia technology; database management; business information systems; IT project management; health informatics; and 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.
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

<table>
<thead>
<tr>
<th>Code</th>
<th>Course title</th>
</tr>
</thead>
<tbody>
<tr>
<td>HG025</td>
<td>Graduate Certificate in Information Technology</td>
</tr>
<tr>
<td>HF042</td>
<td>Graduate Diploma in Information Technology</td>
</tr>
<tr>
<td>HC049</td>
<td>Master of Information Technology</td>
</tr>
</tbody>
</table>

2 Attendance pattern
The attendance pattern for the courses is full time or part time according to candidate choice.

3 Master's type
The master's degree in these resolutions is a professional master's course, as defined by the Coursework Rule.

4 Embedded courses in this sequence
(1) The embedded courses in this sequence are:
   (a) the Graduate Certificate in Information Technology
   (b) the Graduate Diploma in Information Technology
   (c) the Master of Information Technology
(2) Providing candidates satisfy the admission requirements for each stage, a candidate may progress to the award of any of the courses in this sequence. Only the longest award completed will be conferred.

5 Admission to candidature
(1) Available places will be offered to qualified applicants based on merit, according to the following admissions criteria.
(2) Admission to the Graduate Certificate in Information Technology requires:
   (a) a bachelor's degree with a substantial study in a relevant field of Information Technology; or
   (b) the Bachelor of Engineering from the University of Sydney, or equivalent qualification, with a major sequence of study in Computer Engineering, Software Engineering or Telecommunications Engineering.
(3) Admission to the Graduate Diploma in Information Technology requires:
   (a) a bachelor's degree in any aspect of Information Technology; or
   (b) the Bachelor of Engineering from the University of Sydney, or equivalent qualification, with a major sequence of study in Computer Engineering, Software Engineering or Telecommunications Engineering; or
   (c) completion of the embedded graduate certificate with at least a credit average.
(4) Admission to the Master of Information Technology requires:
   (a) a bachelor's degree with at least a credit average and a major sequence of study in any aspect of Information Technology; or
   (b) the Bachelor of Engineering from the University of Sydney, or equivalent qualification, with at least a credit average and a major sequence of study in Computer Engineering, Software Engineering or Telecommunications Engineering; or
   (c) completion of the embedded graduate diploma with at least a credit average; or
   (d) completion of the Graduate Diploma in Computing from the University of Sydney with no more than 12 credit points of unit of study failed.
(5) In exceptional circumstances the Dean may admit applicants without these qualifications who, in the opinion of the faculty, have qualifications and evidence of experience and achievement sufficient to successfully undertake the award.

6 Requirements for award
(1) The units of study that may be taken for these awards are set out in the table of units of study: Master of Information Technology.
(2) From the table of units of study and with the approval of the Dean or nominee, a maximum of 18 credit points may be selected from units outside the School of IT, of which no more than 12 credit points may be from outside the Faculty of Engineering and IT.
(3) To qualify for the Graduate Certificate in Information Technology a candidate must complete 24 credit points of the Foundational or Specialist units of study.
(4) To qualify for the Graduate Diploma in Information Technology a candidate must complete 36 credit points, including:
   (a) a maximum of 24 credit points of the Foundational units of study; and
   (b) a minimum of 12 credit points of the Specialist units of study from the table of units of study excluding Project units and Core Professional Pathway units.
(5) To qualify for the Masters in Information Technology a candidate must complete 48 credit points, including:
   (a) all core units of study of either the Professional Pathway or the Research Path; and
   (b) maximum 24 credit points of Foundational units of study; and
   (c) all prescribed units of study for one defined specialisation or the research path.
Specialisations

(1) Completion of a specialisation is a requirement of the Master of Information Technology. A specialisation requires the completion of all core units of study as prescribed by the faculty and at least 18 credit points chosen from units of study listed in the table for the defined specialisation. The specialisations available are:

(a) Business Information Systems
(b) Computer Networks
(c) Computer Science
(d) Database Management Systems
(e) Health Informatics
(f) Multimedia Technology
(g) Project Management
(h) Software Engineering
(i) Telecommunications Engineering.

Progression Rules

(1) A candidate for the Master of Information Technology must complete 24 credit points from Foundational or Specialist units of study with at least Credit average marks before taking any Information Technology Project units. Admission to project units of study is subject to availability of supervision and to the approval of the Dean or nominee.

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.

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.

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.

Credit for previous study

(1) In addition to the general credit transfer rules of the Coursework Rule, the following restrictions on credit transfer into these courses apply:

(a) where postgraduate study has been undertaken at the University of Sydney in one of the embedded courses of the Master of Information Technology Management and no award has been conferred, credit may be transferred in full, provided the study has been undertaken within the previous three years and subject to approval of the Academic Director; where study has been undertaken at postgraduate level and no award has been conferred, credit to a maximum of 50% of the prescribed credit points may be transferred to the Graduate Diploma in Information Technology or the Master of Information Technology, provided:

(i) the study has been undertaken at the University of Sydney, or at an external institution recognised by the University of Sydney, within the previous three years; and

(ii) the units of study have been completed at credit level or above; and

(iii) the units are equivalent to Core or Specialist units of study offered under the degree being taken, subject to approval of the Academic Director.

(c) where study has been undertaken at postgraduate level and an award has been conferred, credit to a maximum of 12 credit points may be transferred to the Master of Information Technology, provided:

(i) the study has been undertaken at an external institution recognized by the University of Sydney within the previous three years; and

(ii) the units of study have been completed at credit level or above; and

(iii) the units are equivalent to Core or Specialist units of study offered under the degree being taken, subject to approval of the Academic Director.

Satisfactory progress

Progression is subject to the Coursework Rule. A candidate who has failed to meet these progression rules will be transferred to either the Graduate Diploma or the Graduate Certificate in Information Technology, depending on the credit points successfully completed.

Time limit

(1) A candidate for the Graduate Certificate in Information Technology shall complete the requirements for the award in a minimum enrolment of one semester and a maximum enrolment of four semesters.

(2) A candidate for the Graduate Diploma in Information Technology shall complete the requirements for the award in a minimum enrolment of two semesters and a maximum enrolment of six semesters.

(3) A candidate for the Master of Information Technology shall complete the requirements for the award in a minimum of two semesters and a maximum of eight semesters.

Transitional provisions

(1) These resolutions apply to students who commenced their candidature after 1 January, 2011 and students who commenced their candidature prior to 1 January, 2011 who elect to proceed under these resolutions.

(2) Candidates who commenced prior to 1 January, 2011 may complete the requirements in accordance with the resolutions in force at the time of their commencement.
### Master of Information Technology

Candidates for the degree of Master of Information Technology are required to complete 48 credit points from the units of study as follows:

1. A total of 48 credit points must be completed.
2. A maximum of 24 credit points can be selected from Foundational units of study.
3. At least 24 credit points should come from specialist units of study or IT project units of study.
4. Every candidate must complete a defined major in the Master of Information Technology, which requires them to complete at least 18 credit points of core units in the designated major and INFO5990.
5. After completing 24 credit points of units of study, candidates who achieve Credit average results or above may select 12 credit points of IT project units of study among their specialist units.
6. 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.
7. Candidates who pursue the Research path must take INFO5993 and 18 credit points from IT Research units of study.
8. A maximum of 18 credit points may be selected from units outside the Faculty of Engineering and IT.

#### Foundational units

A maximum of 24 credit points of Foundational units can be taken.

<table>
<thead>
<tr>
<th>Unit of Study</th>
<th>Credit Points</th>
<th>A: Assumed knowledge</th>
<th>Session</th>
</tr>
</thead>
<tbody>
<tr>
<td>COMP5028</td>
<td>6</td>
<td>Students enrolled in COMP5028 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 INFO3220</td>
<td>Semester 1</td>
</tr>
<tr>
<td>COMP5114</td>
<td>6</td>
<td></td>
<td>Semester 1 Semester 2</td>
</tr>
<tr>
<td>COMP5116</td>
<td>6</td>
<td></td>
<td>Semester 1 Semester 2</td>
</tr>
<tr>
<td>COMP5138</td>
<td>6</td>
<td>Some exposure to programming and some familiarity with data model concepts</td>
<td>Semester 1 Semester 2</td>
</tr>
<tr>
<td>COMP5206</td>
<td>6</td>
<td></td>
<td>Semester 1 Semester 2</td>
</tr>
<tr>
<td>COMP5211</td>
<td>6</td>
<td>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.</td>
<td>Semester 1 Semester 2</td>
</tr>
<tr>
<td>COMP5214</td>
<td>6</td>
<td></td>
<td>Semester 1 Semester 2</td>
</tr>
<tr>
<td>INFO5001</td>
<td>6</td>
<td>Experience with a data model as in COMP5212 or COMP5214 or COMP5028 or COMP5138 N INFO2110, ELEC3610, ELEC5743</td>
<td>Semester 2</td>
</tr>
<tr>
<td>INFO5003</td>
<td>6</td>
<td></td>
<td>Summer Late</td>
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<tr>
<td>PUBH5018</td>
<td>6</td>
<td></td>
<td>Semester 1</td>
</tr>
<tr>
<td>STAT5002</td>
<td>6</td>
<td>HSC Mathematics</td>
<td>Semester 1</td>
</tr>
</tbody>
</table>

### Core Professional Practice Pathway units

Compulsory unit for the Professional Practice Pathway

<table>
<thead>
<tr>
<th>Unit of Study</th>
<th>Credit Points</th>
<th>A: Assumed knowledge P: Prerequisites C: Corequisites N: Prohibition</th>
<th>Session</th>
</tr>
</thead>
<tbody>
<tr>
<td>INFO5990</td>
<td>6</td>
<td>Student’s enrolled in INFO5990 are assumed to have previously completed a Bachelor’s 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.</td>
<td>Semester 1 Semester 2</td>
</tr>
</tbody>
</table>
# Unit of study table

<table>
<thead>
<tr>
<th>Unit of study</th>
<th>Credit points</th>
<th>A: Assumed knowledge</th>
<th>P: Prerequisites</th>
<th>C: Corequisites</th>
<th>N: Prohibition</th>
<th>Session</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Specialist units</strong></td>
<td></td>
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<tr>
<td>A minimum of 18 credit points of Specialist units must be taken.</td>
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<tr>
<td>CIXS6022 Cybersecurity</td>
<td>6</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Semester 2</td>
</tr>
<tr>
<td>COMP5045 Computational Geometry</td>
<td>6</td>
<td>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-Oh notations and simple algorithmic techniques like sorting, binary search, and balanced search trees.</td>
<td></td>
<td></td>
<td></td>
<td>Semester 1</td>
</tr>
<tr>
<td>COMP5046 Statistical Natural Language Processing</td>
<td>6</td>
<td>A Knowledge of an O programming language N COMP4046 Practical work will use the Natural Language Toolkit</td>
<td></td>
<td></td>
<td></td>
<td>Semester 1</td>
</tr>
<tr>
<td>COMP5047 Pervasive Computing</td>
<td>6</td>
<td>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. N NETS4047</td>
<td></td>
<td></td>
<td></td>
<td>Semester 2</td>
</tr>
<tr>
<td>COMP5048 Information Visualisation</td>
<td>6</td>
<td>A It is assumed that students will have basic knowledge of data structures, algorithms and programming skills. N COMP4048</td>
<td></td>
<td></td>
<td></td>
<td>Semester 2</td>
</tr>
<tr>
<td>COMP5216 Mobile Computing</td>
<td>6</td>
<td>A COMP5214 Software Development in JAVA, or similar introductory software development units.</td>
<td></td>
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<td></td>
<td>Semester 2</td>
</tr>
<tr>
<td>COMP5313 Large Scale Networks</td>
<td>6</td>
<td>A Logical thinking (as expected from any IT graduate). Basic probability knowledge.</td>
<td></td>
<td></td>
<td></td>
<td>Semester 1</td>
</tr>
<tr>
<td>COMP5318 Knowledge Discovery and Data Mining</td>
<td>6</td>
<td>A COMP5318</td>
<td></td>
<td></td>
<td></td>
<td>Semester 1</td>
</tr>
<tr>
<td>COMP5338 Advanced Data Models</td>
<td>6</td>
<td>A This unit of study assumes foundational knowledge of relational database systems as taught in COMP5318 (Relational Database Management Systems) or INFO2120/2820 (Database Systems 1). The Extensible Markup Language (XML) in not a pre-requisite as it will be taught in this unit.</td>
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<td></td>
<td>Semester 2</td>
</tr>
<tr>
<td>COMP5347 e-Commerce Technology</td>
<td>6</td>
<td>A COMP5028. The course assumes basic knowledge on OO design and UML diagrams.</td>
<td></td>
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<td></td>
<td>Semester 1</td>
</tr>
<tr>
<td>COMP5348 Enterprise Scale Software Architecture</td>
<td>6</td>
<td>A Programming competence in java or similar O language. Capacity to master novel technologies (especially to program against novel APIs) using manuals, tutorial examples, etc.</td>
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<td></td>
<td>Semester 1</td>
</tr>
<tr>
<td>COMP5349 Cloud Computing</td>
<td>6</td>
<td>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 Software Development in JAVA</td>
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<td></td>
<td>Semester 1</td>
</tr>
<tr>
<td>COMP5415 Multimedia Authoring and Production</td>
<td>6</td>
<td>A COMP5114</td>
<td></td>
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<td></td>
<td>Semester 2</td>
</tr>
<tr>
<td>COMP5416 Advanced Network Technologies</td>
<td>6</td>
<td>A COMP5116 OR ELEC3506</td>
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<td>Semester 2</td>
</tr>
<tr>
<td>COMP5424 Information Technology in Biomedicine</td>
<td>6</td>
<td></td>
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<td></td>
<td>Semester 1</td>
</tr>
<tr>
<td>COMP5425 Multimedia Storage, Retrieval &amp; Delivery</td>
<td>6</td>
<td>A COMP5211. Basic Programming skills and data structure knowledge.</td>
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<td></td>
<td></td>
<td>Semester 1</td>
</tr>
<tr>
<td>COMP5426 Parallel and Distributed Computing</td>
<td>6</td>
<td>A COMP5116</td>
<td></td>
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<td>Semester 1</td>
</tr>
<tr>
<td>COMP5427 Usability Engineering</td>
<td>6</td>
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<td></td>
<td>Semester 2</td>
</tr>
<tr>
<td>COMP5456 Introduction to Bioinformatics</td>
<td>6</td>
<td>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 by first year BIOL papers or MBLG1001 N COMP3456</td>
<td></td>
<td></td>
<td></td>
<td>Summer Main</td>
</tr>
<tr>
<td>ELEC5070 Error Control Coding</td>
<td>6</td>
<td>A Basic knowledge on digital communications. Fundamental mathematics including probability theory and linear algebra.</td>
<td></td>
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<td></td>
<td>Semester 1</td>
</tr>
<tr>
<td>ELEC5074 Wireless Engineering</td>
<td>6</td>
<td>A Basic knowledge in probability and statistics, analog and digital communications, error probability calculation in communications channels, and telecommunications network.</td>
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<td></td>
<td>Semester 2</td>
</tr>
<tr>
<td>ELEC5090 Mobile Networks</td>
<td>6</td>
<td>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.</td>
<td></td>
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<td></td>
<td>Semester 2</td>
</tr>
<tr>
<td>ELEC5100 Satellite Communication Systems</td>
<td>6</td>
<td>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.</td>
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<td></td>
<td>Semester 2</td>
</tr>
<tr>
<td>ELEC5111 Optical Communication Systems</td>
<td>6</td>
<td>A (ELEC3505 Communications) and (ELEC3405 Communications Electronics and Photonics) or equivalent</td>
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<td></td>
<td></td>
<td>Semester 1</td>
</tr>
<tr>
<td>ELEC5112 Optical Networks</td>
<td>6</td>
<td>A Knowledge of digital communications, wave propagation, and fundamental optics</td>
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<td></td>
<td>Semester 2</td>
</tr>
<tr>
<td>ELEC5140 Real Time Computing</td>
<td>6</td>
<td>A SOFT2130 Software Construction (or SOFT2004 Software Development Methods 1) and ELEC3607 Embedded Computing (or ELEC2601 Microprocessor Systems) N MECH5701</td>
<td></td>
<td></td>
<td></td>
<td>Semester 1</td>
</tr>
<tr>
<td>ELEC5161 Computer and Network Security</td>
<td>6</td>
<td>A A programming language, basic maths.</td>
<td></td>
<td></td>
<td></td>
<td>Semester 1</td>
</tr>
<tr>
<td>ELEC5162 Object Oriented Application Frameworks</td>
<td>6</td>
<td>A Java programming, and some web development experience are essential. Databases strongly recommended</td>
<td></td>
<td></td>
<td></td>
<td>Semester 2</td>
</tr>
</tbody>
</table>
### Unit of study table

<table>
<thead>
<tr>
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<th>N: Prohibition</th>
<th>Session</th>
</tr>
</thead>
<tbody>
<tr>
<td>HIMT5058 Health Informatics Applications</td>
<td>6</td>
<td>Note: Department permission required for enrolment</td>
<td></td>
<td></td>
<td></td>
<td>Semester 1</td>
</tr>
<tr>
<td>HIMT5060 Integration for Health Informatics</td>
<td>6</td>
<td></td>
<td></td>
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<td></td>
<td>Semester 2</td>
</tr>
<tr>
<td>HIMT5069 Health Care Systems</td>
<td>6</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Semester 1</td>
</tr>
<tr>
<td>IDEA9106 Design Thinking</td>
<td>6</td>
<td></td>
<td></td>
<td></td>
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<td>Semester 1</td>
</tr>
<tr>
<td>INFO5010 IT Advanced Topic A</td>
<td>6</td>
<td>A Good programming skills, especially in Java for the practical assignment, as well as proficiency in databases and SQL. P Permission of Head of School N INFO4010</td>
<td></td>
<td></td>
<td></td>
<td>Semester 1, Semester 2</td>
</tr>
<tr>
<td>INFO5011 IT Advanced Topic B</td>
<td>6</td>
<td>P Permission of Head of School N INFO4011</td>
<td></td>
<td></td>
<td></td>
<td>Semester 1, Winter Main</td>
</tr>
<tr>
<td>INFO5050 Data Analytics and Business Intelligence</td>
<td>6</td>
<td>A The unit is expected to be taken after introductory courses in related units such as COMP5206 Introduction to Information Systems</td>
<td></td>
<td></td>
<td></td>
<td>Summer Early, Summer Late</td>
</tr>
<tr>
<td>INF05301 Information Security Management</td>
<td>6</td>
<td>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.</td>
<td></td>
<td></td>
<td></td>
<td>Semester 1</td>
</tr>
<tr>
<td>INF05306 Enterprise Healthcare Info Systems</td>
<td>6</td>
<td>A The unit is expected to be taken after introductory courses in related units such as COMP5206 - Introduction to IS (or COMP5138 Relational DBMS).</td>
<td></td>
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<td></td>
<td>Semester 2</td>
</tr>
<tr>
<td>INF05991 Services Science Management and Eng</td>
<td>6</td>
<td>A INFO5990 Students are expected to have a degree in computer science, engineering, information technology, information systems or business.</td>
<td></td>
<td></td>
<td></td>
<td>Semester 1, Semester 2</td>
</tr>
<tr>
<td>INFO6007 Project Management in IT</td>
<td>6</td>
<td>A Students enrolled in INFO6007 are assumed to have previously completed a Bachelor’s 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</td>
<td></td>
<td></td>
<td></td>
<td>Semester 1, Semester 2</td>
</tr>
<tr>
<td>INFO6010 Advanced Topics in IT Project Management</td>
<td>6</td>
<td>A Students are assumed to understand the role of IT projects. P INFO6007, OR 3-5 years working experience in IT Project Management</td>
<td></td>
<td></td>
<td></td>
<td>Semester 2</td>
</tr>
<tr>
<td>INF0612 Enterprise Systems Management</td>
<td>6</td>
<td>This is a defined elective unit of study in both the Master of Professional Accounting and the Master of Commerce programs.</td>
<td></td>
<td></td>
<td></td>
<td>Semester 1</td>
</tr>
<tr>
<td>INF0617 Strategic Information &amp; Knowledge Mgmt</td>
<td>6</td>
<td></td>
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<td></td>
<td>Semester 2</td>
</tr>
<tr>
<td>ISYS5070 Change Management in IT</td>
<td>6</td>
<td>A The unit is expected to be taken after the following related units INFO6007 Project Management in IT and COMP5206 Introduction to Information Systems.</td>
<td></td>
<td></td>
<td></td>
<td>Winter Main</td>
</tr>
<tr>
<td>PMGT5657 Quantitative Methods: Project Management</td>
<td>6</td>
<td>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.</td>
<td></td>
<td></td>
<td></td>
<td>Semester 1, Semester 2</td>
</tr>
<tr>
<td>PUBH5010 Epidemiology Methods and Uses</td>
<td>6</td>
<td>N BSTA5011</td>
<td></td>
<td></td>
<td></td>
<td>Semester 1</td>
</tr>
<tr>
<td>STAT5003 Computational Statistical Methods</td>
<td>6</td>
<td>P STAT5002</td>
<td></td>
<td></td>
<td></td>
<td>Semester 2</td>
</tr>
</tbody>
</table>

### Project units

Candidates who achieve Credit (65%) average results or above over the first 24 credit points may select 12 credit points of IT project units of study.

| COMP5703 Information Technology Project         | 12            | Note: Department permission required for enrolment |                |                |                | Semester 1, Semester 2 |
| COMP5705 Information Technology Short Project   | 6             | N COMP5702, COMP5703, COMP5704 |                |                |                | Semester 1, Semester 2 |
| COMP5706 IT Industry Placement Project          | 6             | N COMP5702, COMP5703, COMP5704 | Note: Department permission required for enrolment |                |                | Semester 1, Semester 2 |

### Research path units

Candidates who achieve Distinction (75%) average results or above over the first 24 credit points may select 18 credit points of IT project units of study.

Candidates who pursue the Research path take INFO5993 instead of INFO5990.

| COMP5702 IT Research Project A                   | 12            | A Students should concurrently or previously learn about Research Methods in IT, from INFO5993. Note: Department permission required for enrolment Department permission required for enrolment, COMP5702 and COMP5704 together form the Research thesis of MIT/MITM Research Track. It is allowed to enrol in one of these units in one semester, and the other the following semester; the same mark and grade is given for both once they have both been completed. |                |                |                | Semester 1          |
| COMP5704 IT Research Project B                    | 6             | A Students should concurrently or previously learn about Research Methods in IT, from INFO5993. Note: Department permission required for enrolment Department permission required for enrolment, COMP5702 and COMP5704 together form the Research thesis for MIT/MITM Research Track. It is allowed to enrol in one of these units in one semester, and the other the following semester; the same mark and grade is given for both once they have both been completed. |                |                |                | Semester 1          |
## Unit of study table

<table>
<thead>
<tr>
<th>Unit of study</th>
<th>Credit points</th>
<th>A: Assumed knowledge</th>
<th>P: Prerequisites</th>
<th>C: Corequisites</th>
<th>N: Prohibition</th>
<th>Session</th>
</tr>
</thead>
<tbody>
<tr>
<td>INFO5993 IT Research Methods</td>
<td>6</td>
<td>N INFO4990</td>
<td></td>
<td></td>
<td></td>
<td>Semester 1</td>
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<td>Semester 2</td>
</tr>
<tr>
<td><strong>Exchange Units</strong></td>
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<tr>
<td>Exchange units require the approval of the Program Director. With approval, up to 12 credit points of Exchange units may be taken in place of other units, towards the requirements of the degree.</td>
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</tr>
<tr>
<td>ENGG5231 Engineering Graduate Exchange A</td>
<td>6</td>
<td>P Permission from faculty and school. Note: Department permission required for enrolment</td>
<td></td>
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<td></td>
<td>Int January</td>
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<td></td>
<td>Int July</td>
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<tr>
<td>ENGG5232 Engineering Graduate Exchange B</td>
<td>6</td>
<td>P Permission from faculty and school. Note: Department permission required for enrolment</td>
<td></td>
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<td>Int January</td>
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<td>Int July</td>
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<tr>
<td><strong>Majors for the Master of Information Technology</strong></td>
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<tr>
<td><strong>Business Information Systems Major</strong></td>
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<tr>
<td><strong>Core units</strong></td>
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</tr>
<tr>
<td>Candidates pursuing the Research path take INFO5993 instead of INFO5980.</td>
<td></td>
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</tr>
<tr>
<td>INFO5990 Professional Practice in IT</td>
<td>6</td>
<td>A Student’s enrolled in INFO5990 are assumed to have previously completed a Bachelor’s 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.</td>
<td>Semester 1</td>
<td>Semester 2</td>
<td></td>
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<tr>
<td>COMP5206 Introduction to Information Systems</td>
<td>6</td>
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<td>Semester 1</td>
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<td>Semester 2</td>
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<tr>
<td><strong>Elective units</strong></td>
<td></td>
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</tr>
<tr>
<td>Select 12 credit points from:</td>
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<tr>
<td>CISS602 Cybersecurity</td>
<td>6</td>
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<td>Semester 2</td>
</tr>
<tr>
<td>INFO5060 Data Analytics and Business Intelligence</td>
<td>6</td>
<td>A The unit is expected to be taken after introductory courses related units such as COMP5206 Introduction to Information Systems.</td>
<td>Summer Early</td>
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</tr>
<tr>
<td>INFO5301 Information Security Management</td>
<td>6</td>
<td>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.</td>
<td>Semester 1</td>
<td></td>
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<tr>
<td>INFO5306 Enterprise Healthcare Info Systems</td>
<td>6</td>
<td>A The unit is expected to be taken after introductory courses in related units such as COMP5206 - Introduction to IS (or COMP5138 Relational DBMS).</td>
<td>Semester 2</td>
<td></td>
<td></td>
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</tr>
<tr>
<td>INFO5991 Services Science Management and Eng</td>
<td>6</td>
<td>A INFO5990 Students are expected to have a degree in computer science, engineering, information technology, information systems or business.</td>
<td>Semester 1</td>
<td>Semester 2</td>
<td></td>
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</tr>
<tr>
<td>INF56012 Enterprise Systems Management</td>
<td>6</td>
<td>This is a defined elective unit of study in both the Master of Professional Accounting and the Master of Commerce programs.</td>
<td>Semester 1</td>
<td></td>
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</tr>
<tr>
<td>INF56017 Strategic Information &amp; Knowledge Mgmt</td>
<td>6</td>
<td>A The unit is expected to be taken after the following related units INFO6007 Project Management in IT and COMP5206 Introduction to Information Systems.</td>
<td></td>
<td>Winter Main</td>
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<tr>
<td>ISYS5070 Change Management in IT</td>
<td>6</td>
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<tr>
<td><strong>Computer Networks Major</strong></td>
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<tr>
<td><strong>Core unit</strong></td>
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</tr>
<tr>
<td>Candidates pursuing the Research path take INFO5993 instead of INFO5980.</td>
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<td></td>
<td></td>
</tr>
<tr>
<td>INFO5990 Professional Practice in IT</td>
<td>6</td>
<td>A Student’s enrolled in INFO5990 are assumed to have previously completed a Bachelor’s 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.</td>
<td>Semester 1</td>
<td>Semester 2</td>
<td></td>
<td></td>
</tr>
<tr>
<td>COMP5047 Pervasive Computing</td>
<td>6</td>
<td>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. N NETS4047</td>
<td>Semester 2</td>
<td></td>
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</tr>
<tr>
<td>COMP5115 Design of Networks &amp; Distributed Systems</td>
<td>6</td>
<td></td>
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<td></td>
<td>Semester 1</td>
</tr>
<tr>
<td>COMP5216 Mobile Computing</td>
<td>6</td>
<td>A COMP5214 Software Development in JAVA, or similar introductory software development units.</td>
<td>Semester 2</td>
<td></td>
<td></td>
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</tr>
<tr>
<td>COMP5313 Large Scale Networks</td>
<td>6</td>
<td>A Algorithmic skills (as expected from any IT graduate). Basic probability knowledge.</td>
<td>Semester 1</td>
<td></td>
<td></td>
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</tr>
<tr>
<td>COMP5349 Cloud Computing</td>
<td>6</td>
<td>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 Software Development in JAVA</td>
<td>Semester 1</td>
<td></td>
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</tr>
</tbody>
</table>
### Computer Science Major

#### Core unit

Candidates pursuing the Research path take INFO5993 instead of INFO5990.

<table>
<thead>
<tr>
<th>Unit of study</th>
<th>Credit points</th>
<th>A: Assumed knowledge</th>
<th>P: Prerequisites</th>
<th>C: Corequisites</th>
<th>N: Prohibition</th>
<th>Session</th>
</tr>
</thead>
</table>
| INFO5990 Professional Practice in IT | 6             | A Student’s enrolled in INFO5990 are assumed to have previously completed a Bachelor’s 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. |                |                |                | Semester 1  
|                               |               | 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 2  
|                               |               | The Extensible Markup Language (XML) is not a pre-requisite as it will be taught in COMP5138 (Relational Database Management Systems) or INFO2120/2820 (Database Systems 1). |                |                |                |             |

#### Elective units

Select 18 credit points from:

<table>
<thead>
<tr>
<th>Unit of study</th>
<th>Credit points</th>
<th>A: Assumed knowledge</th>
<th>P: Prerequisites</th>
<th>C: Corequisites</th>
<th>N: Prohibition</th>
<th>Session</th>
</tr>
</thead>
</table>
| 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-Oh 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 | N COMP4046 | 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. | N NETS4047 |                |                | Semester 2  
| COMP5048 Information Visualisation | 6             | A It is assumed that students will have basic knowledge of data structures, algorithms and programming skills. | N COMP4048 |                |                |             |
| COMP5211 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 that will be taught in this course. Some knowledge of computer programming is required. |                |                |                | Semester 1  
| COMP5456 Introduction to Bioinformatics | 6             | A Some experience with basic programming (coding) in Java, C, C++ or Perl; Some proven ability in mathematical or information sciences (as evidenced in the prerequisites); Some knowledge of molecular biology either through first year BIOL papers or MBLG1001. | N COMP3456 |                |                | Summer Main |

#### Database Management Systems Major

#### Core unit

Candidates pursuing the Research path take INFO5993 instead of INFO5990.

<table>
<thead>
<tr>
<th>Unit of study</th>
<th>Credit points</th>
<th>A: Assumed knowledge</th>
<th>P: Prerequisites</th>
<th>C: Corequisites</th>
<th>N: Prohibition</th>
<th>Session</th>
</tr>
</thead>
</table>
| INFO5990 Professional Practice in IT | 6             | A Student’s enrolled in INFO5990 are assumed to have previously completed a Bachelor’s 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. |                |                |                | Semester 1  
|                               |               | 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. |                |                |                |             |

#### Elective units

Select 18 credit points from:

<table>
<thead>
<tr>
<th>Unit of study</th>
<th>Credit points</th>
<th>A: Assumed knowledge</th>
<th>P: Prerequisites</th>
<th>C: Corequisites</th>
<th>N: Prohibition</th>
<th>Session</th>
</tr>
</thead>
</table>
| COMP5046 Statistical Natural Language Processing | 6             | A Knowledge of an OO programming language | N COMP4046 | Practical work will use the Natural Language Toolkit |                | Semester 1  
| COMP5138 Relational Database Management Systems | 6             | A Some exposure to programming and some familiarity with data model concepts |                |                |                | Semester 1  
| COMP5318 Knowledge Discovery and Data Mining | 6             | A COMP5138 |                |                |                | Semester 1  
| COMP5338 Advanced Data Models | 6             | A This unit of study assumes foundational knowledge of relational database systems as taught in COMP5138 (Relational Database Management Systems) or INFO2120/2820 (Database Systems 1). The Extensible Markup Language (XML) in not a pre-requisite as it will be taught in this unit. |                |                |                | 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 Software Development in JAVA |                |                |                | Semester 1  
| COMP5425 Multimedia Storage, Retrieval & Delivery | 6             | A COMP5211. Basic Programming skills and data structure knowledge. |                |                |                | Semester 1  |
## Unit of study table

<table>
<thead>
<tr>
<th>Unit of study</th>
<th>Credit points</th>
<th>A: Assumed knowledge</th>
<th>P: Prerequisites</th>
<th>C: Corequisites</th>
<th>N: Prohibition</th>
<th>Session</th>
</tr>
</thead>
<tbody>
<tr>
<td>INFOS5060 Data Analytics and Business Intelligence</td>
<td>6</td>
<td>A The unit is expected to be taken after introductory courses in related units such as COMP5206</td>
<td></td>
<td></td>
<td></td>
<td>Summer Early</td>
</tr>
<tr>
<td>STAT5002 Introduction to Statistics</td>
<td>6</td>
<td>A HSC Mathematics</td>
<td></td>
<td></td>
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<td>Semester 1</td>
</tr>
<tr>
<td>STAT5003 Computational Statistical Methods</td>
<td>6</td>
<td>P STAT5002</td>
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<td>Semester 2</td>
</tr>
</tbody>
</table>

### Health Informatics Major

#### Core units

Candidates pursuing the Research path take INFO5993 instead of INFO5990.

- **COMP5424 Information Technology in Biomedicine**: 6 credits, Semester 1
- **INFO5990 Professional Practice in IT**: 6 credits, Semester 1 and 2
  - A Student’s enrolled in INFO5990 are assumed to have previously completed a Bachelor’s 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.

#### Elective units

Select 12 credit points from:

- **COMP5046 Statistical Natural Language Processing**: 6 credits, Semester 1
  - A Knowledge of an OOP programming language
  - N COMP4046
  - Practical work will use the Natural Language Toolkit
- **COMP5216 Mobile Computing**: 6 credits, Semester 2
  - A COMP5214 Software Development in JAVA, or similar introductory software development units.
- **COMP5427 Usability Engineering**: 6 credits, Semester 2
- **COMP5456 Introduction to Bioinformatics**: 6 credits, Summer Main
  - A Some experience with basic programming (coding) in Java, C, C++ or Perl; Some proven ability in mathematical or information sciences (as evidenced in the prerequisites); Some knowledge of molecular biology either through first year BIOL papers or MBLG1001.
  - N COMP3456
- **HIMT5058 Health Informatics Applications**: 6 credits, Semester 1
  - Note: Department permission required for enrolment
- **HIMT5060 Integration for Health Informatics**: 6 credits, Semester 2
- **HIMT5069 Health Care Systems**: 6 credits, Semester 1
- **INFO5003 IT for Health Professionals**: 6 credits, Summer Late
- **INFO5030 Enterprise Healthcare Info Systems**: 6 credits, Semester 2
  - A The unit is expected to be taken after introductory courses in related units such as COMP5206 - Introduction to IS (or COMP5138 Relational DBMS).
- **INFO6007 Project Management in IT**: 6 credits, Semester 1 and 2
  - A Students enrolled in INFO6007 are assumed to have previously completed a Bachelor’s 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
- **INFO5063 IT for Health Professionals**: 6 credits, Summer Late
- **PUBH5010 Epidemiology Methods and Uses**: 6 credits, Semester 1
  - N BSTA5011
- **PUBH5018 Introductory Biostatistics**: 6 credits, Semester 1

### Multimedia Technology Major

#### Core unit

Candidates pursuing the Research path take INFO5993 instead of INFO5990.

- **INFO5990 Professional Practice in IT**: 6 credits, Semester 1 and 2
  - A Student’s enrolled in INFO5990 are assumed to have previously completed a Bachelor’s 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.

#### Elective units

One unit of study from the Computer Science Major may also be included.

- **COMP5114 Digital Media Fundamentals**: 6 credits, Semester 1 and 2
- **COMP5216 Mobile Computing**: 6 credits, Semester 2
  - A COMP5214 Software Development in JAVA, or similar introductory software development units.
<table>
<thead>
<tr>
<th>Unit of study</th>
<th>Credit points</th>
<th>A: Assumed knowledge</th>
<th>P: Prerequisites</th>
<th>C: Corequisites</th>
<th>N: Prohibition</th>
<th>Session</th>
</tr>
</thead>
<tbody>
<tr>
<td>COMP5415 Multimedia Authoring and Production</td>
<td>6</td>
<td>A COMP5114</td>
<td></td>
<td></td>
<td></td>
<td>Semester 2</td>
</tr>
<tr>
<td>COMP5425 Multimedia Storage, Retrieval &amp; Delivery</td>
<td>6</td>
<td>A COMP5211. Basic Programming skills and data structure knowledge.</td>
<td></td>
<td></td>
<td></td>
<td>Semester 1</td>
</tr>
<tr>
<td>IDEA9106 Design Thinking</td>
<td>6</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Semester 1</td>
</tr>
</tbody>
</table>

### Project Management Major

#### Core units

Candidates pursuing the Research path take INFO5993 instead of INFO5990.

**INFO5990 Professional Practice in IT**
- 6 Credit points
- A Student’s enrolled in INFO5990 are assumed to have previously completed a Bachelor’s 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 2

**INFO6007 Project Management in IT**
- 6 Credit points
- A Students enrolled in INFO6007 are assumed to have previously completed a Bachelor’s 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 PMGT3871
- Semester 2

### Elective units

Select 12 credit points from:

**COMP5348 Enterprise Scale Software Architecture**
- 6 Credit points
- 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

**INFO5001 System Analysis and Modelling**
- 6 Credit points
- A Experience with a data model as in COMP5212 or COMP5214 or COMP5028 or COMP5138
- N INFO2110, ELEC3610, ELEC5743
- Semester 2

**INFO5991 Services Science Management and Eng**
- 6 Credit points
- A INFO5990 Students are expected to have a degree in computer science, engineering, information technology, information systems or business.
- Semester 2

**INFO6010 Advanced Topics in IT Project Management**
- 6 Credit points
- 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

**ISYS5070 Change Management in IT**
- 6 Credit points
- A The unit is expected to be taken after the following related units INFO6007 Project Management in IT and COMP5206 Introduction to Information Systems.
- Winter Main

**PMGT6867 Quantitative Methods: Project Management**
- 6 Credit points
- 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

### Software Engineering Major

#### Core unit

Candidates pursuing the Research path take INFO5993 instead of INFO5990.

**INFO5990 Professional Practice in IT**
- 6 Credit points
- A Student’s enrolled in INFO5990 are assumed to have previously completed a Bachelor’s 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 2

#### Elective units

Select 18 credit points from:

**CISS6022 Cybersecurity**
- 6 Credit points
- Semester 2

**COMP5028 Object-Oriented Design**
- 6 Credit points
- A Students enrolled in COMP5028 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 INFO3220
- Semester 1

**COMP5214 Software Development in Java**
- 6 Credit points
- A COMP5028. The course assumes basic knowledge on OO design and UML diagrams.
- Semester 1

**COMP5347 e-Commerce Technology**
- 6 Credit points
- 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

**COMP5348 Enterprise Scale Software Architecture**
- 6 Credit points
- 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.
<table>
<thead>
<tr>
<th>Unit of study</th>
<th>Credit points</th>
<th>A: Assumed knowledge</th>
<th>P: Prerequisites</th>
<th>C: Corequisites</th>
<th>N: Prohibition</th>
<th>Session</th>
</tr>
</thead>
<tbody>
<tr>
<td>COMP5349 Cloud Computing</td>
<td>6</td>
<td>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 Software Development in JAVA</td>
<td></td>
<td></td>
<td></td>
<td>Semester 1</td>
</tr>
<tr>
<td>COMP5427 Usability Engineering</td>
<td>6</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Semester 2</td>
</tr>
<tr>
<td>ELEC5616 Computer and Network Security</td>
<td>6</td>
<td>A A programming language, basic maths.</td>
<td></td>
<td></td>
<td></td>
<td>Semester 1</td>
</tr>
<tr>
<td>ELEC5619 Object Oriented Application Frameworks</td>
<td>6</td>
<td>A Java programming, and some web development experience are essential. Databases strongly recommended</td>
<td></td>
<td></td>
<td></td>
<td>Semester 2</td>
</tr>
<tr>
<td>INFO5001 System Analysis and Modelling</td>
<td>6</td>
<td>A Experience with a data model as in COMP5212 or COMP5214 or COMP5028 or COMP5138 INFO52110, ELEC5810, ELEC5743</td>
<td></td>
<td></td>
<td></td>
<td>Semester 2</td>
</tr>
</tbody>
</table>

### Telecommunications Engineering Major

#### Core unit

Candidates pursuing the Research path take INFO5993 instead of INFO5990.

**INFO5990 Professional Practice in IT**

- Credit points: 6
- Assumed knowledge: A Student’s enrolled in INFO5990 are assumed to have previously completed a Bachelor’s 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.
- Prerequisites: 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.
- Session: Semester 1, Semester 2

#### Elective units

Select 18 credit points from:

<table>
<thead>
<tr>
<th>Unit of study</th>
<th>Credit points</th>
<th>A: Assumed knowledge</th>
<th>P: Prerequisites</th>
<th>C: Corequisites</th>
<th>N: Prohibition</th>
<th>Session</th>
</tr>
</thead>
<tbody>
<tr>
<td>COMP5116 Design of Networks &amp; Distributed Systems</td>
<td>6</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Semester 1</td>
</tr>
<tr>
<td>COMP5416 Advanced Network Technologies</td>
<td>6</td>
<td>A COMP5116 OR ELEC3506</td>
<td></td>
<td></td>
<td></td>
<td>Semester 2</td>
</tr>
<tr>
<td>ELEC5507 Error Control Coding</td>
<td>6</td>
<td>A Basic knowledge on digital communications. Fundamental mathematics including probability theory and linear algebra.</td>
<td></td>
<td></td>
<td></td>
<td>Semester 1</td>
</tr>
<tr>
<td>ELEC5508 Wireless Engineering</td>
<td>6</td>
<td>A Basic knowledge in probability and statistics, analog and digital communications, error probability calculation in communications channels, and telecommunications network.</td>
<td></td>
<td></td>
<td></td>
<td>Semester 2</td>
</tr>
<tr>
<td>ELEC5509 Mobile Networks</td>
<td>6</td>
<td>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.</td>
<td></td>
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<td></td>
<td>Semester 1</td>
</tr>
<tr>
<td>ELEC5510 Satellite Communication Systems</td>
<td>6</td>
<td>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.</td>
<td></td>
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<td></td>
<td>Semester 2</td>
</tr>
<tr>
<td>ELEC5511 Optical Communication Systems</td>
<td>6</td>
<td>A (ELEC3505 Communications) and (ELEC3405 Communications Electronics and Photonics) or equivalent</td>
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<td></td>
<td></td>
<td>Semester 1</td>
</tr>
<tr>
<td>ELEC5512 Optical Networks</td>
<td>6</td>
<td>A Knowledge of digital communications, wave propagation, and fundamental optics</td>
<td></td>
<td></td>
<td></td>
<td>Semester 2</td>
</tr>
</tbody>
</table>

For more information on degree program requirements visit CUSP.
Unit of study descriptions

Master of Information Technology
Foundational, Specialist and Project units of study for the Master of Information Technology, Graduate Diploma in Information Technology and Graduate Certificate in Information Technology are shown in the following tables. Candidates for the degree of Master of Information Technology are required to complete 48 credit points from the units of study as follows: 1. A total of 48 credit points must be completed. 2. A maximum of 24 credit points can be selected from Foundational units of study. 3. At least 24 credit points should come from specialist units of study or IT project units of study. 4. Every candidate must complete a defined major in the Master of Information Technology, which requires them to complete at least 18 credit points of core units in the designated major and INFO5990. After completing 24 credit points of units of study, candidates who achieve Credit average results or above may select 12 credit points of IT project units of study among their specialist units. 5. 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. 6. Candidates who pursue the Research Path must take INFO5993 and 18 credit points from IT Research units of study. 7. A maximum of 12 credit points of units of study excluding INFO5990. To qualify for the Graduate Certificate in Information Technology a candidate must complete 24 credit points of the Foundational or Specialist units of study.

Foundational units
A maximum of 24 credit points of Foundational units can be taken.

COMP5028
Object-Oriented Design
Engineering and Information Technologies
Credit points: 6 Session: Semester 1 Classes: One 2 hour lecture and one 1 hour tutorial per week. Prohibitions: INFO3220 Assumed knowledge: Students enrolled in COMP5028 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%) Campus: Camperdown/Darlington Mode of delivery: Normal (lecture/lab/tutorial) Day

COMP5114
Digital Media Fundamentals
Engineering and Information Technologies
Credit points: 6 Session: Semester 1, Semester 2 Classes: One 2 hour lecture and one 1 hour tutorial per week. Assessment: Through semester assessment (50%), Final Exam (50%) Campus: Camperdown/Darlington Mode of delivery: Normal (lecture/lab/tutorial) Day

COMP5116
Design of Networks & Distributed Systems
Engineering and Information Technologies
Credit points: 6 Session: Semester 1, Semester 2 Classes: One 2 hour lecture and one 1 hour tutorial per week. Assessment: Through semester assessment (50%), Final Exam (50%) Campus: Camperdown/Darlington Mode of delivery: Normal (lecture/lab/tutorial) Day

COMP5138
Relational Database Management Systems
Engineering and Information Technologies
Credit points: 6 Session: Semester 1, Semester 2 Classes: One 2 hour lecture and one 1 hour tutorial per week. Assessment: Through semester assessment (50%), Final Exam (50%) Campus: Camperdown/Darlington Mode of delivery: Normal (lecture/lab/tutorial) Day

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Objectives: In this unit students will develop the ability to:
- Understand the foundations of database management;
- Strengthen their theoretical knowledge of database systems in general and relational data model and systems in particular;
- Create robust relational database designs;
- Understand the theory and applications of relational query processing and optimization;
- Study the critical issues in data and database administration;
- Explore the key emerging topics in database management.

COMP5206
Introduction to Information Systems

<table>
<thead>
<tr>
<th>Credit points: 6</th>
<th>Session: Semester 1, Semester 2</th>
<th>Classes: One 2 hour lecture and one 2 hour tutorial per week.</th>
<th>Assessment: Through semester assessment (50%), Final Exam (50%)</th>
<th>Campus: Camperdown/Darlington</th>
<th>Mode of delivery: Normal (lecture/lab/tutorial) Day</th>
</tr>
</thead>
</table>

Associated degrees: B E, Grad Cert D C C, Grad Cert E, Grad Cert I T, Grad Cert Inf Tech Man, Grad Dip Comp, M Appl Sc (Bioinformatics), M I D M, M P E.

This unit will provide a comprehensive introduction to the field of information systems from an organisational perspective. The critical role of information and knowledge management will be emphasised from both conceptual and practical standpoints. Methods and techniques for analysing systems and eliciting user requirements will be discussed. Key topics covered will include:
* Basic Information Systems Concepts
* Systems approach and systems thinking
* E-Business and E-Commerce
* Data and Knowledge Management
* Systems Analysis and Development Methodologies
* Ethical, Legal and Social Aspects of Information technologies
* Web 2.0 and Social Computing

Objectives: Students who successfully complete this unit will be able to:
1. Develop a good understanding of important information concepts,
2. Deep understanding of the systems approach and its applicability.
3. Develop skills to perform systems analysis in contemporary systems environments
4. Understanding of major conceptual and technological developments in Information Systems

COMP5211
Algorithms

<table>
<thead>
<tr>
<th>Credit points: 6</th>
<th>Session: Semester 1, Semester 2</th>
<th>Classes: One 2 hour lecture and one 3 hour tutorial per week.</th>
<th>Assessment: Through semester assessment (40%), Final Exam (60%)</th>
<th>Campus: Camperdown/Darlington</th>
<th>Mode of delivery: Normal (lecture/lab/tutorial) Day</th>
</tr>
</thead>
</table>

Associated degrees: B E, Grad Cert D C C, Grad Cert I T, Grad Dip Comp, Grad Dip E (Prof Eng), M Appl Sc (Bioinformatics), M I D M, M Inf Tech, M P E, PG Coursework Exchange.

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, greedy, local search, and randomisation, as well NP-hardness.

COMP5214
Software Development in Java

Engineering and Information Technologies

<table>
<thead>
<tr>
<th>Credit points: 6</th>
<th>Session: Semester 1, Semester 2</th>
<th>Classes: One 2 hour lecture and one 2 hour tutorial per week.</th>
<th>Assessment: Through semester assessment (40%), Final Exam (60%)</th>
<th>Campus: Camperdown/Darlington</th>
<th>Mode of delivery: Normal (lecture/lab/tutorial) Day</th>
</tr>
</thead>
</table>


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.

INFO5001
System Analysis and Modelling

<table>
<thead>
<tr>
<th>Credit points: 6</th>
<th>Session: Semester 2</th>
<th>Classes: Two 2 hour and 2 hour lab per week.</th>
<th>Prohibitions: INFO2110, ELEC3610, ELEC5743</th>
<th>Assumed knowledge: Experience with a data model such as in COMP5212 or COMP5214 or COMP5226 or COMP5138</th>
<th>Assessment: Through semester assessment (40%), Final Exam (60%)</th>
<th>Campus: Camperdown/Darlington</th>
<th>Mode of delivery: Normal (lecture/lab/tutorial) Day</th>
</tr>
</thead>
</table>

Associated degrees: B E, Grad Dip Comp, Grad Dip E (Prof Eng), M Inf Tech, M P E.

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.

INFO5003
IT for Health Professionals

<table>
<thead>
<tr>
<th>Credit points: 6</th>
<th>Session: Summer Late</th>
<th>Classes: 18hrs Lecture over 2 weeks; 18hours Tutorials over 2 weeks</th>
<th>Assessment: Through session assessment (50%), Final Exam (50%)</th>
<th>Campus: Camperdown/Darlington</th>
<th>Mode of delivery: Block Mode</th>
</tr>
</thead>
</table>

Associated degrees: Grad Cert D C C, Grad Cert Inf Tech Man, Grad Dip Comp, M I D M, M P E.

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.
Introduction to Biostatistics

Credit points: 6 Teacher/Coordinator: A/Prof Shelton Peiris Session: Semester 1 Classes: Two lectures and one tutorial per week. Assumed knowledge: HSC Mathematics A/Prof Shelton Peiris Session: Semester 1 Classes: Two lectures and one tutorial per week. Assumed knowledge: HSC Mathematics Assumed knowledge: HSC Mathematics. 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. 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.

Statistical Natural Language Processing

Credit points: 6 Teacher/Coordinator: Dr Frank Smith Session: Semester 2 Classes: Two 2-hour seminars per 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. 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.

Core Professional Practice Pathway unit

Compulsory unit for the Professional Practice Pathway

INFO5990 Professional Practice in IT

Credit points: 6 Session: Semester 1, Semester 2 Classes: Session 1: Weekly or Block mode or Online Session 2: Weekly or Block mode or Online Assumed knowledge: Students enrolled in INFO5990 are assumed to have previously completed a Bachelor’s 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 session assessment (50%), Final Exam (50%) Course: Camperdown/Darlington Mode of delivery: Block Mode or On-line or Normal (lecture/lab/tutorial) Day 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 of information technology as part of their involvement in professional practice. The students are presented with a wide range of core conceptual ideas, techniques and relevant professional issues associated with the fields of Interpersonal and Organisational Communication, Conflict Management, IT and Sustainability, IT and Globalisation, Negotiation Strategies, Professional Ethics and Social Implications, Data Quality, Auditing and Quality Assurance and key project management principles.

Specialist units

A minimum of 18 credit points of Specialist units must be taken.

CIS5602 Cybersecurity

Arts and Social Sciences

Credit points: 6 Teacher/Coordinator: Dr Frank Smith Session: Semester 2 Classes: Two 2-hour seminars per 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 (50%) and 3000-word analytical essay (40%) and 1000-word equivalent lab exercise (10%) and seminar participation (10%) Course: Camperdown/Darlington Mode of delivery: Normal (lecture/lab/tutorial) Day Note: Practical work will use the Natural Language Toolkit

Associated degrees: Grad Cert Int Sec, M I L, PG Coursework Exchange.

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

Engineering and Information Technologies

Credit points: 6 Session: Semester 1 Classes: One 2-hour scheduled small group class per 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 (75%), Final Exam (25%) Course: Camperdown/Darlington Mode of delivery: Normal (lecture/lab/tutorial) Day

Associated degrees: B C S T (Hons), B E, B I T (Hons), B Sc (Hons), Grad Cert I T.

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

Engineering and Information Technologies

Credit points: 6 Session: Semester 1 Classes: One 2-hour scheduled small group class per week. Prohibitions: COMP4046 Assumed knowledge: Knowledge of an O/C programming language Assessment: Through semester assessment (40%), Final Exam (40%) Course: Camperdown/Darlington Mode of delivery: Normal (lecture/lab/tutorial) Day

Associated degrees: B C S T (Hons), B E, B I T (Hons), B Sc (Hons), Grad Cert I T.

This unit deals with techniques for the automatic processing of natural languages (such as English, French, etc) and the engineering of such
software systems. Engineering processes will be described in the context of methods for creating effective tools for information retrieval and extraction, question answering, classifying and clustering of the documents in a large corpora. Processing sub-systems for such tasks as tokenisation, lexical verification, part-of-speech tagging, parsing and word sense disambiguation will be described. Particular emphasis is given to methods that analyse the meaning in texts and the general application of machine learning methods to these topics. Various applications of these methods to research in health texts and other contexts being pursued in the University of Sydney will be explored.

COMP5074
Pervasive Computing
Engineering and Information Technologies
Credit points: 6  Session: Semester 2 Classes: 3hr integrated lecture and practical session
Prohibitions: NETS4047 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%)
Campus: Camperdown/Darlington Mode of delivery: Normal (lecture/lab/tutorial) Day
Associated degrees: B C S T (Hons), B E, B I T (Hons), B Sc (Hons), Grad Cert I T, M P E.

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 the terms of the new research towards creating user interfaces that disappear into the environment and are available pervasively, for example in homes, workplaces, cars and carried or work.

COMP5048
Information Visualisation
Engineering and Information Technologies
Credit points: 6  Session: Semester 2 Classes: Lecture 2 hours per week, Tutorial 1 hour per week. Prohibitions: COMP4048 Assumed knowledge: It is assumed that students will have basic knowledge of data structures, algorithms and programming skills. Assessment: Through semester assessment (100%)
Campus: Camperdown/Darlington Mode of delivery: Normal (lecture/lab/tutorial) Day
Associated degrees: B C S T (Hons), B E, B I T (Hons), B Sc (Hons), Grad Cert I T, M Inf Tech.

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 research challenge for Information Visualisation is to design and implement new algorithms that produce such pictures. Applications include visualisation of bioinformatics, social network, software visualisation and network visualisation.

This unit will provide basic concepts, techniques and fundamental algorithms to achieve good visualisation of abstract information. Further, it will also provide opportunities for academic research and developing new methods for Information Visualisation.

COMP5216
Mobile Computing
Engineering and Information Technologies
Credit points: 6  Session: Semester 2 Classes: 2hr Lectures per week; 1 hr Tutorial per week. Assumed knowledge: COMP5214 Software Development in JAVA, or similar introductory software development units. Assessment: Through semester assessment (50%), Final Exam (50%)
Campus: Camperdown/Darlington Mode of delivery: Normal (lecture/lab/tutorial) Day
Associated degrees: B E, B I T, B I T, B Com, Grad Cert D C C, Grad Cert I T, Grad Dip Comp, M I D M, M P E.

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 hands-on experiences in developing mobile applications in a broad range of areas.

COMP5313
Large Scale Networks
Engineering and Information Technologies
Credit points: 6  Session: Semester 1 Classes: 2hr Lectures per week; 1 hr Tutorial per week. Assumed knowledge: Algorithmic skills (as expected from any IT graduate), Basic probability knowledge. Assessment: Through semester assessment (60%), Final Exam (40%)
Campus: Camperdown/Darlington Mode of delivery: Normal (lecture/lab/tutorial) Day
Associated degrees: B E, Grad Cert D C C, Grad Cert Inf Tech Man, Grad Dip Comp, M I D M, M P E.

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
Engineering and Information Technologies
Credit points: 6  Session: Semester 1 Classes: (Lec 2hrs & Prac 1hr) per week Assumed knowledge: COMP5138 Assessment: Through semester assessment (40%), Final Exam (60%)
Campus: Camperdown/Darlington Mode of delivery: Normal (lecture/lab/tutorial) Day
Associated degrees: B C S T (Hons), B E, B I T (Hons), B Psych (Hons), B Sc (Hons), Grad Cert I T, PG Coursework Exchange.

Knowledge discovery is the process of extracting useful knowledge from data. Data mining is a discipline within knowledge discovery that seeks to facilitate the exploration and analysis of large quantities of data, by automatic or semiautomatic means. This subject provides a practical and technical introduction to knowledge discovery and data mining.

Objectives: Topics to be covered include problems of data analysis in databases, discovering patterns in the data, and knowledge interpretation, extraction and visualisation. Also covered are analysis, comparison and usage of various types of machine learning techniques and statistical techniques: clustering, classification, prediction, estimation, affinity grouping, description and scientific visualisation.

COMP5338
Advanced Data Models
Engineering and Information Technologies
Credit points: 6  Session: Semester 2 Classes: (Lec 2hrs & Prac 1hr) per week Assumed knowledge: This unit of study assumes foundational knowledge of relational database systems as taught in COMP5138 (Relational Database Management Systems) or INFO2120/2820 (Database Systems 1). The Extensible Markup Language (X-MI) in not a pre-requisite as it will be taught in this unit. Assessment: Through semester assessment (40%), Final Exam (60%)
Campus: Camperdown/Darlington Mode of delivery: Normal (lecture/lab/tutorial) Day
Associated degrees: B C S T (Hons), B E, B I T (Hons), B Psych (Hons), B Sc (Hons), Grad Cert Appl Sc (S I S), Grad Cert I T, M P E.

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-2008, 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
e-Commerce Technology

Engineeering and Information Technologies

Credit points: 6
Session: Semester 1
Classes: One 2 hour lecture and one 1 hour tutorial per week.
Assumed knowledge: COMP5028. The course assumes basic knowledge of OOP design and UML diagrams. Assessment: Through semester assessment (40%), Final Exam (60%)
Campus: Camperdown/Darlington
Mode of delivery: Normal (lecture/tut/tutorial) Day

Associated degrees: B, E, I T (Hons), B Psych (Hons), B Sc (Hons), Grad Cert I T, PG Coursework Exchange.

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 hands-on experiences for the technologies covered.

COMP5348
Enterprise Scale Software Architecture

Credit points: 6
Session: Semester 1
Classes: (Lec 2hrs & Prac 1hr) per week
Assumed knowledge: Programming competence in java or similar O0 language. Capacity to master novel technologies (especially to program against novel APIs) using manuals, tutorials, etc.
Assessment: Through semester assessment (40%), Final Exam (60%)
Campus: Camperdown/Darlington
Mode of delivery: Normal (lecture/tut/tutorial) Day

Associated degrees: B, C S T (Hons), B, E, I T (Hons), B Psych (Hons), B Sc (Hons), Grad Cert I T, M P E.

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 organizations, 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-queueing, 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: 2 hr Lectures per week; 2 hrs Laboratory per 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 Software Development in JAVA
Assessment: Through semester assessment (100%)
Campus: Camperdown/Darlington
Mode of delivery: Normal (lecture/tut/tutorial) Day

Associated degrees: B, E, Grad Cert D C C, Grad Cert Inf Tech Man, Grad Dip Comp, M I D M, M P E.

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 Authoring and Production

Credit points: 6
Session: Semester 2
Classes: One 2 hour lecture and one 1 hour tutorial per week.
Assumed knowledge: COMP5114 Assessment: Through semester assessment (40%), Final Exam (60%)
Campus: Camperdown/Darlington
Mode of delivery: Normal (lecture/tut/tutorial) Day

Associated degrees: B, E, I T (Hons), B Psych (Hons), B Sc (Hons), Grad Cert I T, PG Coursework Exchange.

This unit provides principles and practicalities of creating interactive and effective multimedia products. It gives an overview of the complete spectrum of different media platforms and current authoring techniques used in multimedia production. Coverage includes the following key topics: enabling multimedia technologies; multimedia design issues; interactive 2D & 3D computer animation; multimedia object modelling and rendering, multimedia scripting programming; post-production and delivery of multimedia applications.

COMP5416
Advanced Network Technologies

Credit points: 6
Session: Semester 2
Classes: (Lec 2hrs & Prac 1hr) per week
Assumed knowledge: COMP5116 OR ELEC3506 Assessment: Through semester assessment (40%), Final Exam (60%)
Campus: Camperdown/Darlington
Mode of delivery: Normal (lecture/tut/tutorial) Day

Associated degrees: B, C S T (Hons), B, E, I T (Hons), B Psych (Hons), B Sc (Hons), Grad Cert I T, Grad Dip E.

The unit introduces networking concepts beyond the best effort service of the core TCP/IP protocol suite. Understanding of the fundamental issues in building an integrated multi-service network for global Internet services, taking into account service objectives, application characteristics and needs and network mechanisms will be discussed. Enables students to understand the core issues and be aware of proposed solutions so they can actively follow and participate in the development of the Internet beyond the basic bit transport service.

COMP5424
Information Technology in Biomedicine

Credit points: 6
Session: Semester 1
Classes: (Lec 2hrs & Tut 1hr) per week
Assessment: Through semester assessment (40%), Final Exam (60%)
Campus: Camperdown/Darlington
Mode of delivery: Normal (lecture/tut/tutorial) Day

Associated degrees: B, C S T (Hons), B, E, I T (Hons), B Psych (Hons), B Sc (Hons), Grad Cert I T, Grad Dip I T, M Appl Sc (Bioinformatics).

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 (CBMR), and ubiquitous m-Health, etc. will be addressed. A broad range of practical integrated clinical applications will be also elaborated.

COMP5425
Multimedia Storage, Retrieval & Delivery

Credit points: 6
Session: Semester 1
Classes: One 2-hour lecture and 1 hour prac per week.
Assumed knowledge: COMP5211. Basic Programming skills and data structure knowledge. Assessment: Through semester
Usability Engineering
Engineering and Information Technologies

Credit points: 6 Session: Semester 2 Classes: 2hr Lectures per week; 2hr Laboratory per week. Assessment: Through semester assessment (40%), Final Exam (60%) Mode of delivery: Normal (lecture/lab/tutorial) Day

Associated degrees: B C S T (Hons), B E, B I T (Hons), B Psych (Hons), B Sc (Hons), Grad Cert I T, M P E.

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
Engineering and Information Technologies

Credit points: 6 Session: Summer Main Classes: Block mode in Summer School. 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 evidenced in the prerequisites); Some knowledge of molecular biology either through first year BIOC papers or MBLG1001. Assessment: Through course assessment (30%), final exam (70%) Mode of delivery: Normal (lecture/lab/tutorial) Day

Associated degrees: M Inf Tech.

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. It covers the essentials of bioinformatics data gathering, manipulation, mining and storage that underpin bioinformatics research, and provides additional practice in the graduate attributes of Research and Inquiry, Information Literacy and Communication through analysis of scientific research, use of large bioinformatics data sets, and writing of reports.

ELEC5507
Error Control Coding
Engineering and Information Technologies

Credit points: 6 Session: Semester 1 Classes: 2 hours of lectures and a 1 hour tutorial per week. Assumed knowledge: Basic knowledge on digital communications. Fundamental mathematics including probability theory and linear algebra. Assessment: Through semester assessment (50%), Final Exam (50%) Mode of delivery: Normal (lecture/lab/tutorial) Day

Associated degrees: B E, Grad Cert E, Grad Cert I T, M P E, PG Coursework Exchange.

This unit deals with the principles of error control coding techniques and their applications in various communication and data storage systems. Its aim is to present the fundamentals of error control coding techniques and develop theoretical and practical skills in the design of error control encoders/decoders. Successful completion of this unit will facilitate progression to advanced study or to work in the fields of telecommunications and computer engineering. It is assumed that the students have some background in communications principles and probability theory.

The following topics are covered. Introduction to error control coding, linear algebra. Linear block codes, cyclic codes, BCH codes, Reed-Solomon codes, burst-error correcting codes, design of codecs for block codes, applications of block codes in communications and digital recording. Convolutional codes, Viterbi algorithm, design of codecs for convolutional codes, applications of convolutional codes in communications, soft decision decoding of block and convolutional codes, trellis coded modulation, block coded modulation, design of codecs for trellis codes, applications of trellis codes in data transmission. Turbo codes and applications to space and mobile communications.
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.


**ELEC5509**

**Mobile Networks**

**Engineering and Information Technologies**

**Credit points:** 6  
**Session:** Semester 1  
**Classes:** 2 hours of lecture and a 2 hours tutorial/project meeting per week.  
**Assumed knowledge:** Basically, students need to know the concepts of data communications and mobile communications, which could be gained in 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%)  
**Campus:** Camperdown/Darlington  
**Mode of delivery:** Normal (lecture/lab/tutorial) Day  
**Associated degrees:** B C S T (Hons), B E, B I T (Hons), Grad Cert E, Grad Cert I T, M P E, PG Coursework Exchange.

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**

**Engineering and Information Technologies**

**Credit points:** 6  
**Session:** Semester 2  
**Classes:** 2 hours of lectures, 1 hour tutorial per 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%)  
**Campus:** Camperdown/Darlington  
**Mode of delivery:** Normal (lecture/lab/tutorial) Day  
**Associated degrees:** B E, Grad Cert E, Grad Cert I T, M P E, PG Coursework Exchange.

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**

**Engineering and Information Technologies**

**Credit points:** 6  
**Session:** Semester 1  
**Classes:** 2 hours of lecture and 2 hours laboratory/tutorial per week.  
**Assumed knowledge:** (ELEC3505 Communications) and (ELEC3405 Communications Electronics and Photonics) or equivalent.  
**Assessment:** Through semester assessment (25%), Final Exam (75%)  
**Campus:** Camperdown/Darlington  
**Mode of delivery:** Normal (lecture/lab/tutorial) Day  
**Associated degrees:** B E, Grad Cert E, Grad Cert I T, M P E, PG Coursework Exchange.

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**

**Engineering and Information Technologies**

**Credit points:** 6  
**Session:** Semester 2  
**Classes:** 2 hours of lectures and 1 hour laboratory/tutorial per week.  
**Assumed knowledge:** Knowledge of digital communications, wave propagation, and fundamental optics  
**Assessment:** Through semester assessment (25%), Final Exam (75%)  
**Campus:** Camperdown/Darlington  
**Mode of delivery:** Normal (lecture/lab/tutorial) Day  
**Associated degrees:** B E, Grad Cert E, Grad Cert I T, M P E, PG Coursework Exchange.

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. Wave length switched/routed networks, ultra high speed TDM, dispersion managed links, soliton systems; broadcast and distribution networks, multiple access, subcarrier multiplexed lightweight 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**

**Engineering and Information Technologies**

**Credit points:** 6  
**Session:** Semester 1  
**Classes:** 2 hours of lectures, 1 hour tutorial per week, 2 hours labs per week.  
**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%)  
**Campus:** Camperdown/Darlington  
**Mode of delivery:** Normal (lecture/lab/tutorial) Day  
**Associated degrees:** B C S T (Hons), B E, B I T (Hons), Grad Cert E, Grad Cert I T, M P E, PG Coursework Exchange.

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
Engineering and Information Technologies
Credit points: 6 Session: Semester 1 Classes: 2 hours of lectures, 1 hour of tutorial and 2 hours labs per week. Assumed knowledge: A programming language, basic maths. Assessment: Through semester assessment (50%), Final Exam (50%) Campus: Camperdown/Darlington Mode of delivery: Normal (lecture/lab/tutorial) Day
Associated degrees: B C S T (Hons), B E, B I T (Hons), Grad Cert E, Grad Cert I T, M P E, PG Coursework Exchange. 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.

ELEC5619
Object Oriented Application Frameworks
Engineering and Information Technologies
Credit points: 6 Session: Semester 2 Classes: 3 hours project work in class per week. Assumed knowledge: Java programming, and some web development experience are essential. Databases strongly recommended Assessment: Through semester assessment (100%) Campus: Camperdown/Darlington Mode of delivery: Normal (lecture/lab/tutorial) Day
Associated degrees: B E, Grad Cert I T, Grad Dip E, M P E, UG Study Abroad Program. 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.

HIMT5058
Health Informatics Applications
Health Sciences
Credit points: 6 Teacher/Coordinator: Professor Robert Steele Session: Semester 1 Classes: As per individual learning contract by arrangement with unit coordinator Assessment: As per individual learning contract (100%) Campus: Cumberland Mode of delivery: Block Mode Note: Department permission required for enrolment.
Associated degrees: Grad Cert I T, Grad Dip I T, M H I. This unit of study utilises case study analysis, review of contemporary literature and presentations to explore different health informatics topic areas. Students are provided with the opportunity to develop and enhance their information seeking and critical appraisal skills as they investigate and report on key themes, issues and trends in health informatics. A focus of the unit will be reviewing and investigating current and future technology applications such as: telemedicine and health in the home, web-based applications, cyber-consultations and wireless technology.

HIMT5060
Integration for Health Informatics
Health Sciences
This unit of study is not available in 2014
Credit points: 6 Teacher/Coordinator: Prof Robert Steele Session: Semester 2 Classes: Block mode three 7-hr workshops Assessment: Presentation (10%), Assignment 1 (20%), Assignment 2 (70%) Campus: Cumberland Mode of delivery: Block Mode
Associated degrees: Grad Cert I T, Grad Dip I T, M H I. This unit aims to provide an understanding of the organisational, people and social issues related to the successful implementation and use of health information systems in health care organisations. In this unit there is an analysis of relevant theories and principles as an understanding of these frameworks is essential for the successful diffusion of health information systems. Information and communication technology integration is challenging as healthcare organisations are complex and diverse with a variety of professionals working within them. This unit will cover issues that are often seen as barriers to information diffusion such as: organisational culture; communication; change management and work flow.

HIMT5069
Health Care Systems
Health Sciences
Credit points: 6 Teacher/Coordinator: Professor Stephanie Short Session: Semester 1 Classes: Self directed study Assessment: On-line Test (30%), Academic Poster (40%) and On-line Test (30%) Campus: Cumberland Mode of delivery: Distance Education
Associated degrees: Grad Cert Hlth Sc, Grad Cert I T, Grad Dip I T, Health Sciences PG Cross-Inst, Health Sciences PG Non-Award, M H I, M Hlth Sc. This unit provides an introduction to health care systems with an emphasis on the Australian health care system. Topics to be studied include Commonwealth, State and Local government responsibilities for health with a particular focus on the structure and organisation of health care, health care financing and the health workforce. The Australian health care system analysed with particular attention to the concepts of effectiveness, efficiency and equity. The unit encourages a critical appraisal of current public policies and health care arrangements within an international context.

Textbooks

IDEA9106
Design Thinking
Architecture, Design and Planning
Credit points: 6 Teacher/Coordinator: Dr Lian Loke Session: Semester 1 Classes: Seminar: 3 hrs/wk Assessment: Design exercises, research report, oral/visual presentations (90%), Participation in class activities (10%) Campus: Camperdown/Darlington Mode of delivery: Normal (lecture/lab/tutorial) Day
Associated degrees: Grad Cert Des Sc (Sustainable Des), PG Coursework Exchange. This unit of study aims to introduce students to design thinking and how it can be productively applied to different design situations, in both traditional design contexts and to the broader issues faced in contemporary society. Students will acquire the following learning outcomes:
1. An appreciation of the role of design thinking and strategy in traditional and cross-disciplinary contexts
2. Theoretical and practical understanding and application of design theories, methodologies and methods, with a particular emphasis on human-centred design
3. Demonstration of ideation and concept development to innovate 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
Engineering and Information Technologies

Credit points: 6  Session: Semester 1, Semester 2  Classes: One 2 hour scheduled small-group class per week. Prerequisites: Permission of Head of School
Prohibitions: INFO4010  Assumed knowledge: Good programming skills, especially in Java for the practical assignment, as well as proficiency in databases and SQL.
Assessment: Through semester assessment (60%), Final Exam (40%)  Campus: Camperdown/Darlington  Mode of delivery: Normal (lecture/lab/tutorial)  Day

Note: Department permission required for enrolment.

Associated degrees: B C S T (Hons), B I T (Hons), B Sc (Hons), M Inf Tech, M Inf Tech Man.

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, Force.com, 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.

INFO5011
IT Advanced Topic B
Engineering and Information Technologies

This unit of study is not available in 2014

Credit points: 6  Session: Semester 1, Semester 2, Winter Main  Classes: One 2 hour scheduled small-group class per week. Prerequisites: Permission of Head of School
Prohibitions: INFO4011  Assessment: Practical and written assignments (100%)  Campus: Camperdown/Darlington  Mode of delivery: Normal (lecture/lab/tutorial)  Day

Note: Department permission required for enrolment.

Associated degrees: B C S T (Hons), B I T (Hons), B Sc (Hons), M Inf Tech, M Inf Tech Man.

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
Engineering and Information Technologies

Credit points: 6  Session: Summer Early Classes  12 hrs Lectures per session; 6hrs Tutorial per session; 18hrs Laboratory per session  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%)  Campus: Camperdown/Darlington  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.

INFO50301
Information Security Management
Engineering and Information Technologies

Credit points: 6  Session: Semester 1  Classes: 2hrs of lecture, 1 hr of lab/tut per 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%)  Campus: Camperdown/Darlington  Mode of delivery: Normal (lecture/lab/tutorial)  Day

Associated degrees: B E, M Inf Tech, M Inf Tech Man, M P E.

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.

INFO50306
Enterprise Healthcare Info Sys
Engineering and Information Technologies

Credit points: 6  Session: Semester 2  Classes: 2hrs Lectures per week; 1 hr Tutorial/Laboratory per 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%)  Campus: Camperdown/Darlington  Mode of delivery: Normal (lecture/lab/tutorial)  Day

Associated degrees: B E, M Inf Tech, M Inf Tech Man, M P E.

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.

This 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.

INFO50991
Services Science Management and Eng
Engineering and Information Technologies

Credit points: 6  Session: Semester 1, Semester 2  Classes: Session 1 : Weekly, Session 2 : Weekly or Block mode  Assumed knowledge: INFO50990  Students are expected to have a degree in computer science, engineering, information technology, information systems or business.  Assessment: Through semester assessment (50%), Final Exam (50%)  Campus: Camperdown/Darlington  Mode of delivery: Normal (lecture/lab/tutorial)  Day


The service sector plays a dominant and growing role in economic growth and employment in most parts of the world and information technology (IT) is a key enabler of this. Services Science, Management and Engineering (SSME) takes a multi-disciplinary approach to
services as socio-technical systems. This unit of study offers IT professionals an understanding of the role of IT-centric services in a social, economic and business context as well as knowledge of the principles of their design, engineering and management in a service-oriented computing framework. Delivery of the unit is driven by a critical approach to the literature and live case studies presented by industry professionals. The unit’s learning outcomes are driven by stated industry needs.

INFO6007
Project Management in IT Engineering and Information Technologies
Credit points: 6 Session: Semester 1, Semester 2 Classes: One 2 hour lecture and one 1 hour tutorial per week. Prohibitions: PMGT5871 Assumed knowledge: Students enrolled in INFO6007 are assumed to have previously completed a Bachelor’s 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 Engineering and Information Technologies
Credit points: 6 Session: Semester 2, Summer Late Classes: 2 hours lectures, 1 hour tutorial, 1 hour e-Learning per 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.

INF56012
Enterprise Systems Management Business (Business School)
Credit points: 6 Session: Semester 1 Classes: 1 x 3hr seminar per week Assessment: midsemester 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.


In this unit you will explore the strategic managerial issues that arise from the implementation and use of Enterprise Systems as a means of integrating data and standardising processes. You will use 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. You will also explore the emergence and implications of cloud-based Enterprise Systems, and the part that Enterprise Systems play in an organisation's broader information infrastructure.

INF56017
Strategic Information & Knowledge Mgmt Business (Business School)
This unit of study is not available in 2014
Credit points: 6 Session: Semesters 2 Classes: 1 x 3hr seminar per week Assessment: Class activities (10%); Individual research project (30%); Group Assignment (30%); Final Exam (30%) Mode of delivery: Normal (lecture/lab/tutorial) Day


In today’s digital information society it is essential that organizations have effective strategies for generating, managing and obtaining value from their information and knowledge assets. It requires an understanding of the national policy, legal, technological and business imperatives that shape information design. INF56017 adopts a design thinking approach that focuses on innovation and sustainability in the design and management of information products and services. We use industry case studies to develop in-depth knowledge of information management theory and hands-on design workshops to develop your knowledge and skills in the use of key design methods and tools (e.g. user-centred service design, information audit, information needs analysis and modelling, enterprise content management).

ISYS5070
Change Management in IT Engineering and Information Technologies
Credit points: 6 Session: Winter Main Classes: 18hrs of Lectures per session; 18hrs of Tutorials per session. Assumed knowledge: The unit is expected to be taken after the following related units INFO6007 Project Management in IT and COMP5206 Introduction to Information Systems. Assessment: Through semester assessment (70%), Final Exam (30%) Mode of delivery: Block Mode

Associated degrees: Grad Cert D C C, Grad Cert Inf Tech Man, Grad Dip Comp, M I D M, M P E.

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.

**PMGT6867**
Quantitative Methods: Project Management
Engineering and Information Technologies

**Credit points:** 6  
**Session:** Semester 1  
**Semester 2  
**Classes:** Session 1: 3 hours per week (evening); Session 2: 3 hours per week (evening) & online

**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%)  
**Campus:** Camperdown/Darlington  
**Mode of delivery:** Normal (lecture/lab/tutorial) Evening

**Associated degrees:** B P M, Engineering PG Cross-Inst, Engineering PG Non-Degree, Engineering UG Cross-Inst, Engineering UG Non-Degree, Grad Cert I T, Grad Cert Inf Tech Man, Grad Cert P M, Grad Dip E, M P E.

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.

**PUBH5010**
Epidemiology Methods and Uses

**Medicine (Sydney Medical School)**

**Credit points:** 6  
**Teacher/Coordinator:** Associate Professor Tim Driscoll  
**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.  
**Campus:** Camperdown/Darlington  
**Mode of delivery:** Normal (lecture/lab/tutorial) Evening or Normal (lecture/lab/tutorial) Day or On


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 preparing for their tutorials.

**Textbooks**

**STAT5003**
Computational Statistical Methods
Science

**Credit points:** 6  
**Teacher/Coordinator:** A/Prof Shelton Peries  
**Session:** Semester 2  
**Classes:** Two lectures and one tutorial per week.  
**Prerequisites:** STAT5002 Assessment: 2 hour examination (60%), assignments (20%), quizzes (20%)  
**Campus:** Camperdown/Darlington  
**Mode of delivery:** Normal (lecture/lab/tutorial) Evening

**Associated degrees:** M Inf Tech.

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**

**COMP5703**
Information Technology Project
Engineering and Information Technologies

**Credit points:** 12  
**Session:** Semester 1, Semester 2  
**Classes:** Eight hours of practical work per week.  
**Assessment:** Through semester assessment (100%)  
**Campus:** Camperdown/Darlington  
**Mode of delivery:** Supervision

**Note:** Department permission required for enrolment.

**Associated degrees:** M Inf Tech, M Inf Tech Man.

This is a short 6cp IT project unit of study that can be taken either stand-alone as a short IT project during winter or summer schools, or as an internship-project as part of an industry-based scholarship such as the Faculty Postgraduate Industry Project Placement Scheme (PIPPS). The focus is on the development of a client-focused solution with proper project management and documentation. For such students who follow the internship model of one day a week over both semester 1 and semester 2, COMP5705 can be combined with COMP5706 IT Industry Placement Project.

**COMP5705**
IT Industry Placement Project
Engineering and Information Technologies

**Credit points:** 6  
**Session:** Semester 1, Semester 2, Summer Main, Winter  
**Classes:** Four hours of practical work per week.  
**Prohibitions:** COMP5702, COMP5703, COMP5704  
**Assessment:** Through semester assessment (100%)  
**Campus:** Camperdown/Darlington  
**Mode of delivery:** Supervision

**Note:** Department permission required for enrolment.

**Associated degrees:** M Inf Tech, M Inf Tech Man.

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.

**Research path units**

Candidates who achieve Distinction (75%) average results or above over the first 24 credit points may select 12 credit points of IT project units of study.

**COMP5702**
IT Research Project A
Engineering and Information Technologies

**Credit points:** 12  
**Session:** Semester 1, Semester 2  
**Classes:** Eight hours of practical work per week.  
**Assumed knowledge:** Students should concurrently or previously learn about Research Methods in IT, from INFO5993.  
**Assessment:**
Through semester assessment (100%)  

**Campus:** Camperdown/Darlington

**Mode of delivery:** Supervision

**Note:** Department permission required for enrolment. Note: COMP5702 and COMP5704 together form the Research thesis of MIT/MITM Research track. It is allowed to enrol in one of these units in one semester, and the other the following semester; the same mark and grade is given for both once they have both been completed.

**Associated degrees:** M Inf Tech, M Inf Tech Man.

**Specialist/Elective/Project**

**COMP5704**  

**IT Research Project B**  

**Engineering and Information Technologies**

**Credit points:** 6  

**Session:** Semester 1, Semester 2  

**Classes:** Two 1 hour scheduled small-group class per week, plus private work (including interaction with research supervisors).

**Prohibitions:** INFO5993  

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

**Campus:** Camperdown/Darlington

**Mode of delivery:** Supervision

**Note:** Department permission required for enrolment. Note: COMP5702 and COMP5704 together form the Research thesis for MIT/MITM Research Track. It is allowed to enrol in one of these units in one semester, and the other the following semester; the same mark and grade is given for both once they have both been completed.

**Associated degrees:** M Inf Tech, M Inf Tech Man.

**Specialist/Elective/Project**

**INFO5993**  

**IT Research Methods**  

**Engineering and Information Technologies**

**Credit points:** 6  

**Session:** Semester 1, Semester 2  

**Classes:** One 2 hour scheduled small-group class per week, plus private work (including interaction with research supervisors).

**Prohibitions:** INFO5993  

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

**Campus:** Camperdown/Darlington

**Mode of delivery:** Normal (lecture/lab/tutorial) Day

**Associated degrees:** B C S T (Hons), B I T (Hons), B Sc (Hons), M Inf Tech, M Inf Tech Man.

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.

**Exchange Units**

Exchange units require the approval of the Program Director. With approval, up to 12 credit points of Exchange units may be taken in place of other units, towards the requirements of the degree.

**ENGG5232**  

**Engineering Graduate Exchange B**  

**Engineering and Information Technologies**

**Credit points:** 6  

**Session:** Int January, Int July  

**Classes:** overseas short-course

**Prerequisites:** Permission from faculty and school.  

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

**Campus:** Camperdown/Darlington

**Mode of delivery:** Normal (lecture/lab/tutorial) Day

**Note:** Department permission required for enrolment.

**Associated degrees:** M E, M Inf Tech, M Inf Tech Man, M P E, M P L, M P M.

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**  

**Engineering and Information Technologies**

**Credit points:** 6  

**Session:** Int January, Int July  

**Classes:** overseas short-course

**Prerequisites:** Permission from faculty and school.  

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

**Campus:** Camperdown/Darlington

**Mode of delivery:** Normal (lecture/lab/tutorial) Day

**Note:** Department permission required for enrolment.

**Associated degrees:** M E, M Inf Tech, M Inf Tech Man, M P E, M P L, M P M.

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.

**Majors for the Master of Information Technology**

**Business Information Systems Major**

**Core units**

Candidates pursuing the Research path take INFO5993 instead of INFO5990.

**INFO5990**  

**Professional Practice in IT**  

**Engineering and Information Technologies**

**Credit points:** 6  

**Session:** Semester 1, Semester 2  

**Classes:** One 2 hour tutorial per week.

**Assessment:** Through semester assessment (50%), Final Exam (50%)  

**Campus:** Camperdown/Darlington

**Mode of delivery:** Block Mode or On-line or Normal (lecture/lab/tutorial) Day

**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.

**Associated degrees:** B E, B M P A, Grad Cert I T, Grad Cert Inf Tech Man, Grad Dip P A, M Inf Tech Man, M P Admin, M P E.

This Unit of Study introduces the students to some of the concepts, standards and techniques associated with the current professional practice of information technology as part of their involvement in professional practice. The students are presented with a wide range of core conceptual ideas, techniques and relevant professional issues associated with the fields of Interpersonal and Organisational Communication, Conflict Management, IT and Sustainability, IT and Globalisation, Negotiation Strategies, Professional Ethics and Social Implications, Data Quality, Auditing and Quality Assurance and key project management principles.

**COMP5206**  

**Introduction to Information Systems**  

**Engineering and Information Technologies**

**Credit points:** 6  

**Session:** Semester 1, Semester 2  

**Classes:** One 2 hour lecture and one 1 hour tutorial per week.

**Assessment:** Through semester assessment (50%), Final Exam (50%)  

**Campus:** Camperdown/Darlington

**Mode of delivery:** Normal (lecture/lab/tutorial) Day

**Associated degrees:** B E, Grad Cert D C C, Grad Cert E, Grad Cert I T, Grad Cert Inf Tech Man, Grad Dip Comp, M Appl Sc (Bioinformatics), M I D M, M P E.

This unit will provide a comprehensive introduction to the field of information systems from an organisational perspective. The critical
role of information and knowledge management will be emphasised from both conceptual and practical standpoints. Methods and techniques for analysing systems and eliciting user requirements will be discussed. Key topics covered will include:

* Basic Information Systems Concepts
* Systems approach and systems thinking
* E-Business and E-Commerce
* Data and Knowledge Management
* Systems Analysis and Development Methodologies
* Ethical, Legal and Social Aspects of Information technologies
* Web 2.0 and Social Computing

Objectives: Students who successfully complete this unit will be able to:

1. Develop a good understanding of important information concepts,
2. Deep understanding of the systems approach and its applicability.
3. Develop skills to perform systems analysis in contemporary systems environments
4. Understanding of major conceptual and technological developments in Information Systems

Elective units

Select 12 credit points from:

**CISS6022 Cybersecurity**

**Arts and Social Sciences**

Credit points: 6 Teacher/Coordinator: Dr Frank Smith Session: Semester 2 Classes: 1x2-hour seminar/week. Assessment: 2hr exam (40%) and 3000wd analytical essay (40%) and 1000wd equivalent lab exercise (10%) and seminar participation (10%) Campus: Camperdown/Darlington Mode of delivery: Normal (lecture/lab/tutorial) Day

Associated degrees: Grad Cert Int Sec, M I L, PG Coursework Exchange.

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.

**INFO5060 Data Analytics and Business Intelligence**

**Engineering and Information Technologies**

Credit points: 6 Session: Summer Early Classes: 12 hrs Lectures per session; 8hrs Tutorial per session; 18hrs Laboratory per session. 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 session assessment (65%), Final Exam (35%) Campus: Camperdown/Darlington Mode of delivery: Block Mode

Associated degrees: Grad Cert D C C, Grad Cert Inf Tech Man, Grad Dip Comp, M I D M, M P E.

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**

**Engineering and Information Technologies**

Credit points: 6 Session: Semester 1 Classes: 2 hrs of lecture, 1 hr of lab/tut per 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%) Campus: Camperdown/Darlington Mode of delivery: Normal (lecture/lab/tutorial) Day

Associated degrees: B E, M Inf Tech, M Inf Tech Man, M P E.

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**

**Engineering and Information Technologies**

Credit points: 6 Session: Semester 2 Classes: 2hrs Lectures per week; 1 hr Tutorial/Laboratory per 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%) Campus: Camperdown/Darlington Mode of delivery: Normal (lecture/lab/tutorial) Day

Associated degrees: B E, M Inf Tech, M Inf Tech Man, M P E.

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 etc., 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.

**INFO5991 Services Science Management and Eng**

**Engineering and Information Technologies**

Credit points: 6 Session: 1, Semester 2 Classes: Session 1 : Weekly, Session 2 : Weekly or Block mode. Assumed knowledge: INFO5990 Students are expected to have a degree in computer science, engineering, information technology, information systems or business. Assessment: Through semester assessment (50%), Final Exam (50%) Campus: Camperdown/Darlington Mode of delivery: Normal (lecture/lab/tutorial) Day


The service sector plays a dominant and growing role in economic growth and employment in most parts of the world and information technology (IT) is a key enabler of this. Services Science, Management and Engineering (SSME) takes a multi-disciplinary approach to services as socio-technical systems. This unit of study offers IT professionals an understanding of the role of IT-centric services in a social, economic and business context as well as knowledge of the principles of their design, engineering and management in a service-oriented computing framework. Delivery of the unit is driven by a critical approach to the literature and live case studies presented by industry professionals. The unit's learning outcomes are driven by stated industry needs.
INFS6012
Enterprise Systems Management
Business (Business School)
Credit points: 6, Session: Semester 1, Classes: 1x 3hr seminar per week, Assessment: midsemester test (35%), individual enterprise system portfolio (35%), and group report (30%), Campus: Camperdown/Darlington, 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.


In this unit you will explore the strategic managerial issues that arise with regard to Enterprise System implementation projects. You will also explore the emergence and implications of cloud-based Enterprise Systems, and the part that Enterprise Systems play in an organisation's broader information infrastructure.

INFS6017
Strategic Information & Knowledge Mgmt
Business (Business School)
This unit of study is not available in 2014
Credit points: 6, Session: Semester 2, Classes: 1 x 3hr seminar per week, Assessment: Class activities (10%); Individual research project (30%); Group Assignment (30%); Final Exam (30%), Campus: Camperdown/Darlington, Mode of delivery: Normal (lecture/lab/tutorial) Day


In today's digital information society it is essential that organizations have effective strategies for generating, managing and obtaining value from their information and knowledge assets. It requires an understanding of the national policy, legal, technological and business imperatives that shape information design. INFS6017 adopts a design thinking approach that focuses on innovation and sustainability in the design and management of information products and services. The unit is designed to develop your knowledge and skills in the use of key design methods and tools (e.g. user-centred service design, information audit, information needs analysis and modelling, enterprise content management).

ISYS5070
Change Management in IT
Engineering and Information Technologies
Credit points: 6, Session: Winter Main Classes, 18hrs of Lectures per session; 18hrs of Tutorials per session, Assumed knowledge: The unit is expected to be taken after the following related units INFO6007 Project Management in IT and COMP5026 Introduction to Information Systems, Assessment: Through semester assessment (70%), Final Exam (30%), Campus: Camperdown/Darlington, Mode of delivery: Block Mode

Associated degrees: Grad Cert D C C, Grad Cert Inf Tech Man, Grad Dip Comp, M I D M, M P E.

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.

Computer Networks Major
Core unit
Candidates pursuing the Research path take INFO5993 instead of INFO5990.

INFO5990
Professional Practice in IT
Engineering and Information Technologies
Credit points: 6, Session: Semester 1, Semesters 2, Classes: Session 1: Weekly or Block mode or Online Session 2: Weekly or Block mode or Online, Assumed knowledge: Student’s enrolled in INFO5990 are assumed to have previously completed a Bachelor’s 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 session assessment (50%), Final Exam (50%), Campus: Camperdown/Darlington, Mode of delivery: Block Mode or On-line or Normal (lecture/lab/tutorial) Day

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 of information technology as part of their involvement in professional practice. The students are presented with a wide range of core conceptual ideas, techniques and relevant professional issues associated with the fields of Interpersonal and Organisational Communication, Conflict Management, IT and Sustainability, IT and Globalisation, Negotiation Strategies, Professional Ethics and Social Implications, Data Quality, Auditing and Quality Assurance and key project management principles.

Elective units
Select 18 credit points from:

COMP5047
Pervasive Computing
Engineering and Information Technologies
Credit points: 6, Session: Semester 2, Classes: 3hr integrated lecture and practical session, Prohibitions: NETS4047, 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%), Campus: Camperdown/Darlington, Mode of delivery: Normal (lecture/lab/tutorial) Day

Associated degrees: B C S T (Hons), B E, B I T (Hons), B Sc (Hons), Grad Cert I T, M P E.

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.

COMP5116
Design of Networks & Distributed Systems
Engineering and Information Technologies

Credit points: 6  Session: Semester 1, Semester 2  Classes: One 2 hour lecture and one 1 hour tutorial per week.  Assessment: Through semester assessment (40%), Final Exam (60%)  Campus: Camperdown/Darlington  Mode of delivery: Normal (lecture/lab/tutorial) Day

Associated degrees: B E, Grad Cert E, Grad Cert IT, Grad Cert Inf Tech Man, Grad Dip Comp, M I D M, M P E.

This 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.

COMP5216
Mobile Computing
Engineering and Information Technologies

Credit points: 6  Session: Semester 2  Classes: 2hr Lectures per week; 1 hr Tutorial per week  Assumed knowledge: COMP5214 Software Development in JAVA, or similar introductory software development units.  Assessment: Through semester assessment (50%), Final Exam (50%)  Campus: Camperdown/Darlington  Mode of delivery: Normal (lecture/lab/tutorial) Day

Associated degrees: B E, B I T, B I T, B Com, Grad Cert D C C, Grad Cert I T, Grad Dip Comp, M I D M, M P E.

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 hands-on experiences in developing mobile applications in a broad range of areas.

COMP5313
Large Scale Networks
Engineering and Information Technologies

Credit points: 6  Session: Semester 1  Classes: 2hr Lectures per week; 1 hr Tutorial per week  Assumed knowledge: Algorithmic skills (as expected from any IT graduate). Basic probability knowledge.  Assessment: Through semester assessment (60%), Final Exam (40%)  Campus: Camperdown/Darlington  Mode of delivery: Normal (lecture/lab/tutorial) Day

Associated degrees: B E, Grad Cert D C C, Grad Cert Inf Tech Man, Grad Dip Comp, M I D M, M P E.

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
Engineering and Information Technologies

Credit points: 6  Session: Semester 1  Classes: 2 hr Lectures per week; 2 hrs Laboratory per 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 Software Development in JAVA  Assessment: Through semester assessment (100%)  Campus: Camperdown/Darlington  Mode of delivery: Normal (lecture/lab/tutorial) Day

Associated degrees: B E, Grad Cert D C C, Grad Cert Inf Tech Man, Grad Dip Comp, M I D M, M P E.

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
Engineering and Information Technologies

Credit points: 6  Session: Semester 2  Classes: (Lec 2hrs & Prac 1hr) per week  Assumed knowledge: COMP5116 OR ELEC5506  Assessment: Through semester assessment (40%), Final Exam (60%)  Campus: Camperdown/Darlington  Mode of delivery: Normal (lecture/lab/tutorial) Day

Associated degrees: B C S T (Hons), B E, B I T (Hons), B Psych (Hons), B Sc (Hons), Grad Cert I T, Grad Dip E.

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
Engineering and Information Technologies

Credit points: 6  Session: Semester 1  Classes: 2 hours of lecture and a 2 hours tutorial/project meeting per 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: ELEC5350 Communications, ELEC5356 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%)  Campus: Camperdown/Darlington  Mode of delivery: Normal (lecture/lab/tutorial) Day

ELEC5509
Mobile Networks
Engineering and Information Technologies

Credit points: 6  Session: Semester 1  Classes: 2 hours of lecture and a 2 hours tutorial/project meeting per 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: ELEC5350 Communications, ELEC5356 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%)  Campus: Camperdown/Darlington  Mode of delivery: Normal (lecture/lab/tutorial) Day
This unit of study serves as an introduction to communications network research. The unit relies on a solid understanding of data communications and mobile networks. It introduces some of the currently most debated research topics in mobile networking and presents an overview of different technical solutions. Students are expected to critically evaluate these solutions in their context and produce an objective analysis of the advantages/disadvantages of the different research proposals. The general areas covered are wireless Internet, mobility management, quality of service in mobile and IP networks, ad hoc networks, and cellular network architectures. The following topics are covered. Introduction to wireless and mobile Internet. Wireless cellular data networks. Cellular mobile networks. Mobile networks of the future. Quality of service in a mobile environment. Traffic modelling for wireless Internet. Traffic management for wireless Internet. Mobility management in mobile networks. Transport protocols for mobile networks. Internet protocols for mobile networks.

Computer Science Major

Core unit

Candidates pursuing the Research path take INFO5993 instead of INFO5990.

INFO5990

Professional Practice in IT

Engineering and Information Technologies

Credit points: 6 Session: Semester 1, Semester 2 Classes: Session 1: Weekly or Block mode or Online Session 2: Weekly or Block mode or Online

Assumed knowledge: Students enrolled in INFO5990 are assumed to have previously completed a Bachelor’s 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 session assessment (50%), Final Exam (50%). Campus: Camperdown/Darlington Mode of delivery: Block Mode or On-line or Normal (lecture/lab/tutorial) Day

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 of information technology as part of their involvement in professional practice. The students are presented with a wide range of core conceptual ideas, techniques and relevant professional issues associated with the fields of Interpersonal and Organisational Communication, Conflict Management, IT and Sustainability, IT and Globalisation, Negotiation Strategies, Professional Ethics and Social Implications, Data Quality, Auditing and Quality Assurance and key project management principles.

Elective units

Select 18 credit points from:

COMP5045

Computational Geometry

Engineering and Information Technologies

Credit points: 6 Session: Semester 1 Classes: One 2 hour scheduled small group class per week, plus 10 hours per week private work. 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 notation and simple algorithmic techniques like sorting, binary search, and balanced search trees. Assessment: Through semester assessment (75%), Final Exam (25%). Campus: Camperdown/Darlington Mode of delivery: Normal (lecture/lab/tutorial) Day

Associated degrees: B C S T (Hons), B E, B I T (Hons), B Sc (Hons), Grad Cert I T.

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

Engineering and Information Technologies

Credit points: 6 Session: Semester 1 Classes: One 2 hour scheduled small group class per week. Prohibitions: COMP4046. Assumed knowledge: Knowledge of an OC programming language Assessment: Through semester assessment (60%), Final Exam (40%). Campus: Camperdown/Darlington Mode of delivery: Normal (lecture/lab/tutorial) Day

Note: Practical work will use the Natural Language Toolkit

Associated degrees: B C S T (Hons), B E, B I T (Hons), B Sc (Hons), Grad Cert I T.

This unit deals with techniques for the automatic processing of natural languages (such as English, French, etc) and the engineering of such software systems. Engineering processes will be described in the context of methods for creating effective tools for information retrieval and extraction, question answering, classifying and clustering of the documents in a large corpora. Processing sub-systems for such tasks as tokenisation, lexical verification, part-of-speech tagging, parsing and word sense disambiguation will be described. Particular emphasis is given to methods that analyse the meaning in texts and the general application of machine learning methods to these topics. Various applications of these methods to research in health texts and other contexts being pursued in the University of Sydney will be explored.

COMP5047

Pervasive Computing

Engineering and Information Technologies

Credit points: 6 Session: Semester 2 Classes: 3hr integrated lecture and practical session Prohibitions: NETS4047. 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%). Campus: Camperdown/Darlington Mode of delivery: Normal (lecture/lab/tutorial) Day

Associated degrees: B C S T (Hons), B E, B I T (Hons), B Sc (Hons), Grad Cert I T, M P E.

This is an advanced course in HCI, Human Computer Interaction, with a focus on Pervasive Computing. It introduces the key aspects of HCI and explores these in terms of the new research towards creating user interfaces that disappear into the environment and are available pervasively, for example in homes, workplaces, cars and carried or work.

COMP5048

Information Visualisation

Engineering and Information Technologies

Credit points: 6 Session: Semester 2 Classes: Lecture 2 hours per week, Tutorial 1 hour per week. Prohibitions: COMP4048. Assumed knowledge: It is assumed that students will have basic knowledge of data structures, algorithms and programming skills. Assessment: Through semester assessment (100%). Campus: Camperdown/Darlington Mode of delivery: Normal (lecture/lab/tutorial) Day

Associated degrees: B C S T (Hons), B E, B I T (Hons), B Sc (Hons), Grad Cert I T, M Inf Tech.

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 research challenge for Information Visualisation is to design and implement new algorithms that produce such pictures. Applications include visualisation of bioinformatics, social network, software visualisation and network visualisation.

This unit will provide basic concepts, techniques and fundamental algorithms to achieve good visualisation of abstract information.
Further, it will also provide opportunities for academic research and developing new methods for Information Visualisation.

COMP5211
Algorithms
Engineering and Information Technologies
Credit points: 6 Session: Semester 1, 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%) Campus: Camperdown/Darlington Mode of delivery: Normal (lecture/lab/tutorial) Day

Associated degrees: B E, Grad Cert D C C, Grad Cert I T, Grad Dip Comp, Grad Dip E (Prof Eng), M Appl Sc (Bioinformatics), M I D M, M Inf Tech, M P E, PG Coursework Exchange.

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, greedy, local search, and randomisation, as well NP-hardness.

COMP5456
Introduction to Bioinformatics
Engineering and Information Technologies
Credit points: 6 Session: Summer Main Classes: Block mode in Summer School. Prohibitions: COMP3456 Assumed knowledge: Some experience with programming (coding) in Java, 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 course assessment(50%), exam (50%) Campus: Camperdown/Darlington Mode of delivery: Normal (lecture/lab/tutorial) Day

Associated degrees: M Inf Tech.

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. It covers the essentials of bioinformatics data gathering, manipulation, mining and storage that underpin bioinformatics research, and provides additional practice in the graduate attributes of Research and Inquiry, Information Literacy and Communication through analysis of scientific research, use of large bioinformatics data sets, and writing of reports.

Database Management Systems Major
Core unit
Candidates pursuing the Research path take INFO5993 instead of INFO5990.

INFO5990
Professional Practice in IT
Engineering and Information Technologies
Credit points: 6 Session: Semester 1, Semester 2 Classes: Session 1: Weekly or Block mode or Online Session 2: Weekly or Block mode or Online Assumed knowledge: Students enrolled in INFO5990 are assumed to have previously completed a Bachelor’s 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 session assessment (50%), Final Exam (50%) Campus: Camperdown/Darlington Mode of delivery: Block Mode or On-line or Normal (lecture/lab/tutorial) Day

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 of information technology as part of their involvement in professional practice. The students are presented with a wide range of core conceptual ideas, techniques and relevant professional issues associated with the fields of Interpersonal and Organisational Communication, Conflict Management, IT and Sustainability, IT and Globalisation, Negotiation Strategies, Professional Ethics and Social Implications, Data Quality, Auditing and Quality Assurance and key project management principles.

Elective units
Select 18 credit points from:

COMP5046
Statistical Natural Language Processing
Engineering and Information Technologies
Credit points: 6 Session: Semester 1, Semester 2 Classes: One 2 hour lecture and one 2 hour tutorial per week. Assumed knowledge: Some knowledge of programming Language and mathematical or information sciences (as evinced in the prerequisites); 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 course assessment(50%), exam (50%) Campus: Camperdown/Darlington Mode of delivery: Normal (lecture/lab/tutorial) Day

Note: Practical work will use the Natural Language Toolkit

Associated degrees: B C S T (Hons), B E, B I T (Hons), B Sc (Hons), Grad Cert I T.

This unit deals with techniques for the automatic processing of natural languages (such as English, French, etc) and the engineering of such software systems. Engineering processes will be described in the context of methods for creating effective tools for information retrieval and extraction, question answering, classifying and clustering of the documents in a large corpora. Processing sub-systems for such tasks as tokenisation, lexical verification, part-of-speech tagging, parsing and word sense disambiguation will be described. Particular emphasis is given to methods that analyse the meaning in texts and the general application of machine learning methods to these topics. Various applications of these methods to research in health texts and other contexts being pursued in the University of Sydney will be explored.

COMP5138
Relational Database Management Systems
Engineering and Information Technologies
Credit points: 6 Session: Semester 1, Semester 2 Classes: One 2 hour lecture and one 2 hour tutorial per week. Assumed knowledge: Some exposure to programming and some familiarity with relational database concepts. Assessment: Through semester assessment (50%), Final Exam (50%) Campus: Camperdown/Darlington Mode of delivery: Normal (lecture/lab/tutorial) Day

Associated degrees: B E, Grad Cert I T, Grad Cert Inf Tech Man, M H I, M P E.

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;

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- Explore the key emerging topics in database management.

COMP5318
Knowledge Discovery and Data Mining
Engineering and Information Technologies
Credit points: 6  Session: Semester 1 Classes: (Lec 2hrs & Prac 1hr) per week  Assumed knowledge: COMP5138  Assessment: Through semester assessment (40%), Final Exam (60%)  Campus: Camperdown/Darlington  Mode of delivery: Normal (lecture/lab/tutorial) Day

Associated degrees: B C S T (Hons), B E, B I T (Hons), B Psych (Hons), B Sc (Hons), Grad Cert I T, PG Coursework Exchange.

Knowledge discovery is the process of extracting useful knowledge from data. Data mining is a discipline within knowledge discovery that seeks to facilitate the exploration and analysis of large quantities of data, by automatic or semi-automatic 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
Engineering and Information Technologies
Credit points: 6  Session: Semester 2 Classes: (Lec 2hrs & Prac 1hr) per week  Assumed knowledge: This unit of study assumes foundational knowledge of relational database systems as taught in COMP5138 (Relational Database Management Systems) or INFO2120/2820 (Database Systems 1). The Extensible Markup Language (XML) in not a pre-requisite as it will be taught in this unit.  Assessment: Through semester assessment (40%), Final Exam (60%)  Campus: Camperdown/Darlington  Mode of delivery: Normal (lecture/lab/tutorial) Day

Associated degrees: B C S T (Hons), B E, B I T (Hons), B Psych (Hons), B Sc (Hons), Grad Cert Appl Sc (5 I S), Grad Cert I T, M P E.

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-2008, 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
Engineering and Information Technologies
Credit points: 6  Session: Semester 1 Classes: 2 hr Lectures per week; 2 hrs Laboratory per 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 Software Development in JAVA  Assessment: Through semester assessment (100%)  Campus: Camperdown/Darlington  Mode of delivery: Normal (lecture/lab/tutorial) Day

Associated degrees: B E, Grad Cert D C C, Grad Cert Inf Tech Man, Grad Dip Comp, M I D M, M P E.

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 Storage, Retrieval & Delivery
Engineering and Information Technologies
Credit points: 6  Session: Semester 1 Classes: One 2-hour lecture and 1 hour prac per week  Assumed knowledge: COMP5211. Basic Programming skills, and data structure knowledge.  Assessment: Through semester assessment (40%), Final Exam (60%)  Campus: Camperdown/Darlington  Mode of delivery: Normal (lecture/lab/tutorial) Day

Associated degrees: B C S T (Hons), B E, B I T (Hons), B Psych (Hons), B Sc (Hons), Grad Cert I T.

The explosive growth of multimedia data, including text, audio, images and video, has generated an extremely challenging job in effective and efficient storing, managing, retrieving and delivering this data across IT infrastructure. This unit provides students with the most updated knowledge in order to address these issues, from multimedia database to multimedia content delivery. The unit content principally covers multimedia data compression; low-level feature extraction; high-level semantic description; storage structures and management; similarity measurement, indexing, and retrieval; security for content distribution. Various applications will be discussed, including multimedia Internet search and video streaming.

INFO5060
Data Analytics and Business Intelligence
Engineering and Information Technologies
Credit points: 6  Session: Summer Early Classes: 12 hrs Lectures per session; 6hrs Tutorial per session; 18hrs Laboratory per session  Assumed knowledge: The unit is expected to be taken after introductory courses in related units such as COMP5206 Introduction to Information Systems.  Assessment: Through semester assessment (65%), Final Exam (35%)  Campus: Camperdown/Darlington  Mode of delivery: Block Mode

Associated degrees: Grad Cert D C C, Grad Cert Inf Tech Man, Grad Dip Comp, M I D M, M P E.

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.

STAT5002
Introduction to Statistics
Science
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%)  Campus: Camperdown/Darlington  Mode of delivery: Normal (lecture/lab/tutorial) Evening

Associated degrees: M Inf Tech.

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

STAT5003
Computational Statistical Methods
Science
Credit points: 6  Teacher/Coordinator: A/Prof Shelton Peiris  Session: Semester 2 Classes: Two lectures and one tutorial per week.  Prerequisites:
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

Health Informatics Major

Core units
Candidates pursuing the Research path take INFO5993 instead of INFO5990.

**COMP5424 Information Technology in Biomedicine Engineering and Information Technologies**

**Credit points:** 6  
**Session:** Semester 1  
**Classes:** (Lec 2hrs & Tut 1hr) per week  
**Assessment:** Through semester assessment (40%), Final Exam (60%)  
**Campus:** Camperdown/Darlington  
**Mode of delivery:** Normal (lecture/lab/tutorial) Day

**Associated degrees:** B C S T (Hons), B E, B I T (Hons), B Psych (Hons), B Sc (Hons), Grad Cert I T, Grad Dip I T, M Appl Sc (Biometrics), M Inf Tech.

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 mobile computing will be addressed. A broad range of practical integrated clinical applications will be also elaborated.

**INFO5990 Professional Practice in IT Engineering and Information Technologies**

**Credit points:** 6  
**Session:** Semester 1, Semester 2  
**Classes:** Session 1: Weekly or Block mode or Online Session 2: Weekly or Block mode or Online  
**Assumed knowledge:** Students enrolled in INFO5990 are assumed to have previously completed a Bachelor’s 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%)  
**Campus:** Camperdown/Darlington  
**Mode of delivery:** Block Mode or On-line or Normal (lecture/lab/tutorial) Day

**Associated degrees:** B E, B M P A, Grad Cert I T, Grad Cert Inf Tech Man, Grad Dip P A, M Inf Tech Man, M P Admin, M P E.

This Unit of Study introduces the students to some of the concepts, standards and techniques associated with the current professional practice of information technology as part of their involvement in professional practice. The students are presented with a wide range of core conceptual ideas, techniques and relevant professional issues associated with the fields of Interpersonal and Organisational Communication, Conflict Management, IT and Sustainability, IT and Globalisation, Negotiation Strategies, Professional Ethics and Social Implications, Data Quality, Auditing and Quality Assurance and key project management principles.

**Elective units**
Select 12 credit points from:

**COMP5046 Statistical Natural Language Processing**

**Engineering and Information Technologies**

**Credit points:** 6  
**Session:** Semester 1  
**Classes:** One 2 hour scheduled core session per week.  
**Prohibitions:** COMP4046  
**Assumed knowledge:** Knowledge of an OOP programming language.  
**Assessment:** Through semester assessment (60%), Final Exam (40%)  
**Campus:** Camperdown/Darlington  
**Mode of delivery:** Normal (lecture/lab/tutorial) Day

**Associated degrees:** B C S T (Hons), B E, B I T (Hons), B Sc (Hons), Grad Cert I T.

This unit deals with techniques for the automatic processing of natural languages (such as English, French, etc) and the engineering of such software systems. Engineering processes will be described in the context of methods for creating effective tools for information retrieval and extraction, question answering, classifying and clustering of the documents in a large corpora. Processing sub-systems for such tasks as tokenisation, lexical verification, part-of-speech tagging, parsing and word sense disambiguation will be described. Particular emphasis is given to methods that analyse the meaning in texts and the general application of machine learning methods to these topics. Various applications of these methods to research in health texts and other contexts being pursued in the University of Sydney will be explored.

**COMP5216 Mobile Computing**

**Engineering and Information Technologies**

**Credit points:** 6  
**Session:** Semester 2  
**Classes:** 2hr Lectures per week; 1 hr Tutorial per week.  
**Assumed knowledge:** COMP5214 Software Development in JAVA, or similar introductory software development units.  
**Assessment:** Through semester assessment (50%), Final Exam (50%)  
**Campus:** Camperdown/Darlington  
**Mode of delivery:** Normal (lecture/lab/tutorial) Day

**Associated degrees:** B E, B I T, B I T, B Com, Grad Cert D C C, Grad Cert I T, Grad Dip Comp, M I D M, M P E.

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.

**COMP5427 Usability Engineering**

**Engineering and Information Technologies**

**Credit points:** 6  
**Session:** Semester 2  
**Classes:** 2hr Lectures per week; 2hr Laboratory per week.  
**Assessment:** Through semester assessment (80%), Final Exam (20%)  
**Campus:** Camperdown/Darlington  
**Mode of delivery:** Normal (lecture/lab/tutorial) Day

**Associated degrees:** B C S T (Hons), B E, B I T (Hons), Grad Cert E, Grad Cert I T, M P E.

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

**Engineering and Information Technologies**

**Credit points:** 6  
**Session:** Summer Main  
**Classes:** Block mode in Summer  
**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 course assessment (30%), final exam (70%)  
**Campus:** Cumberland/Darlington  
**Mode of delivery:** Normal (lecture/lab/tutorial) Day  

**Associated degrees:** M Inf Tech.

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. It covers the essentials of bioinformatics data gathering, manipulation, mining and storage that underpin bioinformatics research, and provides additional practice in the graduate attributes of Research and Inquiry, Information Literacy and Communication through analysis of scientific research, use of large bioinformatics data sets, and writing of reports.

**HIMT5058**

Health Informatics Applications

**Health Sciences**

**Credit points:** 6  
**Teacher/Coordinator:** Professor Robert Steele  
**Session:** Semester 1  
**Classes:** As per individual learning contract by arrangement with unit coordinator  
**Assessment:** As per individual learning contract (100%)  
**Campus:** Cumberland  
**Mode of delivery:** Block Mode  
**Note:** Department permission required for enrolment.

**Associated degrees:** Grad Cert I T, Grad Dip I T, M H I.

This unit of study utilises case study analysis, review of contemporary literature and presentations to explore different health informatics topic areas. Students are provided with the opportunity to develop and enhance their information seeking and critical appraisal skills as they investigate and report on key themes, issues and trends in health informatics. A focus of the unit will be reviewing and investigating current and future technology applications such as: telemedicine and health in the home, web-based applications, cyber-consultations and wireless technology.

**HIMT5060**

Integration for Health Informatics

**Health Sciences**

**This unit of study is not available in 2014**  
**Credit points:** 6  
**Teacher/Coordinator:** Prof Robert Steele  
**Session:** Semester 2  
**Classes:** Block mode three 7-hr workshops  
**Assessment:** Presentation (10%), Assignment 1 (20%), Assignment 2 (70%)  
**Campus:** Cumberland  
**Mode of delivery:** Block Mode  

**Associated degrees:** Grad Cert I T, Grad Dip I T, M H I.

This unit aims to provide an understanding of the organisational, people and social issues related to the successful implementation and use of health information systems in health care organisations. In this unit there is an analysis of relevant theories and principles as an understanding of these frameworks is essential for the successful diffusion of health information systems. Information and communication technology integration is challenging as healthcare organisations are complex and diverse with a variety of professionals working within them. This unit will cover issues that are often seen as barriers to information diffusion such as: organisational culture; communication; change management and work flow.

**HIMT5069**

Health Care Systems

**Health Sciences**

**Credit points:** 6  
**Teacher/Coordinator:** Professor Stephanie Short  
**Session:** Semester 1  
**Classes:** Self directed study  
**Assessment:** On-line test (30%), Academic Poster (40%) and On-line Test (30%)  
**Campus:** Cumberland  
**Mode of delivery:** Distance Education  

**Associated degrees:** Grad Cert Hlth Sci, Grad Cert I T, Grad Dip I T, Health Sciences PG Cross-Inst, Health Sciences PG Non-Award, M H I, M Hlth Sci.

This unit provides an introduction to health care systems with an emphasis on the Australian health care system. Topics to be studied include Commonwealth, State and Local government responsibilities for health with a particular focus on the structure and organisation of health care, health care financing and the health workforce. The Australian health care system analysed with particular attention to the concepts of effectiveness, efficiency and equity. The unit encourages a critical appraisal of current and public policies and health care arrangements within an international context.

**INFO5003**

IT for Health Professionals

**Engineering and Information Technologies**

**Credit points:** 6  
**Session:** Summer Late  
**Classes:** 18hrs Lecture over 2 weeks; 18hours Tutorials over 2 weeks  
**Assessment:** Through session assessment (50%), Final Exam (50%)  
**Campus:** Cumberland/Darlington  
**Mode of delivery:** Block Mode  

**Associated degrees:** Grad Cert D C C, Grad Cert Inf Tech Man, Grad Dip Comp, M I D M, M P E.

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 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.

**INFO5036**

Enterprise Healthcare Info Systems

**Engineering and Information Technologies**

**Credit points:** 6  
**Session:** Semester 2  
**Classes:** 2hrs Lectures per week; 1 hr Tutorial/Laboratory per 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 DBRS).  
**Assessment:** Through semester assessment (50%), Final Exam (50%)  
**Campus:** Cumberland/Darlington  
**Mode of delivery:** Normal (lecture/lab/tutorial) Day  

**Associated degrees:** B E, M Inf Tech, M Inf Tech Man, M P E.

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.

INFO6007
Project Management in IT
Engineering and Information Technologies

Credit points: 6
Session: Semester 1, Semester 2
Classes: One 2 hour lecture and one 1 hour tutorial per week.
Prohibitions: PMGT5871
Assumed knowledge: Students enrolled in INFO6007 are assumed to have previously completed a Bachelor’s 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%)
Campus: Camperdown/Darlington
Mode of delivery: Normal (lecture/lab/tutorial) Day

Associated degrees: B E, E M P A, Grad Cert I T, Grad Cert Inf Tech Man, Grad Dip P A, M P A

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.

INFO5003
IT for Health Professionals
Engineering and Information Technologies

Credit points: 6
Session: Summer Late Classes: 18hrs Lecture over 2 weeks; Assessment: Through session assessment (50%), Final Exam (50%)
Campus: Camperdown/Darlington
Mode of delivery: Block Mode

Associated degrees: Grad Cert D C C, Grad Cert Inf Tech Man, Grad Dip Comp, M I D M, M P E

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

Medicine (Sydney Medical School)

Credit points: 6
Teacher/Coordinator: Associate 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: BSTA5001
Assessment: 1x 4 page 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.
Campus: Camperdown/Darlington
Mode of delivery: Normal (lecture/lab/tutorial) Evening or Normal (lecture/lab/tutorial) Day or On


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 preparing for their tutorials.

Textbooks

PUBH5018
Introductory Biostatistics

Medicine (Sydney Medical School)

Credit points: 6
Teacher/Coordinator: Dr Kevin McGeechan and Professor Petra Macaskill
Session: Semester 1
Classes: 2x 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: 1x 4 page assignment (30%) and 1x 2.5hr open-book exam (70%). For distance students it may be possible to complete the exam externally with the approval of the course coordinator.
Campus: Camperdown/Darlington
Mode of delivery: Normal (lecture/lab/tutorial) Evening or Normal (lecture/lab/tutorial) Day or On


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.
Multimedia Technology Major

Core unit
Candidates pursuing the Research path take INFO5993 instead of INFO5990.

INFO5990 Professional Practice in IT Engineering and Information Technologies
Credit points: 6 Session: Semester 1, Semester 2 Classes: Session 1: Weekly or Block mode or Online Session 2: Weekly or Block mode or Online

Assumed knowledge: Student’s enrolled in INFO5990 are assumed to have previously completed a Bachelor’s 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%)
Campus: Camperdown/Darlington
Mode of delivery: Block Mode or On-line or Normal (lecture/lab/tutorial) Day

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 of information technology as part of their involvement in professional practice. The students are presented with a wide range of core conceptual ideas, techniques and relevant professional issues associated with the fields of Interpersonal and Organisational Communication, Conflict Management, IT and Sustainability, IT and Globalisation, Negotiation Strategies, Professional Ethics and Social Implications, Data Quality, Auditing and Quality Assurance and key project management principles.

Elective units
One unit of study from the Computer Science Major may also be included.

COMP5114 Digital Media Fundamentals Engineering and Information Technologies
Credit points: 6 Session: Semester 1, Semester 2 Classes: One 2 hour lecture and one 1 hour tutorial per week.
Assessment: Through semester assessment (50%), Final Exam (50%)
Campus: Camperdown/Darlington
Mode of delivery: Normal (lecture/lab/tutorial) Day

Associated degrees: B E, Grad Cert E, Grad Cert IT, Grad Cert Inf Tech Man, Grad Dip Comp, M I D M, M P E.

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.

COMP5215 Mobile Computing Engineering and Information Technologies
Credit points: 6 Session: Semester 2 Classes: 2hr Lectures per week; 1 hr Tutorial per week. Assumed knowledge: COMP5214 Software Development in JAVA, or similar introductory software development units. Assessment: Through semester assessment (50%), Final Exam (50%)
Campus: Camperdown/Darlington
Mode of delivery: Normal (lecture/lab/tutorial) Day

Associated degrees: B E, B I T, B Com, Grad Cert D C C, Grad Cert I T, Grad Dip Comp, M I D M, M P E.

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 hands-on experiences in developing mobile applications in a broad range of areas.

COMP5415 Multimedia Authoring and Production Engineering and Information Technologies
Credit points: 6 Session: Semester 2 Classes: One 2 hour lecture and one 1 hour tutorial per week.
Assumed knowledge: COMP5114 Assessment: Through semester assessment (40%), Final Exam (60%)
Campus: Camperdown/Darlington
Mode of delivery: Normal (lecture/lab/tutorial) Day

Associated degrees: B E, B I T (Hons), B Psych (Hons), B Sc (Hons), Grad Cert I T, PG Coursework Exchange.

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 Storage, Retrieval & Delivery Engineering and Information Technologies
Credit points: 6 Session: Semester 1 Classes: One 2-hour lecture and 1 hour prac per week.
Assumed knowledge: COMP5211. Basic Programming skills and data structure knowledge. Assessment: Through semester assessment (40%), Final Exam (60%)
Campus: Camperdown/Darlington
Mode of delivery: Normal (lecture/lab/tutorial) Day

Associated degrees: B C S T (Hons), B E, B I T (Hons), B Psych (Hons), B Sc (Hons), Grad Cert I T.

The explosive growth of multimedia data, including text, audio, images and video, has generated an extremely challenging job in effective and efficient storing, managing, retrieving and delivering this data across IT infrastructure. This unit provides students with the most updated knowledge in order to address these issues, from multimedia database to multimedia content delivery. The unit content principally covers multimedia data compression; low-level feature extraction; high-level semantic description; storage structures and management; similarity measurement, indexing, and retrieval; security for content distribution. Various applications will be discussed, including multimedia Internet search and video streaming.

IDEA9106 Design Thinking Architecture, Design and Planning
Credit points: 6 Teacher/Coordinator: Dr Lian Loke Session: Semester 1 Classes: Seminar 3 hrs/wk Assessment: Design exercises, research report, oral/visual presentations (90%), Participation in class activities (10%)
Campus: Camperdown/Darlington
Mode of delivery: Normal (lecture/lab/tutorial) Day

Associated degrees: Grad Cert Des Sc (Sustainable Des), PG Coursework Exchange.

This unit of study aims to introduce students to design thinking and how it can be productively applied to different design situations, in both traditional design contexts and to the wider issues faced in contemporary society. Students will acquire the following learning outcomes:

1. An appreciation of the role of design thinking and strategy in traditional and cross-disciplinary contexts
2. Theoretical and practical understanding and application of design theories, methodologies and methods, with a particular emphasis on human-centred design
3. Demonstration of ideation and concept development to innovate solutions to complex problems
4. Awareness of design processes and cognition in collaborative, inter-disciplinary teams
5. Demonstration of persuasive oral/visual communication techniques

Project Management Major

Core units
Candidates pursuing the Research path take INFO5993 instead of INFO5990.

INFO5990
Professional Practice in IT

Engineering and Information Technologies

Credit points: 6 Session: Semester 1, Semester 2 Classes: Session 1: Weekly or Block mode or Online Session 2: Weekly or Block mode or Online

Assumed knowledge: Student’s enrolled in INFO5990 are assumed to have previously completed a Bachelor’s 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 session assessment (50%), Final Exam (50%) Campus: Camperdown/Darlington Mode of delivery: Block Mode or On-line or Normal (lecture/lab/tutorial) Day

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 of information technology as part of their involvement in professional practice. The students are presented with a wide range of core conceptual ideas, techniques and relevant professional issues associated with the fields of Interpersonal and Organisational Communication, Conflict Management, IT and Sustainability, IT and Globalisation, Negotiation Strategies, Professional Ethics and Social Implications, Data Quality, Auditing and Quality Assurance and key project management principles.

INFO6007
Project Management in IT

Engineering and Information Technologies

Credit points: 6 Session: Semester 1, Semester 2 Classes: One 2 hour lecture and one 1 hour tutorial per week. Prohibitions: PMGT5871 Assumed knowledge: Students enrolled in INFO6007 are assumed to have previously completed a Bachelor’s 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%) Campus: Camperdown/Darlington Mode of delivery: Normal (lecture/lab/tutorial) Day


This Unit of Study introduces the students to some of the concepts, standards and techniques associated with the current professional practice of information technology as part of their involvement in professional practice. The students are presented with a wide range of core conceptual ideas, techniques and relevant professional issues associated with the fields of Interpersonal and Organisational Communication, Conflict Management, IT and Sustainability, IT and Globalisation, Negotiation Strategies, Professional Ethics and Social Implications, Data Quality, Auditing and Quality Assurance and key project management principles.

Elective units
Select 12 credit points from:

COMP5348
Enterprise Scale Software Architecture

Engineering and Information Technologies

Credit points: 6 Session: Semester 1 Classes: (Lec 2hrs & Prac 1hr) per 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%) Campus: Camperdown/Darlington Mode of delivery: Normal (lecture/lab/tutorial) Day

Associated degrees: B C S T (Hons), B E, B I T (Hons), B Psych (Hons), B Sc (Hons), Grad Cert I T, M P E.

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 them 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 future 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.

INFO5001
System Analysis and Modelling

Engineering and Information Technologies

Credit points: 6 Session: Semester 2 Classes: 2 hours lecture and 2 hour lab per week. Prohibitions: INFO2110, ELEC3610, ELEC5743 Assumed knowledge: Experience with a data model as in COMP5212 or COMP5214 or COMP5028 or COMP5138 Assessment: Through semester assessment (40%), Final Exam (60%) Campus: Camperdown/Darlington Mode of delivery: Normal (lecture/lab/tutorial) Day

Associated degrees: B E, Grad Dip Comp, Grad Dip E (Prof Eng), M Inf Tech, M P E.

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.

INFO5991
Services Science Management and Eng

Engineering and Information Technologies

Credit points: 6 Session: Semester 1, Semester 2 Classes: Session 1: Weekly, Session 2: Weekly or Block mode Assumed knowledge: INFO5990 Students are expected to have a degree in computer science, engineering, information technology, information systems or business. Assessment: Through semester assessment (50%), Final Exam (50%) Campus: Camperdown/Darlington Mode of delivery: Normal (lecture/lab/tutorial) Day

Associated degrees: B C S T (Hons), B E, B I T (Hons), E M P A, Grad Cert I T, Grad Cert Inf Tech Man, Grad Dip P A, M P Admin, PG Coursework Exchange

The service sector plays a dominant and growing role in economic growth and employment in most parts of the world and information technology (IT) is a key enabler of this. Services Science, Management and Engineering (SSME) takes a multi-disciplinary approach to services as socio-technical systems. This unit of study offers IT professionals an understanding of the role of IT-centric services in a social, economic and business context as well as knowledge of the principles of their design, engineering and management in a service-oriented computing framework. Delivery of the unit is driven by a critical approach to the literature and live case studies presented by industry professionals. The unit’s learning outcomes are driven by stated industry needs.

INFO6010
Advanced Topics in IT Project Management

Engineering and Information Technologies

Credit points: 6 Session: Semester 2, Summer Late Classes: 2 hours lectures, 1 hour tutorial, 1 hour e-Learning per 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%) Campus: Camperdown/Darlington 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.

ISYS5070
Change Management in IT
Engineering and Information Technologies
Credit points: 6
Session: Winter Main Classes: 18hrs of Lectures per session; 18hrs of Tutorial session. Assumed knowledge: The unit is expected to be taken after the following related units INFO6007 Project Management in IT and COMP5206 Introduction to Information Systems. Assessment: Through semester assessment (70%), Final Exam (30%)
Campus: Camperdown/Darlington Mode of delivery: Block Mode
Associated degrees: Grad Cert D C C, Grad Cert Inf Tech Man, Grad Dip Comp, M I D M, M P E.

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.

PMGT6867
Quantitative Methods: Project Management
Engineering and Information Technologies
Credit points: 6
Session: Semester 1, Semester 2 Classes: Session 1: 3 hours per week (evening); Session 2: 3 hours per week (evening) & on-line
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%)
Campus: Camperdown/Darlington Mode of delivery: Normal (lecture/lab/tutorial) Evening
Associated degrees: B P M, Engineering PG Cross-Inst, Engineering PG Non-Degree, Engineering UG Cross-Inst, Engineering UG Non-Degree, Grad Cert I T, Grad Cert Inf Tech Man, Grad Cert P M, Grad Dip E, M P E.

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.

Check Project Management timetable for PMGT6867 delivery modes.

Software Engineering Major
Core unit
Candidates pursuing the Research path take INF05993 instead of INF05990.

INFO5990
Professional Practice in IT
Engineering and Information Technologies
Credit points: 6
Session: Semester 1, Semester 2 Classes: Semester 1: Weekly or Block mode or Online Session 2: Weekly or Block mode or Online Assumed knowledge: Student’s enrolled in INFO5990 are assumed to have previously completed a Bachelor’s 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 session assessment (50%), Final Exam (50%)
Campus: Camperdown/Darlington Mode of delivery: Block Mode or On-line or Normal (lecture/lab/tutorial) Day
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 of information technology as part of their involvement in professional practice. The students are presented with a wide range of core conceptual ideas, techniques and relevant professional issues associated with the fields of Interpersonal and Organisational Communication, Conflict Management, IT and Sustainability, IT and Globalisation, Negotiation Strategies, Professional Ethics and Social Implications, Data Quality, Auditing and Quality Assurance and key project management principles.

Elective units
Select 18 credit points from: Students may count either COMP5028 or COMP5214 or INFO5001 towards this major, but not more than one of these Foundational units. One unit of study from the Computer Science Major may also be included.

CISS6022
Cybersecurity
Arts and Social Sciences
Credit points: 6
Teacher/Coordinator: Dr Frank Smith Session: Semester 2 Classes: 1x2-hr seminar/week Assessment: 2hr exam (40%) and 3000wd analytical essay (40%) and 1000wd equivalent lab exercise (10%) and seminar participation (10%)
Campus: Camperdown/Darlington Mode of delivery: Normal (lecture/lab/tutorial) Day
Associated degrees: Grad Cert Int Sec, M I L, PG Coursework Exchange.

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.
COMP5028
Object-Oriented Design
Engineering and Information Technologies
Credit points: 6 Session: Semester 1 Classes: One 2 hour lecture and one 1 hour tutorial per week. Prohibitions: INFO3020 Assumed knowledge: Students enrolled in COMP5028 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%) Campus: Camperdown/Darlington Mode of delivery: Normal (lecture/lab/tutorial) Day
Associated degrees: B E, Grad Cert I T, Grad Cert Inf Tech Man, Grad Dip Comp, M I D M, M P E.
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.

COMP5214
Software Development in Java
Engineering and Information Technologies
Credit points: 6 Session: Semester 1, Semester 2 Classes: One 2 hour lecture and one 1 hour tutorial per week. Assessment: Through semester assessment (40%), Final Exam (60%) Campus: Camperdown/Darlington Mode of delivery: Normal (lecture/lab/tutorial) Day
Programming in a legible, maintainable, reusable way is essential to solve complex problems in the pervasive computing environments. This unit will equip students with foundation of programming concepts that are common to widely used programming languages. 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 applications, approaches and examples to support students from broad backgrounds such as science, engineering, and mathematics.

COMP5347
e-Commerce Technology
Engineering and Information Technologies
Credit points: 6 Session: Semester 1 Classes: One 2 hour lecture and one 1 hour tutorial per week. Assumed knowledge: COMP5028. The course assumes basic knowledge on OO design and UML diagrams. Assessment: Through semester assessment (40%), Final Exam (60%) Campus: Camperdown/Darlington Mode of delivery: Normal (lecture/lab/tutorial) Day
Associated degrees: B E, B I T (Hons), B Psych (Hons), B Sc (Hons), Grad Cert I T, PG Coursework Exchange.
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
Engineering and Information Technologies
Credit points: 6 Session: Semester 1 Classes: (Lec 2hrs & Prac 1hr) per 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%) Campus: Camperdown/Darlington Mode of delivery: Normal (lecture/lab/tutorial) Day
Associated degrees: B C S T (Hons), B E, B I T (Hons), B Psych (Hons), B Sc (Hons), Grad Cert I T, M P E.
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
Engineering and Information Technologies
Credit points: 6 Session: Semester 1 Classes: 2 hr Lectures per week; 2 hrs Laboratory per 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 Software Development in JAVA Assessment: Through semester assessment (100%) Campus: Camperdown/Darlington Mode of delivery: Normal (lecture/lab/tutorial) Day
Associated degrees: B E, Grad Cert D C C, Grad Cert Inf Tech Man, Grad Dip Comp, M I D M, M P E.
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
Engineering and Information Technologies
Credit points: 6 Session: Semester 2 Classes: 2hr Lectures per week; 2hr Laboratory per week. Assessment: Through semester assessment (80%), Final Exam (20%) Campus: Camperdown/Darlington Mode of delivery: Normal (lecture/lab/tutorial) Day
Associated degrees: B C S T (Hons), B E, B I T (Hons), Grad Cert E, Grad Cert I T, M P E.
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
Engineering and Information Technologies
Credit points: 6 Session: Semester 1 Classes: 2 hours of lectures, 1 hour of tutorial and 2 hours labs per week. Assumed knowledge: A programming language, basic maths. Assessment: Through semester assessment (50%). Final Exam (50%) Campus: Camperdown/Darlington Mode of delivery: Normal (lecture/lab/tutorial) Day
Associated degrees: B C S T (Hons), B E, B I T (Hons), Grad Cert E, Grad Cert I T, M P E, P G Coursework Exchange.

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.

ELEC5619
Object Oriented Application Frameworks
Engineering and Information Technologies
Credit points: 6 Session: Semester 2 Classes: 3 hours project work in class per week. Assumed knowledge: Java programming, and some web development experience are essential. Databases strongly recommended Assessment: Through semester assessment (100%) Campus: Camperdown/Darlington Mode of delivery: Normal (lecture/lab/tutorial) Day
Associated degrees: B E, Grad Cert I T, Grad Dip E, M P E, U G Study Abroad Program.

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 developmentJava frameworks will be used, including Spring, Hibernate, and others. Principles of design patterns will also be studied.

INFO5001
System Analysis and Modelling
Engineering and Information Technologies
Credit points: 6 Session: Semester 2 Classes: 2 hours lecture and 2 hour lab per week. Prohibitions: INFO2110, ELEC3610, ELEC3743 Assumed knowledge: Experience with a data model as in COMP5212 or COMP5214 or COMP5029 or COMP5138 Assessment: Through semester assessment (40%), Final Exam (60%) Campus: Camperdown/Darlington Mode of delivery: Normal (lecture/lab/tutorial) Day
Associated degrees: B E, Grad Dip Comp, Grad Dip E (Prof Eng), M Inf Tech, M P E.

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.

Telecommunications Engineering Major
Core unit
Candidates pursuing the Research path take INFO5993 instead of INFO5990.

INFO5990
Professional Practice in IT
Engineering and Information Technologies
Credit points: 6 Session: Semester 1, Semester 2 Classes: Session 1: Weekly or Block mode or Online Session 2: Weekly or Block mode or Online Assumed knowledge: Student’s enrolled in INFO5990 are assumed to have previously completed a Bachelor’s 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 session assessment (50%), Final Exam (50%) Campus: Camperdown/Darlington Mode of delivery: Block Mode or On-line or Normal (lecture/lab/tutorial) Day
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 of information technology as part of their involvement in professional practice. The students are presented with a wide range of core conceptual ideas, techniques and relevant professional issues associated with the fields of Interpersonal and Organisational Communication, Conflict Management, IT and Sustainability, IT and Globalisation, Negotiation Strategies, Professional Ethics and Social Implications, Data Quality, Auditing and Quality Assurance and key project management principles.

Elective units
Select 18 credit points from:

COMP5116
Design of Networks & Distributed Systems
Engineering and Information Technologies
Credit points: 6 Session: Semester 1, Semester 2 Classes: One 2 hour lecture and one 1 hour tutorial per week. Assessment: Through semester assessment (40%), Final Exam (60%) Campus: Camperdown/Darlington Mode of delivery: Normal (lecture/lab/tutorial) Day
Associated degrees: B E, Grad Cert E, Grad Cert I T, Grad Cert I nf Tech Man, Grad Dip Comp, M I D M, M P E.

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.

COMP5416
Advanced Network Technologies
Engineering and Information Technologies
Credit points: 6 Session: Semester 2 Classes: (Lec 2hrs & Prac 1hr) per week Assumed knowledge: COMP5116 OR ELEC3506 Assessment: Through semester assessment (40%), Final Exam (60%) Campus: Camperdown/Darlington Mode of delivery: Normal (lecture/lab/tutorial) Day
This 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

**Engineering and Information Technologies**

**Credit points:** 6

**Session:** Semester 1

**Classes:** 2 hours of lectures and a 1 hour tutorial per week.

**Assumed knowledge:** Basic knowledge on digital communications.

Fundamental mathematics including probability theory and linear algebra. 

**Assessment:** Through semester assessment (50%), Final Exam (50%)

**Campus:** Camperdown/Darlington

**Mode of delivery:** Normal (lecture/lab/tutorial) Day

**Associated degrees:** B E, Grad Cert E, Grad Cert I T, M P E, PG Coursework Exchange.

This unit deals with the principles of error control coding techniques and their applications in various communication and data storage systems. Its aim is to present the fundamentals of error control coding techniques and develop theoretical and practical skills in the design of error control encoders/decoders. Successful completion of this unit will facilitate progression to advanced study or to work in the fields of telecommunications and computer engineering. It is assumed that the students have some background in communications principles and probability theory.

The following topics are covered. Introduction to error control coding, linear algebra. Linear block codes, cyclic codes, BCH codes, Reed-Solomon codes, burst-error correcting codes, design of codes for block codes, applications of block codes in communications and digital recording. Convolutional codes, Viterbi algorithm, design of codes for convolutional codes, applications of convolutional codes in communications, soft decision decoding of block and convolutional codes, trellis coded modulation, block coded modulation, design of codes for trellis codes, applications of trellis codes in data transmission. Turbo codes and applications to space and mobile communications.

**ELEC5508**

Wireless Engineering

**Engineering and Information Technologies**

**Credit points:** 6

**Session:** Semester 2

**Classes:** 2 hours of lectures and a 1 hour tutorial per week.

**Assumed knowledge:** Basic knowledge in probability and statistics, analog and digital communications, error probability calculations and communication channels, and telecommunications network assessment.

**Assessment:** Through semester assessment (30%), Final Exam (70%)

**Campus:** Camperdown/Darlington

**Mode of delivery:** Normal (lecture/lab/tutorial) Day

**Associated degrees:** B C S T (Hons), B E, B I T (Hons), Grad Cert E, Grad Cert I T, M P E, PG Coursework Exchange.

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.


**ELEC5509**

Mobile Networks

**Engineering and Information Technologies**

**Credit points:** 6

**Session:** Semester 1

**Classes:** 2 hours of lecture and a 2 hours tutorial/project meeting per 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, ELEC5506 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%)

**Campus:** Camperdown/Darlington

**Mode of delivery:** Normal (lecture/lab/tutorial) Day

**Associated degrees:** B C S T (Hons), B E, B I T (Hons), Grad Cert E, Grad Cert I T, M P E, PG Coursework Exchange.

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

**Engineering and Information Technologies**

**Credit points:** 6

**Session:** Semester 2

**Classes:** 2 hours of lectures, 1 hour tutorial per week, 3 hour site visit during semester.

**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%)

**Campus:** Camperdown/Darlington

**Mode of delivery:** Normal (lecture/lab/tutorial) Day

**Associated degrees:** B E, Grad Cert E, Grad Cert I T, M P E, PG Coursework Exchange.

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 modern design, speech codec design; error control for digital satellite links.

**ELEC5511**

Optical Communication Systems

**Engineering and Information Technologies**

**Credit points:** 6

**Session:** Semester 1

**Classes:** 2 hours of lectures and 2 hours laboratory/tutorial per week.

**Assumed knowledge:** (ELEC3505 Communications) and (ELEC3405 Communications Electronics and Photonics) or equivalent

**Assessment:** Through semester assessment (25%), Final Exam (75%)

**Campus:** Camperdown/Darlington

**Mode of delivery:** Normal (lecture/lab/tutorial) Day

**Associated degrees:** B E, Grad Cert E, Grad Cert I T, M P E, PG Coursework Exchange.
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

Engineering and Information Technologies

Credit points: 6  
Session: Semester 2  
Classes: 2 hours of lectures and 1 hour laboratory/tutorial per week.  
Assumed knowledge: Knowledge of digital communications, wave propagation, and fundamental optics  
Assessment: Through semester assessment (25%), Final Exam (75%)  
Campus: Camperdown/Darlington  
Mode of delivery: Normal (lecture/lab/tutorial) Day

Associated degrees: B E, Grad Cert E, Grad Cert I T, M P E, PG Coursework Exchange.

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 MITM prepares you for transition into management, equipping 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 these 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 ACS 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

<table>
<thead>
<tr>
<th>Code</th>
<th>Course title</th>
</tr>
</thead>
<tbody>
<tr>
<td>HG026</td>
<td>Graduate Certificate in Information Technology Management</td>
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<tr>
<td>HF043</td>
<td>Graduate Diploma in Information Technology Management</td>
</tr>
<tr>
<td>HC050</td>
<td>Master of Information Technology Management</td>
</tr>
</tbody>
</table>

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 in a computing related area, with a minimum of three years professional experience in the IT industry; or
(b) a bachelor's degree in any discipline, with a minimum of five years professional experience in the IT industry.
(3) Admission to the Graduate Diploma in Information Technology Management requires:
(a) a bachelor's degree in a computing related area, with a minimum of three years professional experience in the IT industry; or
(b) a bachelor's degree in any discipline, with a minimum of five years professional experience in the IT industry; or
(c) completion of the requirements of the embedded graduate certificate with at least a credit average.
(4) Admission to the Master of Information Technology Management requires:
(a) a bachelor's degree in a computing related area with at least a credit average and a minimum of two years professional experience in the IT industry; or
(b) a bachelor's degree in any discipline with at least a credit average and with a minimum of five years professional experience in the IT industry; or
(c) completion of the requirements of the embedded graduate diploma with at least a credit average; or
(d) completion of the Graduate Diploma in Computing from the University of Sydney with no more than 12 credit points of unit of study failed; or
(e) completion of the Master of Information Technology from the University of Sydney.
(5) In exceptional circumstances the Dean may admit applicants without these qualifications who, in the opinion of the faculty, have qualifications and evidence of experience and achievement sufficient to successfully undertake the award.

6 Requirements for award

(1) The units of study that may be taken for the courses are set out in the table of units of study: Master of Information Technology Management.
(2) From the table of units of study and with the approval of the Dean or nominee, a maximum of 18 credit points may be selected from units outside the School of IT, of which no more than 12 credit points may be from outside the Faculty of Engineering and IT.
(3) To qualify for the award of the Graduate Certificate in Information Technology Management a candidate must complete 24 credit points of units of study as specified in the degree table.
(4) To qualify for the award of the Graduate Diploma in Information Technology Management a candidate must complete 36 credit points of units of study as specified in the degree table.
(5) To qualify for the award of the Master of Information Technology Management a candidate must complete 48 credit points of units of study as specified in the degree table.

7 Progression rules

(1) A candidate must complete 24 credit points of units of study with at least Credit average marks before taking any Information Technology Project units. Admission to project units of study is subject to availability of supervision and to the approval of the Dean or nominee.
With permission from the Dean or nominee, a candidate for the Master of Information Technology Management who completed 24 credit points of units of study with at least Distinction average marks may take Research Path units.

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.

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.

Credit for previous study
In addition to the general credit transfer rules of the Coursework Rule, the following restrictions on credit transfer into these courses apply:

(a) Where postgraduate study has been undertaken at the University of Sydney in one of the embedded courses of the Master of Information Technology and no award has been conferred, credit may be transferred in full, provided the study has been undertaken within the previous three years and subject to approval of the Academic Director.

(b) Where study has been undertaken at postgraduate level and no award has been conferred, credit to a maximum of 50% of the prescribed credit points may be transferred to the Graduate Diploma in Information Technology Management or the Master of Information Technology Management, if:
   (I) the study has been undertaken at the University of Sydney, or at an external institution recognized by the University of Sydney, within the previous three years; and
   (II) the units of study have been completed at credit level or above; and
   (III) the units are equivalent to core (additional or mandatory) units of study offered under the degree being taken, subject to approval of the Academic Director.

(c) Where study has been undertaken at postgraduate level and an award has been conferred, credit to a maximum of 12 credit points may be transferred to the Master of Information Technology Management, provided:
   (I) the study has been undertaken at an external institution recognized by the University of Sydney within the previous three years; and
   (II) the units of study have been completed at credit level or above; and
   (III) the units are equivalent to core (additional or mandatory) units of study offered under the degree being taken, subject to approval of the Academic Director.

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.

Satisfactory progress
Progression is subject to the Coursework Rule. A candidate who has failed to meet these progression rules will be transferred to either the Graduate Diploma or the Graduate Certificate in Information Technology Management, depending on the credit points successfully completed.

Time limit
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.

A candidate for the Graduate Diploma in Information Technology Management shall complete the requirements for the award in a minimum enrolment of two semesters and a maximum enrolment of six semesters.

A candidate for the Master of Information Technology Management shall complete the requirements for the award in a minimum of two semesters and a maximum of eight semesters.

Transitional provisions
These resolutions apply to students who commenced their candidature after 1 January, 2011 and students who commenced their candidature prior to 1 January, 2011 who elect to proceed under these resolutions.

Candidates who commenced prior to 1 January, 2011 may complete the requirements in accordance with the resolutions in force at the time of their commencement.
## Unit of study table

<table>
<thead>
<tr>
<th>Unit of study</th>
<th>Credit points</th>
<th>A: Assumed knowledge</th>
<th>P: Prerequisites</th>
<th>C: Corequisites</th>
<th>N: Prohibition</th>
<th>Session</th>
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<tbody>
<tr>
<td><strong>Master of Information Technology Management</strong></td>
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<tr>
<td>Core and Elective 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.</td>
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<tr>
<td>Candidates for the degree of Master of Information Technology Management are required to complete 48 credit points from the units of study as follows:</td>
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<tr>
<td>1. A total of 48 credit points must be completed;</td>
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<td>2. At least 30 credit points must be Core units of study;</td>
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<td>3. INF05990 Professional Practice in IT must be completed as a Core unit of study;</td>
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<tr>
<td>4. INF05991 Services Science Management and Eng must be completed as a Core unit of study;</td>
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<tr>
<td>5. INF05992 Understanding IT Innovations must be completed as a Core unit of study;</td>
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</tr>
<tr>
<td>6. A maximum of 18 credit points of Elective units of study can be taken, of which no more than 12 credit points can be from outside the Faculty of Engineering and IT.</td>
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<tr>
<td>7. After completing 24 credit points, candidates who achieve Credit average results or above may select 12 credit points of Information Technology Project units of study;</td>
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</tr>
<tr>
<td>8. 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. Candidates in the Research Path are not required to take INF05991 or INF05992.</td>
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</tr>
<tr>
<td>Candidates for the Graduate Diploma in Information Technology Management are required to complete 36 credit points from the units of study as follows:</td>
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</tr>
<tr>
<td>1. Candidates for the Graduate Diploma in Information Technology Management must complete 36 credit points from the listed units of study including INF05990 and INF05991.</td>
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</tr>
<tr>
<td>2. A maximum of 18 credit points of Elective units of study can be taken, of which no more than 12 credit points can be chosen from units offered outside the Faculty of Engineering and IT.</td>
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</tr>
<tr>
<td>Candidates for the Graduate Certificate in Information Technology Management are required to complete 24 credit points from the units of study as follows:</td>
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</tr>
<tr>
<td>1. Candidates for the Graduate Certificate in Information Technology Management must complete 24 credit points of the units listed including INF05990.</td>
<td></td>
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<tr>
<td>2. A maximum of 18 credit points of Elective units of study can be taken, of which no more than 12 credit points can be chosen from units offered outside the Faculty of Engineering and IT.</td>
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</tbody>
</table>

### Core units - Mandatory

<table>
<thead>
<tr>
<th>Unit of study</th>
<th>Credit points</th>
<th>A: Assumed knowledge</th>
<th>P: Prerequisites</th>
<th>C: Corequisites</th>
<th>N: Prohibition</th>
<th>Session</th>
</tr>
</thead>
<tbody>
<tr>
<td>INF05990</td>
<td>6</td>
<td>A Student’s enrolled in INF05990 are assumed to have previously completed a Bachelor’s 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.</td>
<td></td>
<td></td>
<td></td>
<td>Semester 1 Semester 2</td>
</tr>
<tr>
<td>Professional Practice in IT</td>
<td></td>
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<td></td>
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</tr>
<tr>
<td>INF05991</td>
<td>6</td>
<td>A INF05990 Students are expected to have a degree in computer science, engineering, information technology, information systems or business.</td>
<td></td>
<td></td>
<td></td>
<td>Semester 1 Semester 2</td>
</tr>
<tr>
<td>Services Science Management and Eng</td>
<td></td>
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</tr>
<tr>
<td>INF05992</td>
<td>6</td>
<td>A INF05990. 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</td>
<td></td>
<td></td>
<td></td>
<td>Semester 1 Semester 2</td>
</tr>
<tr>
<td>Understanding IT Innovations</td>
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</tr>
</tbody>
</table>

### Core units - Additional

Candidates are required to take a minimum of 12 credit points and may take a maximum of 36 credit points of Additional Core units.

<table>
<thead>
<tr>
<th>Unit of study</th>
<th>Credit points</th>
<th>A: Assumed knowledge</th>
<th>P: Prerequisites</th>
<th>C: Corequisites</th>
<th>N: Prohibition</th>
<th>Session</th>
</tr>
</thead>
<tbody>
<tr>
<td>COMP5206</td>
<td>6</td>
<td>A: Introduction to Information Systems</td>
<td></td>
<td></td>
<td></td>
<td>Semester 1 Semester 2</td>
</tr>
<tr>
<td>Introduction to Information Systems</td>
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<td></td>
</tr>
<tr>
<td>COMP5703</td>
<td>12</td>
<td>Note: Department permission required for enrolment</td>
<td></td>
<td></td>
<td></td>
<td>Semester 1 Semester 2</td>
</tr>
<tr>
<td>Information Technology Project</td>
<td></td>
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<tr>
<td>INF05060</td>
<td>6</td>
<td>A The unit is expected to be taken after introductory courses in related units such as COMP5206 Introduction to Information Systems.</td>
<td></td>
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<td></td>
<td>Summer Early Semester 2</td>
</tr>
<tr>
<td>Data Analytics and Business Intelligence</td>
<td></td>
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<td></td>
<td></td>
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</tr>
<tr>
<td>INF05301</td>
<td>6</td>
<td>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.</td>
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<td></td>
<td>Semester 1</td>
</tr>
<tr>
<td>Information Security Management</td>
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<tr>
<td>INF06057</td>
<td>6</td>
<td>A Students enrolled in INF06057 are assumed to have previously completed a Bachelor’s 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</td>
<td></td>
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<td></td>
<td>Semester 1</td>
</tr>
<tr>
<td>Project Management in IT</td>
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<tr>
<td>INFYS5050</td>
<td>6</td>
<td>A An undergraduate degree in Computer Science or Information Systems. Good grasp of database technologies and the role of information systems in organisations.</td>
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<td></td>
<td>Semester 1</td>
</tr>
<tr>
<td>Unit of study</td>
<td>Credit points</td>
<td>A: Assumed knowledge</td>
<td>P: Prerequisites</td>
<td>C: Corequisites</td>
<td>N: Prohibition</td>
<td>Session</td>
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</tr>
<tr>
<td>ISYS5070 Change Management in IT</td>
<td>6</td>
<td>A The unit is expected to be taken after the following related units INFO6007 Project Management in IT and COMP5206 Introduction to Information Systems.</td>
<td></td>
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<td>Winter Main</td>
</tr>
<tr>
<td><strong>Research path</strong></td>
<td></td>
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</tr>
<tr>
<td>COMP5702 IT Research Project A</td>
<td>12</td>
<td>A Students should concurrently or previously learn about Research Methods in IT, from INFO5593. Note: Department permission required for enrolment</td>
<td></td>
<td></td>
<td></td>
<td>Semester 1</td>
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<tr>
<td></td>
<td></td>
<td></td>
<td>Department permission required for enrolment, COMP5702 and COMP5704 together form the Research thesis for MIT/MITM Research track. It is allowed to enrol in one of these units in one semester, and the other the following semester; the same mark and grade is given for both once they have both been completed.</td>
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</tr>
<tr>
<td>COMP5704 IT Research Project B</td>
<td>6</td>
<td>A Students should concurrently or previously learn about Research Methods in IT, from INFO5593. Note: Department permission required for enrolment</td>
<td></td>
<td></td>
<td></td>
<td>Semester 1</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Department permission required for enrolment, COMP5702 and COMP5704 together form the Research thesis for MIT/MITM Research track. It is allowed to enrol in one of these units in one semester, and the other the following semester; the same mark and grade is given for both once they have both been completed.</td>
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<tr>
<td>INFO5993 IT Research Methods</td>
<td>6</td>
<td>N INFO4990</td>
<td></td>
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<td>Semester 1</td>
</tr>
<tr>
<td><strong>Elective units</strong></td>
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<tr>
<td>COMP5028 Object-Oriented Design</td>
<td>6</td>
<td>A Students enrolled in COMP5028 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.</td>
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<td>Semester 1</td>
</tr>
<tr>
<td>COMP5114 Digital Media Fundamentals</td>
<td>6</td>
<td></td>
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<td>Semester 1</td>
</tr>
<tr>
<td>COMP5116 Design of Networks &amp; Distributed Systems</td>
<td>6</td>
<td></td>
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<td></td>
<td></td>
<td>Semester 1</td>
</tr>
<tr>
<td>COMP5138 Relational Database Management Systems</td>
<td>6</td>
<td>A Some exposure to programming and some familiarity with data model concepts</td>
<td></td>
<td></td>
<td></td>
<td>Semester 1</td>
</tr>
<tr>
<td>COMP5213 Computer and Network Organisation</td>
<td>6</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Semester 1</td>
</tr>
<tr>
<td>COMP5705 Information Technology Short Project</td>
<td>6</td>
<td>N COMP5702, COMP5703, COMP5704</td>
<td>Department permission required for enrolment</td>
<td></td>
<td></td>
<td>Semester 1</td>
</tr>
<tr>
<td>COMP5706 IT Industry Placement Project</td>
<td>6</td>
<td>N COMP5702, COMP5703, COMP5704</td>
<td>Department permission required for enrolment</td>
<td></td>
<td></td>
<td>Semester 1</td>
</tr>
<tr>
<td>IDEA9106 Design Thinking</td>
<td>6</td>
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<td>Semester 1</td>
</tr>
<tr>
<td>INFO5003 IT for Health Professionals</td>
<td>6</td>
<td>A The unit is expected to be taken after introductory courses in related units such as COMP5206 - Introduction to IS (or COMP5138 Relational DBMS).</td>
<td></td>
<td></td>
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<td>Summer Late</td>
</tr>
<tr>
<td>INFO5506 Enterprise Healthcare Info Systems</td>
<td>6</td>
<td>A Students are assumed to understand the role of IT projects, and the basics of Information Systems.</td>
<td>INFO6007. OR 3-5 years working experience in IT Project Management</td>
<td>INFO5506 - Introduction to Information Systems</td>
<td></td>
<td>Semester 2</td>
</tr>
<tr>
<td>INFO6010 Advanced Topics in IT Project Management</td>
<td>6</td>
<td>A Students are assumed to understand the role of IT projects, and the basics of Information Systems.</td>
<td>INFO6007. OR 3-5 years working experience in IT Project Management</td>
<td>INFO5506 - Introduction to Information Systems</td>
<td></td>
<td>Summer Late</td>
</tr>
<tr>
<td>INFO6012 Information Technology Strategy &amp; Value</td>
<td>6</td>
<td>A COMP5206 Introduction to Information Systems</td>
<td>Special permission by the School of IT</td>
<td>Department permission required for enrolment</td>
<td></td>
<td>Semester 2</td>
</tr>
<tr>
<td>INFO6012 Enterprise Systems Management</td>
<td>6</td>
<td>This is a defined elective unit of study in both the Master of Professional Accounting and the Master of Commerce programs.</td>
<td></td>
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<td>Semester 1</td>
</tr>
<tr>
<td>INF56013 Information Risk, Governance &amp; Assurance</td>
<td>6</td>
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<td>Semester 2</td>
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<tr>
<td>INF56016 Technology Enabled Business Innovation</td>
<td>6</td>
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<td>Semester 2</td>
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<tr>
<td>INF56017 Strategic Information &amp; Knowledge Mgmt</td>
<td>6</td>
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<td>Semester 2</td>
</tr>
<tr>
<td>INF56018 Managing Business Intelligence</td>
<td>6</td>
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<td>Semester 1</td>
</tr>
<tr>
<td>PMGT6876 Strategic Delivery of Change</td>
<td>6</td>
<td>N WORK6026</td>
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<td></td>
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<td>Semester 1</td>
</tr>
</tbody>
</table>
For more information on degree program requirements visit CUSP.

<table>
<thead>
<tr>
<th>Unit of study</th>
<th>Credit points</th>
<th>A: Assumed knowledge</th>
<th>P: Prerequisites</th>
<th>C: Corequisites</th>
<th>N: Prohibition</th>
<th>Session</th>
</tr>
</thead>
<tbody>
<tr>
<td>Engineering Graduate Exchange A</td>
<td>6</td>
<td>P Permission from faculty and school.</td>
<td>Note: Department permission required for enrolment</td>
<td></td>
<td></td>
<td>Int January</td>
</tr>
<tr>
<td>Engineering Graduate Exchange B</td>
<td>6</td>
<td>P Permission from faculty and school.</td>
<td>Note: Department permission required for enrolment</td>
<td></td>
<td></td>
<td>Int January</td>
</tr>
</tbody>
</table>

Int January
Int July
Unit of study descriptions

Master of Information Technology Management

Core and Elective 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 48 credit points from the units of study as follows:1. A total of 48 credit points must be completed.2. At least 30 credit points must be Core units of study.3. INFO5990 Professional Practice in IT must be completed as a Core unit of study.4. INFO5991 Services Science Management and Eng must be completed as a Core unit of study.5. INFO5992 Understanding IT Innovations must be completed as a Core unit of study.6. A maximum of 18 credit points of Elective units of study can be taken, of which no more than 12 credit points can be from outside the Faculty of Engineering and IT.7. After completing 24 credit points, candidates who achieve Credit average results or above may select 12 credit points of Information Technology Project units of study.8. 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. Candidates in the Research Path are not required to take INFO5991 or INFO5992. Candidates for the Graduate Diploma in Information Technology Management are required to complete 36 credit points from the units of study as follows:1. Candidates for the Graduate Diploma in Information Technology Management must complete 36 credit points from the listed units of study including INFO5990 and INFO5991.2. A maximum of 18 credit points of Elective units of study can be taken, of which no more than 12 credit points can be chosen from units offered outside the Faculty of Engineering and IT. Candidates for the Graduate Certificate in Information Technology Management are required to complete 24 credit points from the units of study as follows:1. Candidates for the Graduate Certificate in Information Technology Management must complete 24 credit points of the units listed including INFO5990 and INFO5991.2. A maximum of 18 credit points of Elective units of study can be taken, of which no more than 12 credit points can be chosen from units offered outside the Faculty of Engineering and IT.

Core units - Mandatory

INFO5990 Professional Practice in IT

Engineering and Information Technologies

Credit points: 6 Session: Semester 1, Semester 2 Classes: Session 1: Weekly or Block mode Assumed knowledge: INFO5990 Professional Practice in IT must be completed as a Core unit of study.4. INFO5991 Services Science Management and Eng must be completed as a Core unit of study.5. INFO5992 Understanding IT Innovations must be completed as a Core unit of study.6. A maximum of 18 credit points of Elective units of study can be taken, of which no more than 12 credit points can be from outside the Faculty of Engineering and IT.7. After completing 24 credit points, candidates who achieve Credit average results or above may select 12 credit points of Information Technology Project units of study.8. 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. Candidates in the Research Path are not required to take INFO5991 or INFO5992. Candidates for the Graduate Diploma in Information Technology Management are required to complete 36 credit points from the units of study as follows:1. Candidates for the Graduate Diploma in Information Technology Management must complete 36 credit points from the listed units of study including INFO5990 and INFO5991.2. A maximum of 18 credit points of Elective units of study can be taken, of which no more than 12 credit points can be chosen from units offered outside the Faculty of Engineering and IT. Candidates for the Graduate Certificate in Information Technology Management are required to complete 24 credit points from the units of study as follows:1. Candidates for the Graduate Certificate in Information Technology Management must complete 24 credit points of the units listed including INFO5990 and INFO5991.2. A maximum of 18 credit points of Elective units of study can be taken, of which no more than 12 credit points can be chosen from units offered outside the Faculty of Engineering and IT.

INFO5992 Understanding IT Innovations

Engineering and Information Technologies

Credit points: 6 Session: Semester 1, Semester 2 Classes: Session 1: Weekly or Block mode Assumed knowledge: INFO5990 Professional Practice in IT must be completed as a Core unit of study.4. INFO5991 Services Science Management and Eng must be completed as a Core unit of study.5. INFO5992 Understanding IT Innovations must be completed as a Core unit of study.6. A maximum of 18 credit points of Elective units of study can be taken, of which no more than 12 credit points can be from outside the Faculty of Engineering and IT.7. After completing 24 credit points, candidates who achieve Credit average results or above may select 12 credit points of Information Technology Project units of study.8. 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. Candidates in the Research Path are not required to take INFO5991 or INFO5992. Candidates for the Graduate Diploma in Information Technology Management are required to complete 36 credit points from the units of study as follows:1. Candidates for the Graduate Diploma in Information Technology Management must complete 36 credit points from the listed units of study including INFO5990 and INFO5991.2. A maximum of 18 credit points of Elective units of study can be taken, of which no more than 12 credit points can be chosen from units offered outside the Faculty of Engineering and IT. Candidates for the Graduate Certificate in Information Technology Management are required to complete 24 credit points from the units of study as follows:1. Candidates for the Graduate Certificate in Information Technology Management must complete 24 credit points of the units listed including INFO5990 and INFO5991.2. A maximum of 18 credit points of Elective units of study can be taken, of which no more than 12 credit points can be chosen from units offered outside the Faculty of Engineering and IT.

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Core units - Additional

Candidates are required to take a minimum of 12 credit points and may take a maximum of 36 credit points of Additional Core units.

**COMP5206**

**Introduction to Information Systems**

**Engineering and Information Technologies**

- **Credit points:** 6
- **Session:** Semester 1, Semester 2
- **Classes:** One 2 hour lecture and one 1 hour tutorial per week.
- **Assessment:** Through semester assessment (50%), Final Exam (50%)
- **Campus:** Camperdown/Darlington
- **Mode of delivery:** Normal (lecture/lab/tutorial) Day

**Associated degrees:** B E, Grad Cert D C C, Grad Cert E, Grad Cert I T, Grad Cert Inf Tech Man, Grad Dip Comp, M Appl Sc (Bioinformatics), M I D M, M P E.

This unit will provide a comprehensive introduction to the field of information systems from an organisational perspective. The critical role of information and knowledge management will be emphasised from both conceptual and practical standpoints. Methods and techniques for analysing systems and eliciting user requirements will be discussed. Key topics covered will include:

* Basic Information Systems Concepts
* Systems approach and systems thinking
* E-Business and E-Commerce
* Data and Knowledge Management
* Systems Analysis and Development Methodologies
* Ethical, Legal and Social Aspects of Information technologies
* Web 2.0 and Social Computing

**Objectives:** Students who successfully complete this unit will be able to:

1. Develop a good understanding of important information concepts.
2. Deep understanding of the systems approach and its applicability.
3. Develop skills to perform systems analysis in contemporary systems environments
4. Understanding of major conceptual and technological developments in Information Systems

**COMP5703**

**Information Technology Project**

**Engineering and Information Technologies**

- **Credit points:** 12
- **Session:** Semester 1, Semester 2
- **Classes:** Eight hours of practical work per week.
- **Assessment:** Through semester assessment (100%)
- **Campus:** Camperdown/Darlington
- **Mode of delivery:** Supervision
- **Note:** Department permission required for enrolment.

**Associated degrees:** M Inf Tech, M Inf Tech Man.

**Specialist/Elective/Project**

**INFO5060**

**Data Analytics and Business Intelligence**

**Engineering and Information Technologies**

- **Credit points:** 6
- **Session:** Summer Early
- **Classes:** 12 hrs Lectures per session; 6hrs Tutorial per session; 18hrs Laboratory per session
- **Assumed knowledge:** The unit is expected to be taken after introductory courses in related units such as COMP5206 Introduction to Information Systems.
- **Assessment:** Through session assessment (85%), Final Exam (15%)
- **Campus:** Camperdown/Darlington
- **Mode of delivery:** Block Mode

**Associated degrees:** Grad Cert D C C, Grad Cert Inf Tech Man, Grad Dip Comp, M I D M, M P E.

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**

**Engineering and Information Technologies**

- **Credit points:** 6
- **Session:** Semester 1 Classes: 2 hrs of lecture, 1 hr of lab/tut per 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%)
- **Campus:** Camperdown/Darlington
- **Mode of delivery:** Normal (lecture/lab/tutorial) Day

**Associated degrees:** B E, M Inf Tech, M Inf Tech Man, M P E.

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.

**INFO6007**

**Project Management in IT**

**Engineering and Information Technologies**

- **Credit points:** 6
- **Session:** Semester 1, Semester 2
- **Classes:** One 2 hour lecture and one 1 hour tutorial per week.
- **Prohibitions:** PMGT5871
- **Assumed knowledge:** Students enrolled in INFO6007 are assumed to have previously completed a Bachelor’s 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%)
- **Campus:** Camperdown/Darlington
- **Mode of delivery:** Normal (lecture/lab/tutorial) Day

**Associated degrees:** B E, M P A, Grad Cert I T, Grad Cert Inf Tech Man, Grad Dip P A, M P Admin, M P E.

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.

**ISYS5050**

**Knowledge Management Systems**

**Engineering and Information Technologies**

- **Credit points:** 6
- **Session:** Semester 1
- **Classes:** One 2 hour scheduled small-group class per 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 (70%), Final Exam (30%)
- **Campus:** Camperdown/Darlington
- **Mode of delivery:** Normal (lecture/lab/tutorial) Day

**Associated degrees:** B C S T (Hons), B E, B I T (Hons), B Sc (Hons), Grad Cert Inf Tech Man.

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.

**ISYS5070**

**Change Management in IT**

**Engineering and Information Technologies**

- **Credit points:** 6
- **Session:** Winter Main Classes: 18hrs of Lectures per session; 18hrs of Tutorials per session.
- **Assumed knowledge:** The unit is expected to be taken after the following related units INFO6007 Project Management in IT and COMP5206 Introduction to Information Systems.
- **Assessment:** Through
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.

Research path

Candidates who achieve Distinction (75%) average results or above over the first 24 credit points may select 18 credit points of IT project units of study.

**COMP5702**

**IT Research Project A**

**Engineering and Information Technologies**

*Credit points: 12 Session: Semester 1, Semester 2 Classes: Eight hours of practical work per week. Assumed knowledge: Students should concurrently or previously learn about Research Methods in IT, from INFO5993. Assessment: Through semester assessment (100%) Campus: Camperdown/Darlington Mode of delivery: Supervision*

Note: Department permission required for enrolment. Note: COMP5702 and COMP5704 together form the Research thesis of MIT/MITM Research track. It is allowed to enrol in one of these units in one semester, and the other the following semester; the same mark and grade is given for both once they have both been completed.

**Associated degrees:** M Inf Tech, M Inf Tech Man.

**Specialist/Elective/Project**

**INFO5993**

**IT Research Methods**

**Engineering and Information Technologies**

*Credit points: 6 Session: Semester 1, Semester 2 Classes: One 2 hour lecture and one 1 hour tutorial per week. Prohibitions: INFO3220 Assumed knowledge: Students enrolled in COMP5028 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%) Campus: Camperdown/Darlington Mode of delivery: Normal (lecture/lab/tutorial) Day*

**Associated degrees:** B E, Grad Cert I T, Grad Cert Inf Tech Man, Grad Dip Comp, M I D M, M P E.

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.

**COMP5114**

**Digital Media Fundamentals**

**Engineering and Information Technologies**

*Credit points: 6 Session: Semester 1, Semester 2 Classes: Four hours of practical work per week. Assumed knowledge: Students should concurrently or previously learn about Research Methods in IT, from INFO5993. Assessment: Through semester assessment (100%) Campus: Camperdown/Darlington Mode of delivery: Supervision*

**Note:** Department permission required for enrolment. Note: COMP5702 and COMP5704 together form the Research thesis for MIT/MITM Research track. It is allowed to enrol in one of these units in one semester, and the other the following semester; the same mark and grade is given for both once they have both been completed.

**Associated degrees:** M Inf Tech, M Inf Tech Man.

**Specialist/Elective/Project**
COMP5116
Design of Networks & Distributed Systems
Engineering and Information Technologies
Credit points: 6 Session: Semester 1, Semester 2 Classes: One 2 hour lecture and one 1 hour tutorial per week. Assessment: Through semester assessment (40%), Final Exam (60%) Campus: Camperdown/Darlington Mode of delivery: Normal (lecture/lab/tutorial) Day
Associated degrees: B.E, Grad Cert E, Grad Cert IT, Grad Cert Inf Tech Man, Grad Dip Comp, M.I.D M, M.P E.
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.

COMP5138
Relational Database Management Systems
Engineering and Information Technologies
Credit points: 6 Session: Semester 1, Semester 2 Classes: One 2 hour lecture and one 2 hour tutorial per week. Assumed knowledge: Some exposure to programming and some familiarity with data model concepts. Assessment: Through semester assessment (50%), Final Exam (50%) Campus: Camperdown/Darlington Mode of delivery: Normal (lecture/lab/tutorial) Day
Associated degrees: B.E, Grad Cert I T, Grad Cert Inf Tech Man, M.H.I, M.P E.
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.

COMP5213
Computer and Network Organisation
Engineering and Information Technologies
Credit points: 6 Session: Semester 1 Classes: One 2 hour lecture and one 1 hour tutorial per week. Assessment: Through semester assessment (40%), Final Exam (60%) Campus: Camperdown/Darlington Mode of delivery: Normal (lecture/lab/tutorial) Day

This unit of study provides an overview of hardware and system software infrastructure including: compilers, operating systems, device drivers, network protocols, etc. It also includes user-level Unix skills and network usability. The objectives are to ensure that on completion of this unit students will have developed an understanding of compilers, operating systems, device drivers, network protocols, Unix skills and network usability.

COMP5705
Information Technology Short Project
Engineering and Information Technologies
Credit points: 6 Session: Semester 1, Semester 2 Classes: Four hours of practical work per week. Prohibitions: COMP5702, COMP5703, COMP5704 Assessment: Through semester assessment (100%) Campus: Camperdown/Darlington Mode of delivery: Supervision Note: Department permission required for enrolment.
Associated degrees: M.Inf Tech, M.Inf Tech Man.
This is a short 6cp IT project unit of study that can be taken either stand-alone as a short IT project during winter or summer schools, or as an internship-project as part of an industry-based scholarship such as the Faculty Postgraduate Industry Project Placement Scheme (PIPSP). 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
Engineering and Information Technologies
Credit points: 6 Session: Semester 1, Semester 2 Classes: Weekly meetings, and about 8 hours of independent study and project work per week. Prohibitions: COMP5702, COMP5703, COMP5704 Assessment: Through semester assessment (100%) Campus: Camperdown/Darlington Mode of delivery: Supervision Note: Department permission required for enrolment.
Associated degrees: M.Inf Tech, M.Inf Tech Man.

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.

IDEA9106
Design Thinking
Architecture, Design and Planning
Credit points: 6 Teacher/Coordinator: Dr Lian Loke Session: Semester 1 Classes: Seminar 3 hrs/wk. Assessment: Design exercises, research report, oral/visual presentations (90%), Participation in class activities (10%) Campus: Camperdown/Darlington Mode of delivery: Normal (lecture/lab/tutorial) Day
Associated degrees: Grad Cert Des Sc (Sustainable Des), PG Coursework Exchange.

This unit of study aims to introduce students to design thinking and how it can be productively applied to different design situations, in both traditional design contexts and to the broader issues faced in contemporary society. Students will acquire the following learning outcomes:
1. An appreciation of the role of design thinking and strategy in traditional and cross-disciplinary contexts
2. Theoretical and practical understanding and application of design theories, methodologies and methods, with a particular emphasis on human-centred design
3. Demonstration of ideation and concept development to innovate solutions to complex problems
4. Awareness of design processes and cognition in collaborative, inter-disciplinary teams
5. Demonstration of persuasive oral/visual communication techniques

INFO5003
IT for Health Professionals
Engineering and Information Technologies
Credit points: 6 Session: Summer Late Classes: 18hrs Lecture over 2 weeks; 18hours Tutorials over 2 weeks. Assessment: Through session assessment (50%), Final Exam (50%) Campus: Camperdown/Darlington Mode of delivery: Block Mode
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.

**INFO5306**

Enterprise Healthcare Info Systems

**Engineering and Information Technologies**

Credit points: 6  Session: Semester 2  Classes: 2hrs Lectures per week; 1 hr Tutorial/Laboratory per 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%)  Campus: Camperdown/Darlington  Mode of delivery: Normal (lecture/lab/tutorial) Day  

Associated degrees: B.E, M Inf Tech, M Inf Tech Man, M P E.

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

**Engineering and Information Technologies**

Credit points: 6  Session: Semester 2, Summer Late  Classes: 2 hours lectures, 1 hour tutorial, 1 hour e-Learning per 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%)  Campus: Camperdown/Darlington  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

**Engineering and Information Technologies**

Credit points: 6  Session: Semester 1, Semester 2  Classes: 3hr Lecture/tutorial/seminar session per week  Prerequisites: Special permission by the School of IT  Assumed knowledge: COMP5206 Introduction to Information Systems  Assessment: Through semester assessment (50%), Final Exam (50%)  Campus: Camperdown/Darlington  Mode of delivery: Normal (lecture/lab/tutorial) Day  

Note: Department permission required for enrolment.

Associated degrees: B C S T (Hons), B E, Grad Dip Inf Tech Man.

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 sourcing 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.

**INF56012**

Enterprise Systems Management

**Business (Business School)**

Credit points: 6  Session: Semester 1  Classes: 1x 3hr seminar per week  Assessment: midterm test (35%), individual enterprise system portfolio (35%), and group report (30%)  Campus: Camperdown/Darlington  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.

In this unit you will explore the strategic managerial issues that arise from the implementation and use of Enterprise Systems as a means of integrating data and standardising processes. You will use a combination of practical sessions with an Enterprise System, such as SAP and ... the long-term effects of strategic implementation decisions, and issues with regard to Enterprise System implementation projects. You will also explore the emergence and implications of cloud-based Enterprise Systems, and the part that Enterprise Systems play in an organisation's broader information infrastructure.

INF56013
Information Risk, Governance & Assurance
Business (Business School)

This unit of study is not available in 2014
Credit points: 6
Session: Semester 2
Classes: 3 x 1hr seminars per week
Assessment: Group Assignment (20%), Individual Research Project (40%) and Open book exam (40%)
Campus: Camperdown/Darlington
Mode of delivery: Normal (lecture/lab/tutorial) Day


This unit explores the changing relationship between information risk, governance and assurance. Information and IT enabled information systems are valuable assets to organisations and are of critical importance in meeting regulatory obligations. Therefore the risk of disruption, theft or destruction to information systems has business value and compliance implications. This unit takes an interdisciplinary view in examining standards, frameworks and methodologies for identifying, analysing and evaluating potential information risk areas, protection strategies and assurance processes across the organisation and throughout the information system lifecycle. Your knowledge will be expanded in a multi-level approach that also examines the design and implementation of information policy, legal, professional and ethical responsibilities, and corporate governance of information and communication technologies. The theoretical and conceptual material covered in seminars is reinforced through problem-based learning.

INF56016
Technology Enabled Business Innovation
Business (Business School)

Credit points: 6
Session: Semester 2
Classes: 1 x 3hr seminar per week
Assessment: Individual research assignment (15%), individual problem-based assignment (35%), and group problem-based assignment (50%)
Campus: Camperdown/Darlington
Mode of delivery: Normal (lecture/lab/tutorial) Day


This unit will assist you to develop knowledge and skills in innovative, technology-enabled business models and strategies from a management perspective. It will enable you to better understand and apply the concepts, strategies, tools and technologies necessary for undertaking business innovation. From basic knowledge of business models and essential business processes, this unit will increase your awareness and understanding of stakeholders, their capabilities and their limitations in the strategic convergence of technology and business. It will increase your insights into the technology and infrastructure required to support commerce in the 21st Century and will support development of your capabilities to analyse, develop and evaluate innovative technology-enabled business strategies and models.

INF56017
Strategic Information & Knowledge Mgmt
Business (Business School)

This unit of study is not available in 2014
Credit points: 6
Session: Semester 2
Classes: 1 x 3hr seminar per week
Assessment: Class activities (10%); Individual research project (30%); Group Assignment (30%); Final Exam (30%)
Campus: Camperdown/Darlington
Mode of delivery: Normal (lecture/lab/tutorial) Day


In today's digital information society it is essential that organisations have effective strategies for generating, managing and obtaining value from their information and knowledge assets. It requires an understanding of the national policy, legal, technological and business imperatives that shape information design. INF56017 adopts a design thinking approach that focuses on innovation and sustainability in the design and management of information products and services. We use industry case studies to develop in-depth knowledge of information management theory and hands-on design workshops to develop your knowledge and skills in the use of key design methods and tools (e.g. user-centred service design, information audit, information needs analysis and modelling, enterprise content management).

INF56018
Managing Business Intelligence
Business (Business School)

Credit points: 6
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%)
Campus: Camperdown/Darlington
Mode of delivery: Normal (lecture/lab/tutorial) Day

Associated degrees: Grad Cert Inf Tech Man, Grad Dip Com, Grad Dip Inf Tech Man, M Com, M Inf Tech Man, PG Coursework Exchange.

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. Participation in the unit will give you access 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 you 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.

PMGT5876
Strategic Delivery of Change
Engineering and Information Technologies

Credit points: 6
Session: Semester 1
Classes: Session 1: Block Mode; Session 2: Online Prohibitions: WOR6026
Assessment: Through semester assessment (100%)
Campus: Camperdown/Darlington
Mode of delivery: On-line

Associated degrees: B P M, Grad Cert I T, Grad Cert Inf Tech Man, Grad Cert P L, Grad Cert P M, Grad Dip E, Grad Dip I T, M P E.

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.
PMGT6867
Quantitative Methods: Project Management
Engineering and Information Technologies
Credit points: 6 Session: Semester 1, Semester 2 Classes: Session 1: 3 hours per week (evening); Session 2: 3 hours per week (evening) & on-line
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%) Campus: Camperdown/Darlington Mode of delivery: Normal (lecture/lab/tutorial) Evening
Associated degrees: B P M, Engineering PG Cross-Inst, Engineering PG Non-Degree, Engineering UG Cross-Inst, Engineering UG Non-Degree, Grad Cert I T, Grad Cert Inf Tech Man, Grad Cert P M, Grad Dip E, M P E.
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.

ENGG5231
Engineering Graduate Exchange A
Engineering and Information Technologies
Note: Department permission required for enrolment.
Associated degrees: M E, M Inf Tech, M Inf Tech Man, M P E, M P L, M P M.
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
Engineering and Information Technologies
Note: Department permission required for enrolment.
Associated degrees: M E, M Inf Tech, M Inf Tech Man, M P E, M P L, M P M.
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.
Graduate Diploma in Computing

Course overview
The Graduate Diploma in Computing will provide you with a strong foundation in information technologies.

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 this 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

<table>
<thead>
<tr>
<th>Code</th>
<th>Course title</th>
</tr>
</thead>
<tbody>
<tr>
<td>HF041</td>
<td>Graduate Diploma in Computing</td>
</tr>
</tbody>
</table>

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 candidacy requires:

(a) a bachelor's degree from the University of Sydney, or equivalent qualification, with a credit average or above, including units of study with a mathematical foundation demonstrating significant numeracy skills; or

(b) a bachelor's degree from the University of Sydney, or equivalent qualification, with a credit average or above, and employment in the area of IT for a minimum of five years. Applicants must also provide evidence of prior learning which is considered to demonstrate the knowledge and aptitude required to undertake this course.

4 Requirements for award

(1) The units of study that may be taken for the course are set out in Table of units: Graduate Diploma in Computing.

(2) To qualify for the award of the Graduate Diploma in Computing, a candidate must complete 48 credit points.

5 Suspension of candidature

A student may suspend candidature in this course for a maximum of one year.

6 Cross-institutional study

Cross-institutional study is not available in this course except where the University of Sydney has a formal cooperation agreement with another university.

7 Credit for previous study

The credit transfer provisions of the Coursework Rule apply except that where the study has been undertaken at postgraduate level and no award has been conferred, credit to a maximum of 50% of the prescribed credit points may be transferred, provided:

(a) the study has been undertaken at the University of Sydney, or at an external institution recognised by the University of Sydney, within the previous three years; and

(b) the units are equivalent to units of study offered under the degree being taken, subject to approval of the Academic Director.

8 Satisfactory progress

The Dean may require any student who has failed a cumulative total of 18 credit points or more at any stage of enrolment in the Graduate Diploma in Computing to show good cause why he or she should be allowed to re-enrol.

9 Time limit

A candidate for the Graduate Diploma in Computing shall complete the requirements for the award in a minimum enrolment of two semesters and a maximum enrolment of eight semesters.

10 Transitional provisions

(1) These resolutions apply to students who commenced their candidature after 1 January, 2011 and students who commenced their candidature prior to 1 January, 2011 who elect to proceed under these resolutions.

(2) Candidates who commenced prior to 1 January, 2011 may complete the requirements in accordance with the resolutions in force at the time of their commencement, provided that requirements are completed by 1 January, 2016. The Faculty may specify a later date for completion or specify alternative requirements for completion of candidatures that extend beyond this time.
Graduate Diploma in Computing
## Unit of study table

### Graduate Diploma in Computing

Candidates for the Graduate Diploma in Computing are required to complete 48 credit points of the units of study from the table below. Please note the following pre-requisites:

COMP5028 Object Oriented Design - 18 credit points
COMP5116 Internet Protocols - 18 credit points

<table>
<thead>
<tr>
<th>Unit of study</th>
<th>Credit points</th>
<th>A: Assumed knowledge</th>
<th>P: Prerequisites</th>
<th>C: Corequisites</th>
<th>N: Prohibition</th>
<th>Session</th>
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<tbody>
<tr>
<td>COMP5028 Object-Oriented Design</td>
<td>6</td>
<td>A Students enrolled in COMP5028 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.</td>
<td></td>
<td></td>
<td></td>
<td>Semester 1</td>
</tr>
<tr>
<td>COMP5114 Digital Media Fundamentals</td>
<td>6</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Semester 1</td>
</tr>
<tr>
<td>COMP5116 Design of Networks &amp; Distributed Systems</td>
<td>6</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Semester 1</td>
</tr>
<tr>
<td>COMP5138 Relational Database Management Systems</td>
<td>6</td>
<td>A Some exposure to programming and some familiarity with data model concepts</td>
<td></td>
<td></td>
<td></td>
<td>Semester 1</td>
</tr>
<tr>
<td>COMP5206 Introduction to Information Systems</td>
<td>6</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Semester 1</td>
</tr>
<tr>
<td>COMP5211 Algorithms</td>
<td>6</td>
<td>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.</td>
<td></td>
<td></td>
<td></td>
<td>Semester 1</td>
</tr>
<tr>
<td>COMP5213 Computer and Network Organisation</td>
<td>6</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Semester 1</td>
</tr>
<tr>
<td>COMP5214 Software Development in Java</td>
<td>6</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Semester 1</td>
</tr>
<tr>
<td>INFO5001 System Analysis and Modelling</td>
<td>6</td>
<td>A Experience with a data model as in COMP5212 or COMP5214 or COMP5028 or COMP5138</td>
<td>INFO2110, ELEC3610, ELEC5743</td>
<td></td>
<td></td>
<td>Semester 2</td>
</tr>
</tbody>
</table>

For more information on degree program requirements visit CUSP.
Graduate Diploma in Computing

Candidates for the Graduate Diploma in Computing are required to complete 48 credit points of the units of study from the table below. Please note the following pre-requisites: COMP5028 Object Oriented Design - 18 credit points COMP5116 Internet Protocols - 18 credit points

COMP5028 Object-Oriented Design Engineering and Information Technologies
Credit points: 6 Session: Semester 1 Classes: One 2 hour lecture and one 1 hour tutorial per week. Prohibitions: INFO3220 Assumed knowledge: Students enrolled in COMP5028 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%) Campus: Camperdown/Darlington Mode of delivery: Normal (lecture/lab/tutorial) Day
Associated degrees: B E, Grad Cert I T, Grad Cert Inf Tech Man, Grad Dip Comp, M I D M, M P E.

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.

COMP5114 Digital Media Fundamentals Engineering and Information Technologies
Credit points: 6 Session: Semester 1, Semester 2 Classes: One 2 hour lecture and one 1 hour tutorial per week. Assessment: Through semester assessment (50%), Final Exam (50%) Campus: Camperdown/Darlington 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.

COMP5116 Design of Networks & Distributed Systems Engineering and Information Technologies
Credit points: 6 Session: Semester 1, Semester 2 Classes: One 2 hour lecture and one 1 hour tutorial per week. Assessment: Through semester assessment (40%), Final Exam (60%) Campus: Camperdown/Darlington Mode of delivery: Normal (lecture/lab/tutorial) Day
Associated degrees: B E, Grad Cert I T, Grad Cert Inf Tech Man, Grad Dip Comp, M I D M, M P E.

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.

COMP5138 Relational Database Management Systems Engineering and Information Technologies
Credit points: 6 Session: Semester 1, Semester 2 Classes: One 2 hour lecture and one 2 hour tutorial per week. Assumed knowledge: Some exposure to programming and some familiarity with data model concepts. Assessment: Through semester assessment (50%), Final Exam (50%) Campus: Camperdown/Darlington Mode of delivery: Normal (lecture/lab/tutorial) Day
Associated degrees: B E, Grad Cert I T, Grad Cert Inf Tech Man, M H I, M P E.

This unit of study provides a conceptual and practical introduction to the use of common platforms that manage large relational databases. Students will understand the foundations of database management and enhance their theoretical and practical knowledge of the widespread relational database systems, as these are used for both operational (OLTP) and decision-support (OLAP) purposes. The unit covers the main aspects of SQL, the industry-standard database query language. Students will further develop the ability to create robust relational database designs by studying conceptual modelling, relational design and normalization theory. This unit also covers aspects of relational database management systems which are important for database administration. Topics covered include storage structures, indexing and its impact on query plans, transaction management and data warehousing.

Objectives: In this unit students will develop the ability to:
- Understand the foundations of database management;
- Strengthen their theoretical knowledge of database systems in general and relational data model and systems in particular;
- Create robust relational database designs;
- Understand the theory and applications of relational query processing and optimization;
- Study the critical issues in data and database administration;
- Explore the key emerging topics in database management.

COMP5206 Introduction to Information Systems Engineering and Information Technologies
Credit points: 6 Session: Semester 1, Semester 2 Classes: One 2 hour lecture and one 1 hour tutorial per week. Assessment: Through semester assessment (50%), Final Exam (50%) Campus: Camperdown/Darlington Mode of delivery: Normal (lecture/lab/tutorial) Day
Associated degrees: B E, Grad Cert D C C, Grad Cert E, Grad Cert I T, Grad Cert Inf Tech Man, Grad Dip Comp, M Appl Sc (Bioinformatics), M I D M, M P E.

This unit will provide a comprehensive introduction to the field of information systems from an organisational perspective. The critical role of information and knowledge management will be emphasised from both conceptual and practical standpoints. Methods and techniques for analysing systems and eliciting user requirements will be discussed. Key topics covered will include:
* Basic Information Systems Concepts
* Systems approach and systems thinking
* E-Business and E-Commerce
Java, one of the most popular programming languages, is important building blocks of programming to the object-oriented approach. This unit will equip students with foundation of programming concepts and 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.

INFO5001
System Analysis and Modelling
Engineering and Information Technologies
Credit points: 6 Session: Semester 2 Classes: 2 hours lecture and 2 hour lab per week. Prohibitions: INFO2110, ELEC3610, ELEC5743 Assumed knowledge: Experience with a data model as in COMP5212 or COMP5214 or COMP5028 or COMP5138 Assessment: Through semester assessment (40%), Final Exam (60%) Campus: Camperdown/Darlington Mode of delivery: Normal (lecture/lab/tutorial) Day

COMP5211
Algorithms
Engineering and Information Technologies
Credit points: 6 Session: Semester 1, 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%) Campus: Camperdown/Darlington Mode of delivery: Normal (lecture/lab/tutorial) Day

Associated degrees: B E, Grad Cert D C C, Grad Cert I T, Grad Dip Comp, Grad Dip E (Prof Eng), M Appl Sc (Bioinformatics), M I D M, M Inf Tech, M P E, PG Coursework Exchange.

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.

COMP5213
Computer and Network Organisation
Engineering and Information Technologies
Credit points: 6 Session: Semester 1 Classes: One 2 hour lecture and one 1 hour tutorial per week. Assessment: Through semester assessment (40%), Final Exam (60%) Campus: Camperdown/Darlington Mode of delivery: Normal (lecture/lab/tutorial) Day


This unit of study provides an overview of hardware and system software infrastructure including: compilers, operating systems, device drivers, network protocols, etc. It also includes user-level Unix skills and network usability. The objectives are to ensure that on completion of this unit students will have developed an understanding of compilers, operating systems, device drivers, network protocols, Unix skills and network usability.

COMP5214
Software Development in Java
Engineering and Information Technologies
Credit points: 6 Session: Semester 1, Semester 2 Classes: One 2 hour lecture and one 1 hour tutorial per week. Assessment: Through semester assessment (40%), Final Exam (60%) Campus: Camperdown/Darlington Mode of delivery: Normal (lecture/lab/tutorial) Day


Programming in a legible, maintainable, reusable way is essential to solve complex problems in the pervasive computing environments. This unit will equip students with foundation of programming concepts that are common to widely used programming languages. 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
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.
Course overview

The MPL looks at the skills required to establish and tailor sophisticated interdependent project frameworks, as well as exploring the cutting-edge 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).
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

<table>
<thead>
<tr>
<th>Code</th>
<th>Course title</th>
</tr>
</thead>
<tbody>
<tr>
<td>HG028</td>
<td>Graduate Certificate in Project Leadership</td>
</tr>
<tr>
<td>HF046</td>
<td>Graduate Diploma in Project Leadership</td>
</tr>
<tr>
<td>HC085</td>
<td>Master of Project Leadership</td>
</tr>
</tbody>
</table>

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.

(a) 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.

(b) 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 credit average.

(c) 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.

(2) All candidates who receive an offer of admission may be required to attend an interview with the Program Director before commencement.

(3) All enrolled students must complete a Professional Development Plan within their first semester of candidature.

(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 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

<table>
<thead>
<tr>
<th>Unit of study</th>
<th>Credit points</th>
<th>A: Assumed knowledge</th>
<th>P: Prerequisites</th>
<th>C: Corequisites</th>
<th>N: Prohibition</th>
<th>Session</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Master of Project Leadership</strong></td>
<td>48</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>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.</td>
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</tr>
</tbody>
</table>

#### Core units

Candidates complete 36 credit points of Core units.

<table>
<thead>
<tr>
<th>Unit of study</th>
<th>Credit points</th>
<th>Session</th>
</tr>
</thead>
<tbody>
<tr>
<td>PMGT5875 Project Innovation Management</td>
<td>6</td>
<td>Semester 1</td>
</tr>
<tr>
<td>PMGT5891 Project Risk Management</td>
<td>6</td>
<td>Semester 1</td>
</tr>
<tr>
<td>PMGT5896 Sustainability &amp; Intelligence in P. M.</td>
<td>6 Note: Department permission required for enrolment</td>
<td>Semester 2</td>
</tr>
<tr>
<td>PMGT5897 Disaster Project Management</td>
<td>6 Note: Department permission required for enrolment</td>
<td>Semester 2</td>
</tr>
<tr>
<td>PMGT5860 Project Leadership Thesis A</td>
<td>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 &amp; PMGT5861 may be undertaken concurrently.</td>
<td>Semester 1</td>
</tr>
<tr>
<td>PMGT5861 Project Leadership Thesis B</td>
<td>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 &amp; PMGT5861 may be undertaken concurrently.</td>
<td>Semester 2</td>
</tr>
</tbody>
</table>

#### Elective units

Candidates are required to select 6 credit points of the following:

<table>
<thead>
<tr>
<th>Unit of study</th>
<th>Credit points</th>
<th>Session</th>
</tr>
</thead>
<tbody>
<tr>
<td>PMGT5876 Strategic Delivery of Change</td>
<td>6</td>
<td>Semester 1</td>
</tr>
<tr>
<td>WORK6026 Organisational Change and Development</td>
<td>6</td>
<td>Semester 2a</td>
</tr>
<tr>
<td>PMGT5898 Complex Project Leadership</td>
<td>6 Note: Department permission required for enrolment</td>
<td>Semester 1</td>
</tr>
<tr>
<td>WORK6130 Leadership in Organisations</td>
<td>6 Note: Department permission required for enrolment ECOFS807, ECOF6090</td>
<td>Semester 2</td>
</tr>
</tbody>
</table>

#### Exchange units

Exchange units may be taken as Core or Elective units with the approval of the Program Director.

<table>
<thead>
<tr>
<th>Unit of study</th>
<th>Credit points</th>
<th>Session</th>
</tr>
</thead>
<tbody>
<tr>
<td>ENGG5231 Engineering Graduate Exchange A</td>
<td>6 P Permission from faculty and school.</td>
<td>Int January</td>
</tr>
<tr>
<td>ENGG5232 Engineering Graduate Exchange B</td>
<td>6 P Permission from faculty and school.</td>
<td>Int July</td>
</tr>
</tbody>
</table>

### 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.

<table>
<thead>
<tr>
<th>Unit of study</th>
<th>Credit points</th>
<th>Session</th>
</tr>
</thead>
<tbody>
<tr>
<td>PMGT5875 Project Innovation Management</td>
<td>6</td>
<td>Semester 1</td>
</tr>
<tr>
<td>PMGT5891 Project Risk Management</td>
<td>6</td>
<td>Semester 1</td>
</tr>
<tr>
<td>PMGT5896 Sustainability &amp; Intelligence in P. M.</td>
<td>6 Note: Department permission required for enrolment</td>
<td>Semester 2</td>
</tr>
<tr>
<td>PMGT5897 Disaster Project Management</td>
<td>6 Note: Department permission required for enrolment</td>
<td>Semester 2</td>
</tr>
</tbody>
</table>
### Elective units

Candidates are required to select 6 credit points of the following:

<table>
<thead>
<tr>
<th>Unit of study</th>
<th>Credit points</th>
<th>A: Assumed knowledge P: Prerequisites C: Corequisites N: Prohibition</th>
<th>Session</th>
</tr>
</thead>
<tbody>
<tr>
<td>PMGT5876 Strategic Delivery of Change</td>
<td>6</td>
<td>N WORK6026</td>
<td>Semester 1</td>
</tr>
<tr>
<td>WORK6026 Organisational Change and Development</td>
<td>6</td>
<td></td>
<td>Semester 2</td>
</tr>
</tbody>
</table>

### 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

<table>
<thead>
<tr>
<th>Unit of study</th>
<th>Credit points</th>
<th>A: Assumed knowledge P: Prerequisites C: Corequisites N: Prohibition</th>
<th>Session</th>
</tr>
</thead>
<tbody>
<tr>
<td>PMGT5896 Sustainability &amp; Intelligence in P. M.</td>
<td>6</td>
<td>Note: Department permission required for enrolment</td>
<td>Semester 2</td>
</tr>
</tbody>
</table>

### Elective Core units

Candidates select 6 credit points of Elective Core units.

<table>
<thead>
<tr>
<th>Unit of study</th>
<th>Credit points</th>
<th>A: Assumed knowledge P: Prerequisites C: Corequisites N: Prohibition</th>
<th>Session</th>
</tr>
</thead>
<tbody>
<tr>
<td>PMGT5898 Complex Project Leadership</td>
<td>6</td>
<td>N WORK6130 Note: Department permission required for enrolment</td>
<td>Semester 1</td>
</tr>
<tr>
<td>WORK6130 Leadership in Organisations</td>
<td>6</td>
<td>N ECOF5807, ECOF6090</td>
<td>Semester 2</td>
</tr>
</tbody>
</table>

### Elective units

Candidates select a minimum of 12 credit points of Elective units.

<table>
<thead>
<tr>
<th>Unit of study</th>
<th>Credit points</th>
<th>A: Assumed knowledge P: Prerequisites C: Corequisites N: Prohibition</th>
<th>Session</th>
</tr>
</thead>
<tbody>
<tr>
<td>PMGT5875 Project Innovation Management</td>
<td>6</td>
<td></td>
<td>Semester 1</td>
</tr>
<tr>
<td>PMGT5876 Strategic Delivery of Change</td>
<td>6</td>
<td>N WORK6026</td>
<td>Semester 1</td>
</tr>
<tr>
<td>PMGT5891 Project Risk Management</td>
<td>6</td>
<td></td>
<td>Semester 1</td>
</tr>
<tr>
<td>WORK6026 Organisational Change and Development</td>
<td>6</td>
<td></td>
<td>Semester 2a</td>
</tr>
</tbody>
</table>

For more information on degree program requirements visit CUSP.
Master of Project Management

To qualify for the award of the Master of Project Management a candidate must complete 48 credit points. The Master of Project Management is available with the following options: MPM - Generic (a) 2 Foundation units (PMGT5871 is compulsory)(b) 2 Specialisation units (any)(c) 2 Professional Practice units (PMGT5872 is compulsory)(d) 2 Elective units MPM - Specialisation(a) 2 Foundation units (PMGT5871 is compulsory)(b) 2 Specialisation units (including the core from your chosen specialisation)(c) 2 Professional Practice units (PMGT5872 is compulsory)(d) 2 Elective units MPM - Research pathway (Requires Distinction (75%) average or higher results over 24 credit points)(a) 2 Foundation units (PMGT5871 is compulsory)(b) 2 Specialisation units (c) 1 Elective unit (d) 1 Professional Practice unit(e) 12 credit points of Thesis units

Foundation units

Compulsory Core unit

PMGT5871
Project Process Planning and Control
Engineering and Information Technologies

Credit points: 6 Session: Int December, Int July, Semester 1, Semester 2, Summer Late Classes: Session 1: Evening, Online Session 2: Evening, Online, Block mode July Int and Dec Int : Block mode Assessment: Through session assessment (60%), Final Exam (40%) Campus: Camperdown/Darlington Mode of delivery: Block mode or On-line or Normal (lecture/lab/tutorial) Evening

Associated degrees: Grad Cert I T, Grad Cert Int Tech Man, Grad Cert P M, Grad Dip E, M Int Tech Man, M P E.

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.

Select a minimum of 6 credit points of the following:

PMGT5877
Management of Project Organisations
Engineering and Information Technologies

Credit points: 6 Session: Semester 1, Semester 2 Classes: Session 1: on-line; Session 2: 3 hours per week (evening) Assessment: Through semester assessment (60%), Final Exam (40%) Campus: Camperdown/Darlington Mode of delivery: On-line

Associated degrees: Grad Cert P M, Grad Dip E, M I D M, M P E.

This course examines the challenges and approaches of managing project-oriented organisations. These could be independent business units or divisions within a larger corporation. Examples are construction contractors, ICT services, R&D units and many internal business units that are project-oriented.

Today, more organisations are adopting project management as a management strategy to provide effective and timely solutions to clients. They are managing organisational architecture to support both ‘business as usual’ and projects that are increasingly important to the organisation.

Focus is on the relationship between project management and the following: organisational culture, structure, processes, cross-functional teams, project governance, performance management, organisational learning, change and knowledge management. The assessment comprises a series of case study based assignments, quizzes and exams.

PMGT5886
System Dynamics Modelling for PM
Engineering and Information Technologies

Credit points: 6 Session: Semester 2 Classes: Session 2: 3hrs per week - evening Assessment: Through semester assessment (60%), Final Exam (40%) Campus: Camperdown/Darlington Mode of delivery: Normal (lecture/lab/tutorial) Evening

Associated degrees: B P M, Grad Cert P M, Grad Dip E, M P E.

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
Engineering and Information Technologies

Credit points: 6 Session: Semester 1, Semester 2 Classes: Session 1: On-line; Session 2: Block-mode Assessment: Through semester assessment (50%), Final Exam (50%) Campus: Camperdown/Darlington Mode of delivery: On-line

Associated degrees: Grad Cert P M, Grad Dip E, M I D M, M P E.

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.

PMGT5895
Contracts Management
Unit of study descriptions

Engineering and Information Technologies

Credit points: 6 Session: Semester 1, Semester 2
Classes: Session 1: Lecture 2 hours per week, Tutorial 2 hours per week.
Assessment: Through semester assessment.

Associated degrees: Grad Cert P M, Grad Cert Inf Tech Man, Grad Cert PM, Grad Dip E, MPE.

International Project Management

Core unit

PMGT5888 Global Project Management

Assessment: Through semester assessment.

Associated degrees: Grad Cert P M, Grad Dip E, MPE.

Brit's strategy 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.

PMGT5893 Statistical Methods in PM

Credit points: 6
Assessment: Through semester assessment.

Associated degrees: B P M, Grad Cert P M, Grad Dip E, M PE.

Aims: Students should achieve an understanding of the applications of statistical methods in project environments.

Objectives: Students should be able to:
- Conduct hypothesis test and draw conclusions;
- Apply regression analysis to examine relationships between variables;
- Explain the relationships between variables;
- Describe the distributions of variables;
- Draw conclusions based on results observed in a sample;
- Discuss the application of statistical model for project selection;
- Appl the statistical techniques learned to a range of different "real world" situations;
- Apply R in analyzing and evaluating statistical information.

By the end of this unit of study, students should be able to:
- Discuss the applications of statistical methods;
- Evaluate a project situation based on statistical results; and
- Apply simple statistical methods to problem-solving in project management.

PMGT6867 Qualitative Methods: Project Management

Credit points: 6
Assessment: Through semester assessment.

Associated degrees: B P M, Engineering PG Cross-Inst, Engineering PG Non-Degree, Engineering UG Cross-Inst, Engineering UG Non-Degree, Grad Cert I T, Grad Cert Inf Tech Man, Grad Cert P M, Grad Dip E, MPE.

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 Economics and Scheduling Management

Core unit

PMGT5889 Integrated Cost and Scheduling Control
Sensitivity Analysis, Risk Analysis and Management

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)

Select a minimum of 6 credit points of the following:

PMGT5873 Project Economics and Finance

- Project Appraisal Report.

PMGT5893 Statistical Methods in PM

Aims: Students should achieve an understanding of the applications of statistical methods in project environments.

Objectives: Students should be able to:
- Conduct hypothesis test and draw conclusions;
- Apply regression analysis to examine relationships between variables;
- Explain the relationships between variables;
- Describe the distributions of variables;
- Draw conclusions based on results observed in a sample;
- Discuss the application of statistical model for project selection;
- Apply the statistical techniques learned to a range of different "real world" situations;
- Apply R in analyzing and evaluating statistical information.

By the end of this unit of study, students should be able to:
- Discuss the applications of statistical methods;
- Evaluate a project situation based on statistical results; and
- Apply simple statistical methods to problem-solving in project management.

PMGT6867 Quantitative Methods: Project Management

Aims: Students should achieve an understanding of the applications of statistical methods in project environments.

Objectives: Students should be able to:
- Apply R in analyzing and evaluating statistical information;
- Apply simple statistical methods to problem-solving in project management.

PMGT6887 Risk Analysis and Management

Aims: Students should achieve an understanding of the applications of statistical methods in project environments.

Objectives: Students should be able to:
- Explain the relationships between variables;
- Describe the distributions of variables;
- Draw conclusions based on results observed in a sample;
- Discuss the application of statistical model for project selection;
- Apply the statistical techniques learned to a range of different "real world" situations;
- Apply R in analyzing and evaluating statistical information.

By the end of this unit of study, students should be able to:
- Discuss the applications of statistical methods;
- Evaluate a project situation based on statistical results; and
- Apply simple statistical methods to problem-solving in project management.

PMGT6891 Risk Management

Aims: Students should achieve an understanding of the applications of statistical methods in project environments.

Objectives: Students should be able to:
- Explain the relationships between variables;
- Describe the distributions of variables;
- Draw conclusions based on results observed in a sample;
- Discuss the application of statistical model for project selection;
- Apply the statistical techniques learned to a range of different "real world" situations;
- Apply R in analyzing and evaluating statistical information.

By the end of this unit of study, students should be able to:
- Discuss the applications of statistical methods;
- Evaluate a project situation based on statistical results; and
- Apply simple statistical methods to problem-solving in project management.
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

Select a minimum of 6 credit points of the following:

ENGG5203  
Quality Engineering and Management

Engineering and Information Technologies

Credit points: 6  
Session: Semester 2  
Classes: Presentation 2.00 hours per week, Project Work 2.00 hours per week.  
Assumed knowledge: First degree in Engineering or a related discipline.  
Assessment: Through semester assessment (100%)  
Campus: Camperdown/Darlington  
Mode of delivery: Normal (lecture/lab/tutorial) Day

Associated degrees: Grad Dip E, M P E, M P L, M P M.

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.

PMGT5867  
Qualitative Methods: Project Management

Engineering and Information Technologies

Credit points: 6  
Session: Semester 1, Semester 2  
Classes: Session 1: 3 hours per week (evening); Session 2: 3 hours per week (evening)  
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 qualitative methods applied in the context of different project environments.  
Assessment: Through semester assessment (40%), Final Exam (60%)  
Campus: Camperdown/Darlington  
Mode of delivery: Normal (lecture/lab/tutorial) Evening

Associated degrees: B P M, Engineering PG Cross-Inst, Engineering PG Non-Degree, Engineering UG Cross-Inst, Engineering UG Non-Degree, Grad Cert I T, Grad Cert Inf Tech Man, Grad Cert P M, Grad Dip E, M P E.

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.

Strategic Project Management Implementation

Core unit

PMGT5876  
Strategic Delivery of Change

Engineering and Information Technologies

Credit points: 6  
Session: Semester 1, Semester 2  
Classes: Online  
Assessment: Through semester assessment (100%)  
Campus: Camperdown/Darlington  
Mode of delivery: On-line

Associated degrees: B P M, Grad Cert I T, Grad Cert Inf Tech Man, Grad Cert P L, Grad Cert P M, Grad Dip E, Grad Dip I T, M P E.

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.

Select a minimum of 6 credit points of the following:

PMGT5875  
Project Innovation Management

Engineering and Information Technologies

Credit points: 6  
Session: Semester 1, Semester 2  
Classes: Block mode  
Assessment: Through semester assessment (100%)  
Campus: Camperdown/Darlington  
Mode of delivery: On-line

Associated degrees: B C S T (Hons), B P M, Grad Cert P L, Grad Cert P M, Grad Dip E, M P E.

This course focuses 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**

**Engineering and Information Technologies**

*Credit points: 6*

*Session: Semester 1, Semester 2*

*Classes: Session 1: Block Mode; Session 2: On-line*

*Assessment: Through semester assessments (100%)*

*Campus: Camperdown/Darlington*

*Mode of delivery: Block Mode*

**Associated degrees:** B P M, Grad Cert P M, Grad Dip E, M P E.

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, is 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.

**PMGT6867**

**Quantitative Methods: Project Management**

**Engineering and Information Technologies**

*Credit points: 6*

*Session: Semester 1, Semester 2*

*Classes: Session 1: 3 hours per week (evening); Session 2: 3 hours per week (evening) & on-line*

*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 (40%)*

*Campus: Camperdown/Darlington*

*Mode of delivery: Normal (lecture/lab/tutorial) Evening*

**Associated degrees:** B P M, Engineering PG Cross-Inst, Engineering PG Non-Degree, Engineering UG Cross-Inst, Engineering UG Non-Degree, Grad Cert I T, Grad Cert Inf Tech Man, Grad Cert P M, Grad Dip E, M P E.

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.

**Professional Practice units**

**Compulsory Core unit**

**PMGT5872**

**People and Leadership**

**Engineering and Information Technologies**

*Credit points: 6*

*Session: Int December, Semester 1, Semester 2, Summer*

*Main Classes: Session 1: Weekly, Block mode & on-line Session 2: Block mode; Dec Int: Block Mode. Assessment: Through semester assessment (100%)*

*Campus: Camperdown/Darlington*

*Mode of delivery: Block Mode*

**Associated degrees:** Grad Cert I T, Grad Cert Inf Tech Man, Grad Cert P M, Grad Dip E, M Inf Tech Man, M P E.

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 OR online delivery OR block mode delivery
- Semester 2 = block mode delivery

Intensive December Session = block mode 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 on 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.

**Topi c areas covered:**

- Project context
- Personal Competence
- Interpersonal Competence
- Team Competence


*Select a minimum of 6 credit points of the following:*

**ENGG5205**

**Professional Practice in PM**

**Engineering and Information Technologies**

*Credit points: 6*

*Session: Semester 1, Semester 2*

*Classes: Lecture 3hrs per week, E-Learning 1 hr per week. Assumed knowledge: Basic engineering or science knowledge. At least 2-3 years of work experience preferred. Assessment: Through semester assessment (60%), Final Exam (40%)*

*Campus: Camperdown/Darlington*

*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.

**Associated degrees:** Grad Cert P M, Grad Dip E, M P E.

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 successfailures in project management and to take lessons from these;
6. consider the roles of project manager in the organization and management of people;
7. provide a path for students seeking improvements in their project management expertise.

**ENGG5811**

**Critical and Systems Thinking**

**Engineering and Information Technologies**

*Credit points: 6*

*Session: Semester 1, Semester 2*

*Classes: 3hr seminar/workshop per week. Assessment: Through semester assessment (100%)*

*Campus: Camperdown/Darlington*

*Mode of delivery: Normal (lecture/lab/tutorial) Day*

**Note:** Department permission required for enrolment.

**Associated degrees:** Grad Dip E, M E, M P E, M P M.

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.

As first in the sequence, 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, 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 foundations for the broader, more thoroughgoing analysis of complex system dynamics and the potential implications of particular management strategies to be developed in the subsequent Critical Thinking & Complex Systems Assessment unit of study and in other advanced Project Management units.

**ENGG5812**

Critical Thinking and Systems Assessment

**Engineering and Information Technologies**

**Credit points:** 6

**Session:** Semester 1, Semester 2

**Classes:** 3hr seminar/workshop per week.

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

**Campus:** Camperdown/Darlington

**Mode of delivery:** Normal (lecture/lab/tutorial) Day

**Note:** Department permission required for enrolment.

**Associated degrees:** Grad Dip E, M E, M P E, M P M.

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.

**PMGT5876**

Strategic Delivery of Change

**Engineering and Information Technologies**

**Credit points:** 6

**Session:** Semester 1, Semester 2

**Classes:** Session 1: Block Mode; Session 2: Online

**Prohibitions:** WORK5026

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

**Campus:** Camperdown/Darlington

**Mode of delivery:** On-line

**Associated degrees:** B P M, Grad Cert I T, Grad Cert Inf Tech Man, Grad Cert P L, Grad Cert P M, Grad Dip E, Grad Dip I T, M P E.

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.

**PMGT5879**

Strategic Portfolio & Program Management

**Engineering and Information Technologies**

**Credit points:** 6

**Session:** Semester 1, Semester 2

**Classes:** Session 1: Block Mode; Session 2: Online

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

**Campus:** Camperdown/Darlington

**Mode of delivery:** Block Mode

**Associated degrees:** B P M, Grad Cert P M, Grad Dip E, M P E.

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.

**PMGT5882**

Project Management Industrial Project

**Engineering and Information Technologies**

**Credit points:** 12

**Session:** Semester 1, Semester 2

**Classes:** 3hr Lecture per week

**Prohibitions:** PMGT5883, PMGT5884

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

**Campus:** Camperdown/Darlington

**Mode of delivery:** Normal (lecture/lab/tutorial) Evening

**Note:** Department permission required for enrolment.

**Associated degrees:** Grad Cert P M, Grad Dip E.

In this simulated project, students are required to apply all of the skills necessary to successfully initiate and plan a project. Working as part of a team, students select a from a range of challenging case studies and are responsible for developing the key project management deliverables, including the project charter, project plan, change control process, status reports and post-planning reviews. Students will facilitate workshops on scoping and risk identifications, as well as update the project plan in response to a change request or variation. Students will be required to present on project status and to complete a post planning 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 PMBoK project management lifecycle and learn about real world practices and techniques. Students will have time in most sessions to work on their assessment tasks whilst receiving guidance and immediate feedback on their progress. Most semesters their is a guest lecture from a highly successful project management practitioner and the unit concludes with practical tips on how to search for a role within the project management profession.

**PMGT6869**

Advanced Knowledge in Project Management

**Engineering and Information Technologies**

**Credit points:** 6

**Session:** Semester 1, Semester 2

**Classes:** Session 1: Weekly classes

**Assumed knowledge:** PMBoK Guide: Assessment; Through Semester Assessment (60%), Final Exam (40%)

**Campus:** Camperdown/Darlington

**Mode of delivery:** Block Mode

**Note:** Department permission required for enrolment.

**Associated degrees:** Engineering PG Cross-Inst, Engineering PG Non-Degree, Grad Cert P M, Grad Dip E, M P E.

This unit builds upon and challenges traditional views of project management. It concentrates on creating environments for the success of multiple, large and complex projects. Particular attention is paid to the potential causes of project failure. Projects and problems are viewed ‘as systems’ composed of interacting, interrelated, and interdependent components.

**Topics:**
Engineering Graduate Exchange A
Engineering and Information Technologies
Prerequisites: Permission from faculty and school. Assessment: Through semester assessment (100%) Campus: Camperdown/Darlington Mode of delivery: Normal (lecture/lab/tutorial) Day
Note: Department permission required for enrolment. 
Associated degrees: M E, M Inf Tech, M Inf Tech Man, M P E, M P L, M P M.
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. 

Engineering Graduate Exchange B
Engineering and Information Technologies
Credit points: 6 Session: Int January, Int July Classes: overseas short-course 
Prerequisites: Permission from faculty and school. Assessment: Through semester assessment (100%) Campus: Camperdown/Darlington Mode of delivery: Normal (lecture/lab/tutorial) Day
Note: Department permission required for enrolment. 
Associated degrees: M E, M Inf Tech, M Inf Tech Man, M P E, M P L, M P M.
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. 

Disaster Project Management
Engineering and Information Technologies
Credit points: 6 Session: Semester 2 Classes: Session 2 : Block Mode Assessment: Through session assessment (100%) Campus: Camperdown/Darlington Mode of delivery: Block Mode
Note: Department permission required for enrolment. 
Associated degrees: Grad Cert P L, Grad Cert P M.
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. 

Unit of study descriptions
PMGT5898
Complex Project Leadership Engineering and Information Technologies
Credit points: 6 Session: Semester 1 Classes: Session 1: block mode
Prohibitions: WORK6120 Assessment: Through session assessment (100%)
Campus: Camperdown/Darlington Mode of delivery: Block Mode
Note: Department permission required for enrolment.
Associated degrees: Engineering PG Cross-Inst, Engineering PG Non-Degree, Grad Cert P L, Grad Cert P M.

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 Practice Pathway
Requires Distinction (75%) average or higher results over 24 credit points.

PMGT5883
Project Management Thesis A Engineering and Information Technologies
Credit points: 6 Session: Semester 1, Semester 2 Classes: project work - own time
Prohibitions: PMGT5892 Assessment: Through semester assessment (100%)
Campus: Camperdown/Darlington 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.

Associated degrees: M P M.

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.

PMGT5877
Project Process Planning and Control Engineering and Information Technologies
Credit points: 6 Session: Int December, Int July, Semester 1, Semester 2, Summer Late Classes: Session 1: Evening, Online Session 2: Evening, Online, Block mode July Int and Dec Int: Block mode Assessment: Through session assessment (60%), Final Exam (40%) Campus: Camperdown/Darlington Mode of delivery: Block Mode or On-line or Normal (lecture/lab/tutorial) Evening

Associated degrees: Grad Cert I T, Grad Cert Inf Tech Man, Grad Cert P M, Grad Dip E, M Inf Tech Man, M P E.

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.

PMGT5877
Management of Project Organisations Engineering and Information Technologies
Credit points: 6 Session: Semester 1, Semester 2 Classes: Session 1: on-line; Session 2: 3 hours per week (evening) Assessment: Through semester assessment (60%), Final Exam (40%) Campus: Camperdown/Darlington Mode of delivery: On-line

Associated degrees: Grad Cert P M, Grad Dip E, M P E.

This course examines the challenges and approaches of managing project-oriented organisations. These could be independent business units or divisions within a larger corporation. Examples are construction contractors, ICT services, R&D units and many internal business units that are project-oriented.

Today, more organisations are adopting project management as a management strategy to provide effective and timely solutions to clients. They are managing organisational architecture to support both "business as usual" and projects that are increasingly important to the organisation.

Focus is on the relationship between project management and the following: organisational culture, structure, processes, cross-functional teams, project governance, performance management, organisational
learning, change and knowledge management. The assessment comprises a series of case study based assignments, quizzes and exams.

PMT5886
System Dynamics Modelling for PM
Engineering and Information Technologies
Credit points: 6 Session: Semester 2 Classes: Session 2: 3hrs per week evening Assessment: Through semester assessment (40%), Final Exam (40%)
Campus: Camperdown/Darlington Mode of delivery: Normal (lecture/lab/tutorial) Evening
Associated degrees: B P M, Grad Cert P M, Grad Dip E, M P E.

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.

PMT5887
Computer Applications in PM
Engineering and Information Technologies
Credit points: 6 Session: Semester 1, Semester 2 Classes: Session 1: On-line; Session 2: Block mode Assessment: Through semester assessment(50%), Final Exam (50%) Campus: Camperdown/Darlington Mode of delivery: On-line
Associated degrees: Grad Cert P M, Grad Dip E, M I D M, M P E.

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.

PMT5905
Contracts Management
Engineering and Information Technologies
Credit points: 6 Session: Semester 1, Semester 2 Classes: Session 1: evening ; Session 2: on-line Assumed knowledge: Risk Management and People & Leadership skills Assessment: Through semester assessment (50%), Final Exam (50%) Campus: Camperdown/Darlington Mode of delivery: Normal (lecture/lab/tutorial) Evening
Associated degrees: Grad Cert P M.

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.

Specialisation units
Candidates select 6 credit points of Specialisation units.

ENNG5203
Quality Engineering and Management
Engineering and Information Technologies
Credit points: 6 Session: Semester 2 Classes: Presentation 2.00 hours per week, Project Work - in class 2.00 hours per week. Assumed knowledge: First degree in Engineering or a related discipline. Assessment: Through semester assessment (100%) Campus: Camperdown/Darlington Mode of delivery: Normal (lecture/lab/tutorial) Day
Associated degrees: Grad Dip E, M P E, M P L, M P M.

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.

ENNG5215
International Eng Strategy & Operations
Engineering and Information Technologies
Credit points: 6 Session: Semester 2 Classes: Lecture 2 hours per week, Tutorial 2 hours per week, Project Work - in class 2 hours per week. Assumed knowledge: Sound competence in all aspects of engineering, and some understanding of issues of engineering management and globalisation. Assessment: Through semester assessment (100%) Campus: Camperdown/Darlington Mode of delivery: Normal (lecture/lab/tutorial) Day
Associated degrees: Grad Dip E, M P E.

This UoI 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.

PMGT5873
Project Economics and Finance
Engineering and Information Technologies
Credit points: 6 Session: Semester 1, Semester 2 Classes: Session 1: Block mode; Session 2: On-line Assessment: Through semester assessment (100%) Campus: Camperdown/Darlington Mode of delivery: On-line
Associated degrees: Grad Cert P M, Grad Dip E, M P E.

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.

PMGT5875
Project Innovation Management
Engineering and Information Technologies
Credit points: 6 Session: Semester 1, Semester 2 Classes: Session 1: Block mode; Session 2: Online Assessment: Through semester assessment (100%)
Campus: Camperdown/Darlington Mode of delivery: On-line
Associated degrees: B C S T (Hons), B P M, Grad Cert P L, Grad Cert P M, Grad Dip E, M P E.

This course focuses on the impact of innovation into the project management practice. Important trends in innovation in project organisation, management and delivery are identified and the 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
Engineering and Information Technologies
Credit points: 6 Session: Semester 1, Semester 2 Classes: Session 1: Block Mode; Session 2: Online Prohibitions: WORK6026 Assessment: Through semester assessment (100%) Campus: Camperdown/Darlington Mode of delivery: On-line
Associated degrees: B P M, Grad Cert P M, Grad Dip E, Grad Dip I T, M P E.

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.

PMGT5879
Strategic Portfolio & Program Management
Engineering and Information Technologies
Credit points: 6 Session: Semester 1, Semester 2 Classes: Session 1: Block Mode; Session 2: On-line Assessment: Through semester assessments (100%)
Campus: Camperdown/Darlington Mode of delivery: Block Mode
Associated degrees: B P M, Grad Cert P M, Grad Dip E, M P E.

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.

PMGT5888
Global Project Management
Engineering and Information Technologies
Credit points: 6 Session: Int January, Semester 1, Semester 2, Summer Late Classes: Session 1: On-line; Session 2: Block Mode; Int Jan: Block Mode
Assessment: Through semester assessment (100%) Campus: Camperdown/Darlington Mode of delivery: Normal (lecture/lab/tutorial) Day
Associated degrees: Grad Cert P M, Grad Dip E, M P E.

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
Engineering and Information Technologies
Credit points: 6 Session: Semester 1, Semester 2 Classes: Session 1: On-line; Session 2: Block Mode Assessment: Through semester assessment (50%), Final Exam (50%) Campus: Camperdown/Darlington Mode of delivery: Block Mode
Associated degrees: Grad Cert P M, Grad Dip E, M P E.

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 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)

PMGT5981
Project Risk Management
Engineering and Information Technologies

Credit points: 6
Session: Semester 1, Semester 2
Classes: Session 1: Block mode & on-line; Session 2: Block mode & on-line
Assessment: Through semester assessment (100%)
Campus: Camperdown/Darlington
Mode of delivery: Block Mode or On-line

Associated degrees: Grad Cert P L, Grad Cert P M, Grad Dip E, M P E.

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

PMGT5983
Statistical Methods in PM
Engineering and Information Technologies

Credit points: 6
Session: Semester 1 Classes: 3hrs Weekly (evening)
Assessment: Through semester assessment (40%), Final Exam (60%)
Campus: Camperdown/Darlington
Mode of delivery: Normal (lecture/lab/tutorial) Evening

Note: Department permission required for enrolment.

Associated degrees: B P M, Grad Cert P M, Grad Dip E, M P E.

Aims: Students should achieve an understanding of the applications of statistical methods in project environments.

Objectives: Students should be able to:
- Conduct hypothesis test and draw conclusions;
- Apply regression analysis to examine relationships between variables;
- Explain the relationships between variables;
- Describe the distributions of variables;
- Draw conclusions based on results observed in a sample;
- Discuss the application of statistical model for project selection;
- Apply the statistical techniques learned to a range of different "real world" situations;
- Apply R in analyzing and evaluating statistical information.
By the end of this unit of study, students should be able to:
- Discuss the applications of statistical methods;
- Evaluate a project situation based on statistical results; and
- Apply simple statistical methods to problem-solving in project management.

PMGT6887
Quantitative Methods: Project Management
Engineering and Information Technologies

Credit points: 6
Session: Semester 1, Semester 2
Classes: Session 1: 3 hours per week (evening); Session 2: 3 hours per week (evening) & on-line
Assessment: Through semester assessment (40%), Final Exam (60%)
Campus: Camperdown/Darlington
Mode of delivery: Normal (lecture/lab/tutorial) Evening

Associated degrees: B P M, Engineering PG Cross-Inst, Engineering PG Non-Degree, Engineering UG Cross-Inst, Engineering UG Non-Degree, Grad Cert I T, Grad Cert Inf Tech Man, Grad Cert P M, Grad Dip E, M P E.

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.

Professional Practice units
Candidates select 6 credit points of Professional Practice units.

ENGG5205
Professional Practice in PM
Engineering and Information Technologies

Credit points: 6
Session: Semester 1, Semester 2
Classes: Lecture 3hrs per week, E-Learning 1 hr per week
Assessment: Through semester assessment (80%), Final Exam (40%)
Campus: Camperdown/Darlington
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.

Associated degrees: Grad Cert P M, Grad Dip E, M P E.

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 at different stages of a project;
6. consider the roles of project manager in the organization and management of people.

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ENGG5811
Critical and Systems Thinking
Engineering and Information Technologies
Credit points: 6  Session: Semester 1, Semester 2  Classes: 3hr seminar/workshop per week.  Assessment: Through semester assessment (100%)  Campus: Camperdown/Darlington  Mode of delivery: Normal (lecture/lab/tutorial) Day
Note: Department permission required for enrolment.
Associated degrees: Grad Dip E, M E, M P E, M P M.

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. As first in the sequence, 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, 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 foundations for the broader, more thorough-going analysis of complex system dynamics and the potential implications of particular management strategies to be developed in the subsequent Critical Thinking & Complex Systems Assessment unit of study and in other advanced Project Management units.

ENGG5812
Critical Thinking and Systems Assessment
Engineering and Information Technologies
Credit points: 6  Session: Semester 1, Semester 2  Classes: 3hr seminar/workshop per week.  Assessment: Through semester assessment (100%)  Campus: Camperdown/Darlington  Mode of delivery: Normal (lecture/lab/tutorial) Day
Note: Department permission required for enrolment.
Associated degrees: Grad Dip E, M E, M P E, M P M.

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.

PMGT5872
People and Leadership
Engineering and Information Technologies
Credit points: 6  Session: Int December, Semester 1, Semester 2  Classes: Session 1: Block mode & on-line Session 2: Block mode; Dec Int : Block Mode  Assessment: Through semester assessment (100%)  Campus: Camperdown/Darlington  Mode of delivery: Block Mode
Associated degrees: Grad Cert I T, Grad Cert Inf Tech Man, Grad Cert P M, Grad Dip E, M Inf Tech Man, M P E.

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 OR online delivery OR block mode delivery
Semester 2 = block mode delivery

Intensive December Session = block mode 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:
* Project context
* Personal Competence
* Interpersonal Competence
* Team Competence

The unit references a range of Australian and global Project Management, Management and Consulting Standards. It integrates theory and practice to optimise results.
Recommended reading: A Guide to the Project Management Body of Knowledge (PMBOOK® Guide)

PMGT5876
Strategic Delivery of Change
Engineering and Information Technologies
Credit points: 6  Session: Semester 1, Semester 2  Classes: Session 1: Block Mode; Session 2: Online Prohibitions: WORK6026  Assessment: Through semester assessment (100%)  Campus: Camperdown/Darlington  Mode of delivery: On-line
Associated degrees: B P M, Grad Cert I T, Grad Cert Inf Tech Man, Grad Cert P L, Grad Cert P M, Grad Dip E, Grad Dip I T, M P E.

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.

PMGT5879
Strategic Portfolio & Program Management
Engineering and Information Technologies
Credit points: 6  Session: Semester 1, Semester 2  Classes: Session 1: Block Mode; Session 2: On-line  Assessment: Through semester assessments (100%)  Campus: Camperdown/Darlington  Mode of delivery: Block Mode
Associated degrees: B P M, Grad Cert P M, Grad Dip E, M P E.

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.

**PMGT6869**  
**Advanced Knowledge in Project Management Engineering and Information Technologies**

- **Credit points:** 6  
- **Session:** Semester 1, Semester 2  
- **Classes:** Session 1: Weekly classes Session 2: Block mode  
- **Assumed knowledge:** PMBoK Guide  
- **Assessment:** Through Semester Assessment (60%), Final Exam (40%)  
- **Campus:** Camperdown/Darlington  
- **Mode of delivery:** Block Mode  
- **Note:** Department permission required for enrolment.

**Associated degrees:** Engineering PG Cross-Inst, Engineering PG Non-Degree, Grad Cert P M, Grad Dip E, M P E.

This unit builds upon and challenges traditional views of project management. It concentrates on creating environments for the success of multiple, large and complex projects. Particular attention is paid to the potential causes of project failure. Projects and problems are viewed as ‘as systems’ composed of interacting, interrelated, and interdependent components.

**Topics:**
- Project Failure
- Systems Thinking
- Business Case Development
- Large and Multiple Projects
- International Project Teams
- Organisational Learning
- Corporate Law
- Organisational Design
- Performance and Benefit Measurement
- Project Management Methodologies
- Systems and Data Integration

Unit outcomes include an ability to:
- identify complex problems and situations
- analyse situations and apply research findings to cases / projects
- integrate diverse considerations
- examine multiple views
- prioritise information
- differentiate between process and content
- synthesise findings

Recommended reading: A Guide to the Project Management Body of Knowledge (PMBoK® Guide)

**Elective units**

Candidates select 6 credit points of Elective units.

Choose elective units from Foundation, Specialisation or Professional Practice units.

**Graduate Certificate in Project Management**

To qualify for the award of the Graduate Certificate in Project Management a candidate must complete 24 credit points as follows:(a)  
- 2 Foundation units(b) 1 Specialist unit(c) 1 Elective or Professional Practice unitCandidates admitted to the Graduate Certificate, after completing the requirements, may proceed to the Master of Project Management by achieving a Credit (65%) average or above. Candidates intending to transfer to the Master of Project Management should plan their enrolment accordingly to ensure they meet the degree requirements of the MPM.

**Foundation units**

Candidates select 12 credit points of Foundation units.

**PMGT5871**  
**Project Process Planning and Control**

**Engineering and Information Technologies**

- **Credit points:** 6  
- **Session:** Int December, Int July, Semester 1, Semester 2, Summer Late  
- **Classes:** Session 1: Evening, Online Session 2: Evening, Online  
- **Block mode July Int and Dec Int:** Block mode  
- **Assessment:** Through session assessment (60%), Final Exam (40%)  
- **Campus:** Camperdown/Darlington  
- **Mode of delivery:** Block Mode or On-line or Normal (lecture/lab/tutorial) Evening  

**Associated degrees:** Grad Cert I T, Grad Cert Inf Tech Man, Grad Cert P M, Grad Dip E, M Inf Tech Man, M P E.

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.

**PMGT5877**  
**Management of Project Organisations**

**Engineering and Information Technologies**

- **Credit points:** 6  
- **Session:** Semester 1, Semester 2  
- **Classes:** Session 1: on-line; Session 2: 3 hours per week (evening)  
- **Assessment:** Through semester assessment (60%), Final Exam (40%)  
- **Campus:** Camperdown/Darlington  
- **Mode of delivery:** On-line  

**Associated degrees:** Grad Cert P M, Grad Dip E, M P E.

This course examines the challenges and approaches of managing project-oriented organisations. These could be independent business units or divisions within a larger corporation. Examples are construction contractors, ICT services, R&D units and many internal business units that are project-oriented.

Today, more organisations are adopting project management as a management strategy to provide effective and timely solutions to clients. They are managing organisational architecture to support both "business as usual" and projects that are increasingly important to the organisation.

Focus is on the relationship between project management and the following: organisational culture, structure, processes, cross-functional teams, project governance, performance management, organisational learning, change and knowledge management. The assessment comprises a series of case study based assignments, quizzes and exams.

**PMGT5886**  
**System Dynamics Modelling for PM**

**Engineering and Information Technologies**

- **Credit points:** 6  
- **Session:** Semester 2  
- **Classes:** Session 2: 3hrs per week - evening  
- **Assessment:** Through semester assessment (60%), Final Exam (40%)  
- **Campus:** Camperdown/Darlington  
- **Mode of delivery:** Normal (lecture/lab/tutorial) Evening  

**Associated degrees:** B P M, Grad Cert P M, Grad Dip E, M P E.

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**
Candidates select 6 credit points of Specialisation units.

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PMGT5876
Strategic Delivery of Change
Engineering and Information Technologies
Credit points: 6
Session: Semester 1, Semester 2
Classes: Session 1: Block Mode; Session 2: Online
Prohibitions: WOR65026
Assessment: Through semester assessment (100%)
Campus: Camperdown/Darlington
Mode of delivery: On-line

Associated degrees: B P M, GradCert I T, Grad Cert Inf Tech Man, Grad Cert P L, Grad Cert P M, Grad Dip E, Grad Dip I T, M P E.

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.

PMGT5879
Strategic Portfolio & Program Management
Engineering and Information Technologies
Credit points: 6
Session: Semester 1, Semester 2
Classes: Session 1: Block Mode; Session 2: Online
Assessment: Through semester assessments (100%)
Campus: Camperdown/Darlington
Mode of delivery: Block Mode

Associated degrees: B P M, Grad Cert P M, Grad Dip E, M P E.

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.

PMGT5888
Global Project Management
Engineering and Information Technologies
Credit points: 6
Session: Int January, Semester 1, Semester 2, Summer Late
Classes: Session 1: On-line; Session 2: Block Mode; Int Jan: Block Mode
Assessment: Through semester assessment (100%)
Campus: Camperdown/Darlington
Mode of delivery: Normal (lecture/lab/tutorial) Day

Associated degrees: Grad Cert P M, Grad Dip E, M P E.

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
Engineering and Information Technologies
Credit points: 6
Session: Semester 1, Semester 2
Classes: Session 1: On-line; Session 2: Block Mode
Assessment: Through semester assessment (50%), Final Exam (50%)
Campus: Camperdown/Darlington
Mode of delivery: Block Mode

Associated degrees: Grad Cert P M, Grad Dip E, M P E.

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:
- 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;
- Undertake earned value analysis (EVA) in network scheduling;
- Apply critical path analysis (CPA) in network 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).

PMGT5891
Project Risk Management
Engineering and Information Technologies
Credit points: 6
Session: Semester 1, Semester 2
Classes: Session 1: Block mode & on-line; Session 2: Block mode & on-line
Assessment: Through semester assessment (100%)
Campus: Camperdown/Darlington
Mode of delivery: Block Mode or On-line

Associated degrees: Grad Cert P L, Grad Cert P M, Grad Dip E, M P E.

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

PMGT6867 Quantitative Methods: Project Management

Engineering and Information Technologies
Credit points: 6 Session: Semester 1, Semester 2 Classes: Session 1: 3hrs per week (evening) & A/L in the same week (evening); Session 2: 3hrs per week (evening) & on-line 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: Normal (lecture/lab/tutorial) Evening
Note: Department permission required for enrolment.

Associated degrees: B P M, Grad Cert P M, Grad Dip E, M P E.

Aims: Students should achieve an understanding of the applications of statistical methods in project environments.

Objectives: Students should be able to:
- Conduct hypothesis test and draw conclusions;
- Apply regression analysis to examine relationships between variables;
- Explain the relationships between variables;
- Describe the distributions of variables;
- Draw conclusions based on results observed in a sample;
- Discuss the application of statistical model for project selection;
- Apply the statistical techniques learned to a range of different "real world" situations;
- Apply R in analyzing and evaluating statistical information.

By the end of this unit of study, students should be able to:
- Discuss the applications of statistical methods;
- Evaluate a project situation based on statistical results; and
- Apply simple statistical methods to problem-solving in project management.

ENGG5205 Professional Practice in PM Engineering and Information Technologies
Credit points: 6 Session: Semester 1, Semester 2 Classes: Lecture 3hrs per week, E-Learning 1 hr per week. Assumed knowledge: Basic engineering or science knowledge. At least 2-3 years of work experience preferred. 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.

Associated degrees: Grad Cert P M, Grad Dip E, M P E.

This UoS teaches the fundamental knowledge on the importance, organisational context and professional practice in project management. It serves as an introduction to project management practices for non-PM students. For PM students, this UoS lays the foundation to progress to advanced PM subjects. Although serving as a general introduction unit, the focus has been placed on scope, time, cost, and integration related issues.

Specifically, the UoS aims to:
1. introduce students to the institutional, organisational and professional environment for today's project management practitioners as well as typical challenges and issues facing them;
2. demonstrate the importance of project management to engineering and organizations;
3. demonstrate the progression from strategy formulation to execution of the project;
4. provide a set of tools and techniques at different stages of a project's lifecycle with emphasis on scope, time, cost and integration related issues;
5. highlight examples of project success/failures in project management and to take lessons from these;
6. consider the roles of project manager in the organization and management of people;
7. provide a path for students seeking improvements in their project management expertise.

ENGG5111 Critical and Systems Thinking Engineering and Information Technologies
Credit points: 6 Session: Semester 1, Semester 2 Classes: 3hr seminar/workshop per week. Assessment: Through semester assessment (100%) Mode of delivery: Normal (lecture/lab/tutorial) Day

Note: Department permission required for enrolment.

Associated degrees: Grad Dip E, M E, M P E, M P M.

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. As first in the sequence, 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, 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 foundations for the broader, more thoroughgoing analysis of complex system dynamics and the potential implications of particular management strategies to be developed in the subsequent Critical Thinking & Complex Systems Assessment unit of study and in other advanced Project Management units.

ENNG5812
Critical Thinking and Systems Assessment
Engineering and Information Technologies
Credit points: 6  Session: Semester 1, Semester 2  Classes: 3hr seminar/workshop per week  Assessment: Through semester assessment (100%)  Campus: Camperdown/Darlington  Mode of delivery: Normal (lecture/lab/tutorial) Day
Note: Department permission required for enrolment.
Associated degrees: Grad Dip E, M E, M P E, M P M.
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.

PMGT5876
Strategic Delivery of Change
Engineering and Information Technologies
Credit points: 6  Session: Semester 1, Semester 2  Classes: Session 1: Block Mode; Session 2: Online  Prohibitions: WORK6226  Assessment: Through semester assessment (100%)  Campus: Camperdown/Darlington  Mode of delivery: On-line
Associated degrees: B P M, Grad Cert I T, Grad Cert Inf Tech Man, Grad Cert P L, Grad Cert P M, Grad Dip E, Grad Dip I T, M P E.
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.

PMGT5879
Strategic Portfolio & Program Management
Engineering and Information Technologies
Credit points: 6  Session: Semester 1, Semester 2  Classes: Session 1: Block Mode; Session 2: On-line  Assessment: Through semester assessment (100%)  Campus: Camperdown/Darlington  Mode of delivery: Block Mode
Associated degrees: B P M, Grad Cert P M, Grad Dip E, M P E.
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.

PMGT6869
Advanced Knowledge in Project Management
Engineering and Information Technologies
Credit points: 6  Session: Semester 1, Semester 2  Classes: Session 1: Weekly classes  Session 2: Block mode  Assessment: Through semester assessment (60%), Final Exam (40%)  Campus: Camperdown/Darlington  Mode of delivery: Block Mode
Note: Department permission required for enrolment.
Associated degrees: Engineering PG Cross-Inst, Engineering PG Non-Degree, Grad Cert P M, Grad Dip E, M P E.
This unit builds upon and challenges traditional views of project management. It concentrates on creating environments for the success of multiple, large and complex projects. Particular attention is paid to the potential causes of project failure. Projects and problems are viewed ‘as systems’ composed of interacting, interrelated, and interdependent components.
Unit of study descriptions

Topics:
- Project Failure
- Systems Thinking
- Business Case Development
- Large and Multiple Projects
- International Project Teams
- Organisational Learning
- Corporate Law
- Organisational Design
- Performance and Benefit Measurement
- Project Management Methodologies
- Systems and Data Integration

Unit outcomes include an ability to:
* identify complex problems and situations
* analyse situations and apply research findings to cases / projects
* integrate diverse considerations
* examine multiple views
* prioritise information
* differentiate between process and content
* synthesise findings

Recommended reading: A Guide to the Project Management Body of Knowledge (PMBOK® Guide)

Choose elective units from Foundation, Specialisation or Professional Practice units.

For more information on units of study visit CUSP.
Master of Project Management

Course overview
The MPM 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 across a wide range of industries.

Course structure
You may choose either to specialise in a particular area of practice or to complete a general MPM without a specialisation.

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

Specialisations
• Project Economics and Scheduling Management
• International Project Management
• Project Risk Management
• Strategic Project Management Implementation

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 1st February 2010 until 2017.
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

<table>
<thead>
<tr>
<th>Code</th>
<th>Course title</th>
</tr>
</thead>
<tbody>
<tr>
<td>HG006</td>
<td>Graduate Certificate in Project Management</td>
</tr>
<tr>
<td>HF023</td>
<td>Graduate Diploma in Project Management</td>
</tr>
<tr>
<td>HC031</td>
<td>Master of Project Management</td>
</tr>
</tbody>
</table>

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.

   (a) Admission to the Graduate Certificate in Project Management requires:
      - a bachelor's degree from the University of Sydney or equivalent qualification; or
      - relevant industry experience and certifications.

   (b) Admission to the Graduate Diploma of Project Management requires:
      - a bachelor's degree from the University of Sydney or equivalent qualification; or
      - completion of the embedded graduate certificate with a minimum credit average.

   (c) Admission to the Master of Project Management requires:
      - a bachelor's degree from the University of Sydney or equivalent qualification with a minimum credit average; or
      - completion of the embedded graduate diploma with a minimum credit average.

   (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 are required for the courses are set out in the table of units of study: Graduate Certificate in Project Management / Graduate Diploma of Project Management / Master of Project Management.

(2) To qualify for the award of the Graduate Certificate in Project Management a candidate must complete 24 credit points, including:
   (a) 12 credit points of foundation units of study;
   (b) 6 credit points of specialist units of study; and
   (c) 6 credit points of elective or professional practice units of study.

(3) To qualify for the award of the Graduate Diploma in Project Management a candidate must complete 36 credit points, including:
   (a) 12 credit points of foundation units of study;
   (b) 12 credit points of specialist units of study;
   (c) 6 credit points of professional practice units of study; and
   (d) 6 credit points of elective units of study.

(4) A candidate who has been admitted to the Master of Project Management shall proceed either: by professional practice pathway; or by research practice pathway.

(5) To qualify for the award of the Master of Project Management by professional practice pathway, a candidate must complete 48 credit points, including:
   (a) 12 credit points of foundation units of study;
   (b) 12 credit points of specialist units of study;
   (c) 12 credit points of professional practice units of study; and
   (d) 12 credit points of elective units of study.

(6) To qualify for the award of the Master of Project Management by research pathway, a candidate must complete 48 credit points, including:
   (a) 12 credit points of foundation units of study;
   (b) 12 credit points of specialist units of study;
   (c) 12 credit points of professional practice units of study; and
   (d) 12 credit points of elective units of study.

(6) Entry into the Master of Project Management research pathway requires special permission from the Program Director. To qualify for the award of the Master of Project Management by research pathway, a candidate must complete 48 credit points, including:
(a) 12 credit points from foundation units of study;
(b) 12 credit points from specialisation units of study prescribed by the faculty;
(c) 12 credit points of research units of study;
(d) 6 credit points of professional practice units of study; and
(e) 6 credit points of elective units of study.

7 Specialisations

(1) Completion of a specialisation is not a requirement of the Master of Project Management. A specialisation requires the completion of 12 credit points from units of study listed in the table for that specialisation including the core unit. The specialisations available are:
(a) International Project Management
(b) Project Economics and Scheduling Management
(c) Project Risk Management
(d) Strategic PM Implementation

8 Cross-institutional study

Cross-institutional study is not available in these courses except where the University of Sydney has a formal cooperation agreement with another university.

9 Satisfactory progress

Progression is subject to the Coursework Rule. A candidate who has failed to meet these progression rules will be transferred to either the Graduate Diploma or the Graduate Certificate in Project Management, depending on the credit points successfully completed.

10 Course transfer

A candidate for the master or graduate diploma may elect to discontinue study and graduate with a shorter award from this embedded sequence, with the approval of the Director of the Faculty of Engineering and Information Technologies Graduate School, and provided the requirements of the shorter award have been met.

11 Transitional provisions

(1) These resolutions apply to students who commenced their candidature after 1 January, 2011 and students who commenced their candidature prior to 1 January, 2011 who elect to proceed under these resolutions.
(2) Candidates who commenced prior to 1 January, 2011 may complete the requirements in accordance with the resolutions in force at the time of their commencement.
Master of Project Management

To qualify for the award of the Master of Project Management a candidate must complete 48 credit points.

The Master of Project Management is available with the following options:

**MPM - Generic**
(a) 2 Foundation units (PMGT5871 is compulsory)
(b) 2 Specialisation units (any)
(c) 2 Professional Practice units (PMGT5872 is compulsory)
(d) 2 Elective units

**MPM - Specialisation**
(a) 2 Foundation units (PMGT5871 is compulsory)
(b) 2 Specialisation units (Including the core from your chosen specialisation)
(c) 2 Professional Practice units (PMGT5872 is compulsory)
(d) 2 Elective units

**MPM - Research pathway (Requires Distinction (75%) average or higher results over 24 credit points)**
(a) 2 Foundation units (PMGT5871 is compulsory)
(b) 2 Specialisation units
(c) 1 Elective unit
(d) 1 Professional Practice unit
(e) 12 credit points of Thesis units

### Foundation units

**Compulsory Core unit**

<table>
<thead>
<tr>
<th>Unit of Study</th>
<th>Credit Points</th>
<th>A: Assumed knowledge</th>
<th>P: Prerequisites</th>
<th>C: Corequisites</th>
<th>N: Prohibition</th>
<th>Session</th>
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<tbody>
<tr>
<td>PMGT5871 Project Process Planning and Control</td>
<td>6</td>
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<td>Int December Int July Semester 1 Semester 2 Summer Late</td>
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Select a minimum of 6 credit points of the following:

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<tr>
<td>PMGT5877 Management of Project Organisations</td>
<td>6</td>
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<tr>
<td>PMGT5886 System Dynamics Modelling for PM</td>
<td>6</td>
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<tr>
<td>PMGT5887 Computer Applications in PM</td>
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<tr>
<td>PMGT5895 Contracts Management</td>
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### Specialisation units

Candidates who wish to complete a Specialisation complete 12 credit points from one of the Specialisations listed. Candidates must complete the Core unit and an additional unit.

Exchange units may be taken as Specialist units with the approval of the Program Director.

**Master of Project Management Specialisations**

### International Project Management

**Core unit**

<table>
<thead>
<tr>
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<td>ENGG5215 International Eng Strategy &amp; Operations</td>
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<td>Select a minimum of 6 credit points of the following:</td>
<td></td>
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</tr>
<tr>
<td>ENGG5203 Quality Engineering and Management</td>
<td>6</td>
<td>A First degree in Engineering or a related discipline,</td>
<td></td>
<td></td>
<td></td>
<td>Semester 2</td>
</tr>
<tr>
<td>PMGT5893 Statistical Methods in PM</td>
<td>6</td>
<td>Note: Department permission required for enrolment</td>
<td></td>
<td></td>
<td></td>
<td>Semester 1</td>
</tr>
<tr>
<td>PMGT6867 Quantitative Methods: Project Management</td>
<td>6</td>
<td>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.</td>
<td></td>
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<td></td>
<td>Semester 1, Semester 2</td>
</tr>
<tr>
<td>Strategic Project Management Implementation</td>
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<tr>
<td>Core unit</td>
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<tr>
<td>PMGT5876 Strategic Delivery of Change</td>
<td>6</td>
<td>N WORK6026</td>
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<td></td>
<td>Semester 1, Semester 2</td>
</tr>
<tr>
<td>Select a minimum of 6 credit points of the following:</td>
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<tr>
<td>PMGT5875 Project Innovation Management</td>
<td>6</td>
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<td></td>
<td>Semester 1, Semester 2</td>
</tr>
<tr>
<td>PMGT5879 Strategic Portfolio &amp; Program Management</td>
<td>6</td>
<td></td>
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<td>Semester 1, Semester 2</td>
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<td>PMGT6867 Quantitative Methods: Project Management</td>
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<td></td>
<td>Semester 1, Semester 2</td>
</tr>
<tr>
<td>Professional Practice units</td>
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<tr>
<td>Compulsory Core unit</td>
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</tr>
<tr>
<td>PMGT5872 People and Leadership</td>
<td>6</td>
<td></td>
<td></td>
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<td></td>
<td>Int December, Semester 1, Semester 2, Summer Main</td>
</tr>
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<td>Select a minimum of 6 credit points of the following:</td>
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</tr>
<tr>
<td>ENGG5205 Professional Practice in PM</td>
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<td>A Basic engineering or science knowledge. At least 2-3 years of work experience preferred. 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.</td>
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<td>Semester 1, Semester 2</td>
</tr>
<tr>
<td>ENGG5811 Critical and Systems Thinking</td>
<td>6</td>
<td>Note: Department permission required for enrolment</td>
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<td>Semester 1, Semester 2</td>
</tr>
<tr>
<td>ENGG5812 Critical Thinking and Systems Assessment</td>
<td>6</td>
<td>Note: Department permission required for enrolment</td>
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<td>Semester 1, Semester 2</td>
</tr>
<tr>
<td>PMGT5876 Strategic Delivery of Change</td>
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<tr>
<td>PMGT5879 Strategic Portfolio &amp; Program Management</td>
<td>6</td>
<td></td>
<td></td>
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<td>Semester 1, Semester 2</td>
</tr>
<tr>
<td>PMGT5892 Project Management Industrial Project</td>
<td>12</td>
<td>N PMGT5883, PMGT5884 Note: Department permission required for enrolment</td>
<td></td>
<td></td>
<td></td>
<td>Semester 1, Semester 2</td>
</tr>
<tr>
<td>PMGT6869 Advanced Knowledge in Project Management</td>
<td>6</td>
<td>A PMBoK Guide</td>
<td>Note: Department permission required for enrolment</td>
<td></td>
<td></td>
<td>Semester 1, Semester 2</td>
</tr>
</tbody>
</table>
### Elective units

Candidates may select a maximum of 12 credit points of Elective units.

**Choose elective units from Foundation, Specialisation or Professional Practice units.**

Exchange units may be taken as Elective units with the approval of the Program Director.

<table>
<thead>
<tr>
<th>Unit of study</th>
<th>Credit points</th>
<th>A: Assumed knowledge</th>
<th>P: Prerequisites</th>
<th>C: Corequisites</th>
<th>N: Prohibition</th>
<th>Session</th>
</tr>
</thead>
<tbody>
<tr>
<td>ENGG5231 Engineering Graduate Exchange A</td>
<td>6</td>
<td></td>
<td>P: Permission from faculty and school.</td>
<td></td>
<td>Note: Department permission required for enrolment</td>
<td>Int January</td>
</tr>
<tr>
<td>ENGG5232 Engineering Graduate Exchange B</td>
<td>6</td>
<td></td>
<td>P: Permission from faculty and school.</td>
<td></td>
<td>Note: Department permission required for enrolment</td>
<td>Int January</td>
</tr>
<tr>
<td>MPM 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.</td>
<td></td>
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</tr>
<tr>
<td>PMGT5896 Sustainability &amp; Intelligence in P. M.</td>
<td>6</td>
<td></td>
<td>Note: Department permission required for enrolment</td>
<td></td>
<td></td>
<td>Semester 2</td>
</tr>
<tr>
<td>PMGT5897 Disaster Project Management</td>
<td>6</td>
<td></td>
<td>Note: Department permission required for enrolment</td>
<td></td>
<td></td>
<td>Semester 2</td>
</tr>
<tr>
<td>PMGT5898 Complex Project Leadership</td>
<td>6</td>
<td></td>
<td>N WORK6130</td>
<td></td>
<td>Note: Department permission required for enrolment</td>
<td>Semester 1</td>
</tr>
</tbody>
</table>

### Research Practice Pathway

Requires Distinction (75%) average or higher results over 24 credit points.

<table>
<thead>
<tr>
<th>Unit of study</th>
<th>Credit points</th>
<th>A: Assumed knowledge</th>
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<th>C: Corequisites</th>
<th>N: Prohibition</th>
<th>Session</th>
</tr>
</thead>
<tbody>
<tr>
<td>PMGT5883 Project Management Thesis A</td>
<td>6</td>
<td></td>
<td>N PMGT5892</td>
<td></td>
<td>Note: Department permission required for enrolment</td>
<td>Semester 1 Semester 2</td>
</tr>
<tr>
<td>PMGT5884 Project Management Thesis B</td>
<td>6</td>
<td></td>
<td>N PMGT5892</td>
<td></td>
<td>Note: Department permission required for enrolment</td>
<td>Semester 1 Semester 2</td>
</tr>
<tr>
<td>It is expected that the project will be conducted over two consecutive semesters although the two 6 credit point units PMGT5883 &amp; 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.</td>
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</tr>
<tr>
<td>PMGT5885 Project Process Planning and Control</td>
<td>6</td>
<td></td>
<td>A Risk Management and People &amp; Leadership skills.</td>
<td></td>
<td></td>
<td>Semester 1 Semester 2</td>
</tr>
<tr>
<td>PMGT5886 Management of Project Organisations</td>
<td>6</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Semester 1 Semester 2</td>
</tr>
<tr>
<td>PMGT5887 System Dynamics Modelling for PM</td>
<td>6</td>
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<td></td>
<td></td>
<td></td>
<td>Semester 2</td>
</tr>
<tr>
<td>PMGT5888 Computer Applications in PM</td>
<td>6</td>
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<td></td>
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<td></td>
<td>Semester 1 Semester 2</td>
</tr>
<tr>
<td>PMGT5895 Contracts Management</td>
<td>6</td>
<td></td>
<td></td>
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<td></td>
<td>Semester 1 Semester 2</td>
</tr>
</tbody>
</table>

### Graduate Diploma in Project Management

To qualify for the award of the Graduate Diploma in Project Management a candidate must complete 36 credit points as follows:

(a) 2 Foundation units  
(b) 2 Specialist units  
(c) 1 Professional Practice unit  
(d) 1 Elective unit  

Candidates admitted to the Graduate Diploma, after completing 24 credit points, may proceed to the Master of Project Management by achieving a Credit (65%) average or above.

Candidates intending to transfer to the Master of Project Management should plan their enrolment accordingly to ensure they meet the degree requirements of the MPM.

#### Foundation units

Candidates select 12 credit points of Foundation units.

<table>
<thead>
<tr>
<th>Unit of study</th>
<th>Credit points</th>
<th>A: Assumed knowledge</th>
<th>P: Prerequisites</th>
<th>C: Corequisites</th>
<th>N: Prohibition</th>
<th>Session</th>
</tr>
</thead>
<tbody>
<tr>
<td>PMGT5871 Project Process Planning and Control</td>
<td>6</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Int December Int July Semester 1 Semester 2 Summer Late</td>
</tr>
<tr>
<td>PMGT5877 Management of Project Organisations</td>
<td>6</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Semester 1 Semester 2</td>
</tr>
<tr>
<td>PMGT5886 System Dynamics Modelling for PM</td>
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<td></td>
<td></td>
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</tr>
<tr>
<td>PMGT5887 Computer Applications in PM</td>
<td>6</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Semester 1 Semester 2</td>
</tr>
<tr>
<td>PMGT5895 Contracts Management</td>
<td>6</td>
<td>A Risk Management and People &amp; Leadership skills.</td>
<td></td>
<td></td>
<td></td>
<td>Semester 1 Semester 2</td>
</tr>
</tbody>
</table>

#### Specialisation units

Candidates select 6 credit points of Specialisation units.

<table>
<thead>
<tr>
<th>Unit of study</th>
<th>Credit points</th>
<th>A: Assumed knowledge</th>
<th>P: Prerequisites</th>
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<th>Session</th>
</tr>
</thead>
<tbody>
<tr>
<td>ENGG5203 Quality Engineering and Management</td>
<td>6</td>
<td>A First degree in Engineering or a related discipline.</td>
<td></td>
<td></td>
<td></td>
<td>Semester 2</td>
</tr>
<tr>
<td>ENGG5215 International Eng Strategy &amp; Operations</td>
<td>6</td>
<td>A Sound competence in all aspects of engineering, and some understanding of issues of engineering management and globalisation</td>
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<td></td>
<td></td>
<td>Semester 2</td>
</tr>
<tr>
<td>PMGT5873 Project Economics and Finance</td>
<td>6</td>
<td></td>
<td></td>
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<td></td>
<td>Semester 1 Semester 2</td>
</tr>
<tr>
<td>PMGT5875 Project Innovation Management</td>
<td>6</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Semester 1 Semester 2</td>
</tr>
</tbody>
</table>
### Unit of study table

<table>
<thead>
<tr>
<th>Unit of study</th>
<th>Credit points</th>
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</thead>
<tbody>
<tr>
<td>PMGT5876 Strategic Delivery of Change</td>
<td>6</td>
<td>N WORK6026</td>
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<td>Semester 1 Semester 2</td>
</tr>
<tr>
<td>PMGT5879 Strategic Portfolio &amp; Program Management</td>
<td>6</td>
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</tr>
<tr>
<td>PMGT5888 Global Project Management</td>
<td>6</td>
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<td></td>
<td></td>
<td>Int January Semester 1 Semester 2 Summer Late</td>
</tr>
<tr>
<td>PMGT5889 Integrated Cost and Scheduling Control</td>
<td>6</td>
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</tr>
<tr>
<td>PMGT5891 Project Risk Management</td>
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<td></td>
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</tr>
<tr>
<td>PMGT5893 Statistical Methods in PM</td>
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<td></td>
<td>Semester 1</td>
</tr>
<tr>
<td>PMGT6887 Quantitative Methods: Project Management</td>
<td>6</td>
<td>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.</td>
<td></td>
<td></td>
<td></td>
<td>Semester 1 Semester 2</td>
</tr>
</tbody>
</table>

### Professional Practice units

Candidates select 6 credit points of Professional Practice units.

| ENGG5205 Professional Practice in PM               | 6             | A Basic engineering or science knowledge. At least 2-3 years of work experience preferred. 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             | Note: Department permission required for enrolment |                 |                 |                 | Semester 1 Semester 2 |
| ENGG5812 Critical Thinking and Systems Assessment | 6             | Note: Department permission required for enrolment |                 |                 |                 | Semester 1 Semester 2 |
| PMGT5872 People and Leadership                    | 6             |                      |                  |                 |                 | Int December Semester 1 Semester 2 Summer Main |
| PMGT5876 Strategic Delivery of Change              | 6             | N WORK6026           |                  |                 |                 | Semester 1 Semester 2 |
| PMGT5879 Strategic Portfolio & Program Management  | 6             |                      |                  |                 |                 | Semester 1 Semester 2 |
| PMGT6889 Advanced Knowledge in Project Management | 6             | A PMBoK Guide        | Note: Department permission required for enrolment |                 |                 | Semester 1 Semester 2 |

### Elective units

Candidates select 6 credit points of Elective units.

Choose elective units from Foundation, Specialisation or Professional Practice units.

### Graduate Certificate in Project Management

To qualify for the award of the Graduate Certificate in Project Management a candidate must complete 24 credit points as follows:

(a) 2 Foundation units

(b) 1 Specialist unit

(c) 1 Elective or Professional Practice unit

Candidates admitted to the Graduate Certificate, after completing the requirements, may proceed to the Master of Project Management by achieving a Credit (65%) average or above.

Candidates intending to transfer to the Master of Project Management should plan their enrolment accordingly to ensure they meet the degree requirements of the MPM.

### Foundation units

Candidates select 12 credit points of Foundation units.

| PMGT5871 Project Process Planning and Control      | 6             |                      |                  |                 |                 | Int December Int July Semester 1 Semester 2 Summer Late |
| PMGT5877 Management of Project Organisations       | 6             |                      |                  |                 |                 | Semester 1 Semester 2 |
| PMGT5886 System Dynamics Modelling for PM          | 6             |                      |                  |                 |                 | Semester 2 |
| PMGT5887 Computer Applications in PM               | 6             |                      |                  |                 |                 | Semester 1 Semester 2 |
| PMGT5895 Contracts Management                      | 6             | A Risk Management and People & Leadership skills. |                 |                 |                 | Semester 1 Semester 2 |
### Specialisation units

Candidates select 6 credit points of Specialisation units.

<table>
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<tr>
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<td>PMGT5875 Project Innovation Management</td>
<td>6</td>
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### Professional Practice units and Elective units

Candidates select 6 credit points.

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<td>ENGG5811 Critical and Systems Thinking</td>
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<td></td>
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<td>Semester 1 Semester 2</td>
</tr>
</tbody>
</table>

Choose elective units from Foundation, Specialisation or Professional Practice units.

For more information on degree program requirements visit CUSP.
Master of Project Management

To qualify for the award of the Master of Project Management a candidate must complete 48 credit points. The Master of Project Management is available with the following options: MPM - Generic (a) 2 Foundation units (PMGT5871 is compulsory) (b) 2 Specialisation units (any) (c) 2 Professional Practice units (PMGT5872 is compulsory) (d) 2 Elective units MPM - Specialisation (a) 2 Foundation units (PMGT5871 is compulsory) (b) 2 Specialisation units (including the core from your chosen specialisation) (c) 2 Professional Practice units (PMGT5872 is compulsory) (d) 2 Elective units MPM - Research pathway (Requires Distinction (75%) average or higher results over 24 credit points) (a) 2 Foundation units (PMGT5871 is compulsory) (b) 2 Specialisation units (c) 1 Elective unit (d) 1 Professional Practice unit (e) 12 credit points of Thesis units

Foundation units

Compulsory Core unit

PMGT5871
Project Process Planning and Control

Engineering and Information Technologies

Credit points: 6 Session: Int December, Int July, Semester 1, Semester 2, Summer Late Classes: Session 1: Evening, Online Session 2: Evening, Online, Block mode July Int and Dec Int: Block mode Assessment: Through session assessment (60%), Final Exam (40%) Campus: Camperdown/Darlington Mode of delivery: Block mode or On-line or Normal (lecture/lab/tutorial) Evening

Associated degrees: Grad Cert I T, Grad Cert Int Tech Man, Grad Cert P M, Grad Dip E, M Int Tech Man, M P E.

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.

Select a minimum of 6 credit points of the following:

PMGT5877
Management of Project Organisations

Engineering and Information Technologies

Credit points: 6 Session: Semester 1, Semester 2 Classes: Session 1: on-line; Session 2: 3 hours per week (evening) Assessment: Through semester assessment (60%), Final Exam (40%) Campus: Camperdown/Darlington Mode of delivery: On-line

Associated degrees: Grad Cert P M, Grad Dip E, M P E.

This course examines the challenges and approaches of managing project-oriented organisations. These could be independent business units or divisions within a larger corporation. Examples are construction contractors, ICT services, R&D units and many internal business units that are project-oriented.

Today, more organisations are adopting project management as a management strategy to provide effective and timely solutions to clients. They are managing organisational architecture to support both 'business as usual' and projects that are increasingly important to the organisation.

Focus is on the relationship between project management and the following: organisational culture, structure, processes, cross-functional teams, project governance, performance management, organisational learning, change and knowledge management. The assessment comprises a series of case study based assignments, quizzes and exams.

PMGT5886
System Dynamics Modelling for PM

Engineering and Information Technologies

Credit points: 6 Session: Semester 2 Classes: Session 2: 3hrs per week - evening Assessment: Through semester assessment (60%), Final Exam (40%) Campus: Camperdown/Darlington Mode of delivery: Normal (lecture/lab/tutorial) Evening

Associated degrees: B P M, Grad Cert P M, Grad Dip E, M P E.

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

Engineering and Information Technologies

Credit points: 6 Session: Semester 1, Semester 2 Classes: Session 1: On-line; Session 2: Block-mode Assessment: Through semester assessment (50%), Final Exam (50%) Campus: Camperdown/Darlington Mode of delivery: On-line

Associated degrees: Grad Cert P M, Grad Dip E, M I D M, M P E.

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.

PMGT5895
Contracts Management
Engineering and Information Technologies

**Credit points: 6** | **Session:** Semester 1, Semester 2 | **Classes:** Session 1: Evening; Session 2: On-line | **Assumed knowledge:** Risk Management and People & Leadership skills | **Assessment:** Through semester assessment (50%), Final Exam (50%) | **Campus:** Camperdown/Darlington | **Mode of delivery:** Normal (lecture/lab/tutorial) Evening

**Associated degrees:** Grad Cert P M.

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.

**Specialisation units**

Candidates who wish to complete a Specialisation complete 12 credit points from one of the Specialisations listed. Candidates must complete the Core unit and an additional unit. Exchange units may be taken as Specialist units with the approval of the Program Director.

**Master of Project Management**

**Specialisations**

**International Project Management**

**Core unit**

**PMGT5888 Global Project Management**

**Engineering and Information Technologies**

**Credit points: 6** | **Session:** Int January, Semester 1, Semester 2, Summer Late | **Classes:** Session 1: On-line; Session 2: Block Mode; Int Jan: Block Mode | **Assessment:** Through semester assessment (100%) | **Campus:** Camperdown/Darlington | **Mode of delivery:** Normal (lecture/lab/tutorial) Day

**Associated degrees:** Grad Cert P M, Grad Dip E, M P E.

This course has been 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.

**PMGT5893 Statistical Methods in PM**

**Engineering and Information Technologies**

**Credit points: 6** | **Session:** Semester 1 | **Classes:** 3hrs Weekly (evening) | **Assessment:** Through semester assessment (40%), Final Exam (60%) | **Campus:** Camperdown/Darlington | **Mode of delivery:** Normal (lecture/lab/tutorial) Evening

**Note:** Department permission required for enrolment.

**Associated degrees:** B P M, Grad Cert P M, Grad Dip E, M P E.

Aims: Students should achieve an understanding of the applications of statistical methods in project environments.

**Objectives:**
- Conduct hypothesis test and draw conclusions;
- Apply regression analysis to examine relationships between variables;
- Explain the relationships between variables;
- Describe the distributions of variables;
- Draw conclusions based on results observed in a sample;
- Discuss the application of statistical model for project selection;
- Apply the statistical techniques learned to a range of different "real world" situations;
- Apply R in analyzing and evaluating statistical information.

By the end of this unit of study, students should be able to:
- Discuss the applications of statistical methods;
- Evaluate a project situation based on statistical results; and
- Apply simple statistical methods to problem-solving in project management.

**PMGT6867 Quantitative Methods: Project Management**

**Engineering and Information Technologies**

**Credit points: 6** | **Session:** Semester 1, Semester 2 | **Classes:** 1: 3 hours per week (evening); 2: 3 hours per week (evening) & on-line | **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%) | **Campus:** Camperdown/Darlington | **Mode of delivery:** Normal (lecture/lab/tutorial) Evening

**Associated degrees:** B P M, Engineering PG Cross-Inst, Engineering PG Non-Degree, Engineering UG Cross-Inst, Engineering UG Non-Degree, Grad Cert I T, Grad Cert Inf Tech Man, Grad Cert P M, Grad Dip E, M P E.

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 Economics and Scheduling Management**

**Core unit**

**PMGT5889 Integrated Cost and Scheduling Control**

**Engineering and Information Technologies**

**Credit points: 6** | **Session:** Semester 1, Semester 2 | **Classes:** 1: On-line; 2: Block Mode | **Assessment:** Through semester assessment
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)

Select a minimum of 6 credit points of the following:

**PMGT5873 Project Economics and Finance**

**Engineering and Information Technologies**

Credit points: 6
Session: Semester 1, Semester 2
Classes: Session 1: Block mode; Session 2: On-line
Assessment: Through semester assessment (100%)
Campus: Camperdown/Darlington

Associated degrees: Grad Cert P M, Grad Dip E, M P E.

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.
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

Select a minimum of 6 credit points of the following:

**ENGG5203 Quality Engineering and Management**

**Engineering and Information Technologies**

Credit points: 6 Session: Semester 2 Classes: Presentation 2.00 hours per week. Project Work - in-class 2.00 hours per week. Assumed knowledge: First degree in Engineering or a related discipline. Assessment: Through semester assessment (100%).

Campus: Camperdown/Darlington Mode of delivery: Normal (lecture/lab/tutorial) Day

Associated degrees: Grad Dip E, M P E, M P L, M P M.

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 safe work practices and systems assurance.

**PMGT6893 Statistical Methods in PM**

**Engineering and Information Technologies**

Credit points: 6 Session: Semester 1 Classes: 3hrs Weekly (evening). Assessment: Through semester assessment (40%), Final Exam (60%)

Campus: Camperdown/Darlington Mode of delivery: Normal (lecture/lab/tutorial) Evening

Note: Department permission required for enrolment.

Associated degrees: B P M, Grad Cert P M, Grad Dip E, M P E.

Aims: Students should achieve an understanding of the applications of statistical methods in project environments.

Objectives: Students should be able to:
- Conduct hypothesis test and draw conclusions;
- Apply regression analysis to examine relationships between variables;
- Explain the relationships between variables;
- Describe the distributions of variables;
- Draw conclusions based on results observed in a sample;
- Discuss the application of statistical model for project selection;
- Apply the statistical techniques learned to a range of different "real world" situations;
- Apply R in analyzing and evaluating statistical information.

By the end of this unit of study, students should be able to:
- Discuss the applications of statistical methods;
- Evaluate a project situation based on statistical results; and
- Apply simple statistical methods to problem-solving in project management.

**PMGT6867 Quantitative Methods: Project Management Engineering and Information Technologies**

Credit points: 6 Session: Semester 1, Semester 2 Classes: Session 1: 3 hours per week (evening); Session 2: 3 hours per week (evening) & on-line

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%)

Campus: Camperdown/Darlington Mode of delivery: Normal (lecture/lab/tutorial) Evening

Associated degrees: B P M, Engineering PG Cross-Inst, Engineering PG Non-Degree, Engineering UG Cross-Inst, Engineering UG Non-Degree, Grad Cert I T, Grad Cert Inf Tech Man, Grad Cert P M, Grad Dip E, M P E.

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.

**Strategic Project Management Implementation**

Core unit

**PMGT5876 Strategic Delivery of Change**

**Engineering and Information Technologies**

Credit points: 6 Session: Semester 1, Semester 2 Classes: Session 1: Block mode; Session 2: Online. Prohibitions: WORK6226 Assessment: Through semester assessment (100%) Mode of delivery: On-line

Associated degrees: B P M, Grad Cert I T, Grad Cert Inf Tech Man, Grad Cert P L, Grad Cert P M, Grad Dip E, Grad Dip I T, M P E.

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.

Select a minimum of 6 credit points of the following:

**PMGT5875 Project Innovation Management**

**Engineering and Information Technologies**

Credit points: 6 Session: Semester 1, Semester 2 Classes: Session 1: Block mode; Session 2: Online. Assessment: Through semester assessment (100%)

Campus: Camperdown/Darlington Mode of delivery: On-line

Associated degrees: B C S T (Hons), B P M, Grad Cert P L, Grad Cert P M, Grad Dip E, M P E.

This course focuses 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**  
Engineering and Information Technologies  
**Credit points:** 6  
**Session:** Semester 1, Semester 2  
**Classes:** Session 1: Block Mode; Session 2: On-line  
**Assessment:** Through semester assessments (100%)  
**Campus:** Camperdown/Darlington  
**Mode of delivery:** Block Mode  
**Associated degrees:** B P M, Grad Cert P M, Grad Dip E, M P E.

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.

**PMGT6867 Quantitative Methods: Project Management**  
Engineering and Information Technologies  
**Credit points:** 6  
**Session:** Semester 1, Semester 2  
**Classes:** Session 1: 3 hours per week (evening); Session 2: 3 hours per week (evening) & on-line  
**Assessment:** Through semester assessment (40%), Final Exam (40%)  
**Campus:** Camperdown/Darlington  
**Mode of delivery:** Normal (lecture/lab/tutorial) Evening  
**Associated degrees:** B P M, Engineering PG Cross-Inst, Engineering PG Non-Degree, Engineering PG Cross-Inst, Engineering UG Non-Degree, Grad Cert I T, Grad Cert Inf Tech Man, Grad Cert P M, Grad Dip E, M P E.

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.

**Professional Practice units**

**Compulsory Core unit**

**PMGT5872 People and Leadership**  
Engineering and Information Technologies  
**Credit points:** 6  
**Session:** Int December, Semester 1, Semester 2, Summer  
**Main Classes:** Session 1: Weekly; Block mode & on-line Session 2: Block mode; Dec Int : Block Mode.  
**Assessment:** Through semester assessment (100%)  
**Campus:** Camperdown/Darlington  
**Mode of delivery:** Block Mode  
**Associated degrees:** Grad Cert I T, Grad Cert Inf Tech Man, Grad Cert P M, Grad Dip E, M Inf Tech Man, M P E.

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 OR online delivery OR block mode delivery
- Semester 2 = block mode delivery

Intensive December Session = block mode 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.

**ENG5205 Professional Practice in PM**  
Engineering and Information Technologies  
**Credit points:** 6  
**Session:** Semester 1, Semester 2  
**Classes:** Lecture 3hrs per week, E-Learning 1 hr per week.  
**Assumed knowledge:** Basic engineering or science knowledge. At least 2-3 years of work experience preferred.  
**Assessment:** Through semester assessment (60%), Final Exam (40%)  
**Campus:** Camperdown/Darlington  
**Mode of delivery:** Normal (lecture/lab/tutorial) Day  
**Note:** This is a core unit for 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.

**Associated degrees:** Grad Cert P M, Grad Dip E, M P E.

This UoS teaches the fundamental knowledge on the importance, organizational context and professional practice in project management. It serves as an introduction to project management practices for non-PM students. For PM students, this UoS lays the foundation to progress to advanced PM subjects. Although serving as a general introduction unit, the focus has been placed on scope, time, cost, and integration related issues.

Specifically, the UoS aims to:

1. introduce students to the institutional, organisational and professional environment for today’s project management practitioners as well as typical challenges and issues facing them;
2. demonstrate the importance of project management to engineering and organizations;
3. demonstrate the progression from strategy formulation to execution of the project;
4. provide a set of tools and techniques at different stages of a project’s lifecycle with emphasis on scope, time, cost and integration related issues;
5. highlight examples of project success/failures in project management and to take lessons from these;
6. consider the roles of project manager in the organization and management of people;
7. provide a path for students seeking improvements in their project management expertise.

**ENG5811 Critical and Systems Thinking**  
Engineering and Information Technologies  
**Credit points:** 6  
**Session:** Semester 1, Semester 2  
**Classes:** 3hr seminar/workshop per week.  
**Assessment:** Through semester assessment (100%)  
**Campus:** Camperdown/Darlington  
**Mode of delivery:** Normal (lecture/lab/tutorial) Day  
**Note:** Department permission required for enrolment.

**Associated degrees:** Grad Dip E, M E, M P E, M P M.

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.

As first in the sequence, the unit develops skills in making basic critical judgments on complex problem situations involving uncertainty, incomplete information and dynamically interacting technical and non-
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 foundations for the broader, more thoroughgoing analysis of complex system dynamics and the potential implications of particular management strategies to be developed in the subsequent Critical Thinking & Complex Systems Assessment unit of study and in other advanced Project Management units.

PMGT6869
Advanced Knowledge in Project Management
Engineering and Information Technologies
Credit points: 6 Session: Semester 1, Semester 2 Classes: Session 1: Weekly classes Session 2: Block mode Assumes knowledge: PMBoK Guide: Assessment: Through semester assessment (60%), Final Exam (40%) Mode of delivery: Block Mode
- Project Failure
- Systems Thinking
- Business Case Development
- Large and Multiple Projects
- International Project Teams
- Organisational Learning
- Corporate Law
- Organisational Design
- Performance and Benefit Measurement
- Project Management Methodologies
- Systems and Data Integration

Unit outcomes include an ability to:
* identify complex problems and situations
* analyse situations and apply research findings to cases/projects
* integrate diverse considerations
* examine multiple views
* prioritise information
* differentiate between process and content
* synthesise findings

Recommended reading: A Guide to the Project Management Body of Knowledge (PMBOK® Guide)

**Elective units**

Candidates may select a maximum of 12 credit points of Elective units.

*Choose elective units from Foundation, Specialisation or Professional Practice units.*

Exchange units may be taken as Elective units with the approval of the Program Director.

**ENGG5231**

Engineering Graduate Exchange A

**Engineering and Information Technologies**

Prerequisites: Permission from faculty and school. Assessment: Through semester assessment (100%) Campus: Camperdown/Darlington Mode of delivery: Normal (lecture/lab/tutorial) Day

Note: Department permission required for enrolment.

Associated degrees: M E, M Inf Tech, M Inf Tech Man, M P E, M P L, M P M.

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 for the Faculty of Engineering and Information Technologies.

**ENGG5232**

Engineering Graduate Exchange B

**Engineering and Information Technologies**

Credit points: 6 Session: Int January, Int July Classes: overseas short-course
Prerequisites: Permission from faculty and school. Assessment: Through semester assessment (100%) Campus: Camperdown/Darlington Mode of delivery: Normal (lecture/lab/tutorial) Day

Note: Department permission required for enrolment.

Associated degrees: M E, M Inf Tech, M Inf Tech Man, M P E, M P L, M P M.

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 for the Faculty of Engineering and Information Technologies.

**PMGT5896**

Sustainability & Intelligence in P. M.

**Engineering and Information Technologies**

Credit points: 6 Session: Semester 2 Classes: Session 2: Block Mode Assessment: Through semester assessment (100%) Campus: Camperdown/Darlington Mode of delivery: Block Mode

Note: Department permission required for enrolment.

Associated degrees: Grad Cert P L, Grad Cert P M.

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 economies 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

**Engineering and Information Technologies**

Credit points: 6 Session: Semester 2 Classes: Session 2: block mode Assessment: Through session assessment (100%) Campus: Camperdown/Darlington Mode of delivery: Block Mode

Note: Department permission required for enrolment.

Associated degrees: Grad Cert P L, Grad Cert P M.

This unit identifies the causes of some well-known project failures and reveals what can be learned by being able to think critically and analyse the issues. The aim of this unit is to outline traditional and contemporary theories in emergency response planning; to provide an overall scope of comprehensive emergency planning and the major elements that must be addressed in an Emergency Response Plan. Student outcomes from this unit include: Developing & implementing an Emergency Response Plan; Specific recommendations for the health & safety of emergency response personnel and provides concise information on learning objectives and a review of important concepts.
PMGT5898
Complex Project Leadership
Engineering and Information Technologies
Credit points: 6 Session: Semester 1 Classes: Session 1: block mode
Prohibitions: WORK5150 Assessment: Through session assessment (100%)
Campus: Camperdown/Darlington Mode of delivery: Block Mode
Note: Department permission required for enrolment.
Associated degrees: Engineering PG Cross-Inst, Engineering PG Non-Degree, Grad Cert P L, Grad Cert P M.

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 lead to managing 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 Practice Pathway
Requires Distinction (75%) average or higher results over 24 credit points.

PMGT5883
Project Management Thesis A
Engineering and Information Technologies
Credit points: 6 Session: Semester 1, Semester 2 Classes: project work - own time
Prohibitions: PMGT5892 Assessment: Through semester assessment (100%)
Campus: Camperdown/Darlington 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.

Associated degrees: M P M.

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.

Graduate Diploma in Project Management
To qualify for the award of the Graduate Diploma in Project Management a candidate must complete 36 credit points as follows:
(a) 2 Foundation units(b) 2 Specialist units(c) 1 Professional Practice unit
Candidates admitted to the Graduate Diploma, after completing 24 credit points, may proceed to the Master of Project Management by achieving a Credit (65%) average or above. Candidates intending to transfer to the Master of Project Management should plan their enrolment accordingly to ensure they meet the degree requirements of the MPM.

Foundation units
Candidates select 12 credit points of Foundation units.

PMGT5871
Project Process Planning and Control
Engineering and Information Technologies
Credit points: 6 Session: Int December, Int July, Semester 1, Semester 2, Summer Late Classes: Session 1: Evening, Online Session 2: Evening, Online, Block mode July Int and Dec Int : Block mode Assessment: Through session assessment (60%) , Final Exam (40%). Campus: Camperdown/Darlington Mode of delivery: Block Mode or On-line or Normal (lecture/lab/tutorial) Evening
Associated degrees: Grad Cert I T, Grad Cert Inf Tech Man, Grad Cert P M, Grad Dip E, M Inf Tech Man, M P E.

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.

PMGT5877
Management of Project Organisations
Engineering and Information Technologies
Credit points: 6 Session: Semester 1, Semester 2 Classes: Session 1: on-line; Session 2: 3 hours per week (evening) Assessment: Through semester assessment (60%), Final Exam (40%) Campus: Camperdown/Darlington Mode of delivery: On-line
Associated degrees: Grad Cert P M, Grad Dip E, M P E.

This course examines the challenges and approaches of managing project-oriented organisations. These could be independent business units or divisions within a larger corporation. Examples are construction contractors, ICT services, R&D units and many internal business units that are project-oriented.

Today, more organisations are adopting project management as a management strategy to provide effective and timely solutions to clients. They are managing organisational architecture to support both "business as usual" and projects that are increasingly important to the organisation.

Focus is on the relationship between project management and the following: organisational culture, structure, processes, cross-functional teams, project governance, performance management, organisational
learning, change and knowledge management. The assessment comprises a series of case study based assignments, quizzes and exams.

PMGT5886
System Dynamics Modelling for PM
Engineering and Information Technologies
Credit points: 6 Session: Semester 2 Classes: Session 2: 3hrs per week - evening Assessment: Through semester assessment (60%), Final Exam (40%)
Campus: Camperdown/Darlington Mode of delivery: Normal (lecture/lab/tutorial) Evening
Associated degrees: B P M, Grad Cert P M, Grad Dip E, M P E.
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
Engineering and Information Technologies
Credit points: 6 Session: Semester 1, Semester 2 Classes: Session 1: On-line; Session 2: Block-mode Assessment: Through semester assessment(50%), Final Exam (50%) Campus: Camperdown/Darlington Mode of delivery: On-line
Associated degrees: Grad Cert P M, Grad Dip E, M I D M, M P E.
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.

PMGT5905
Contracts Management
Engineering and Information Technologies
Credit points: 6 Session: Semester 1, Semester 2 Classes: Session 1: evening ; Session 2: on-line Assumed knowledge: Risk Management and People & Leadership skills. Assessment: Through semester assessment (50%), Final Exam (50%) Campus: Camperdown/Darlington Mode of delivery: Normal (lecture/lab/tutorial) Evening
Associated degrees: Grad Cert P M.
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.

Specialisation units
Candidates select 6 credit points of Specialisation units.

ENGG5203
Quality Engineering and Management
Engineering and Information Technologies
Credit points: 6 Session: Semester 2 Classes: Presentation 2.00 hours per week, Project Work - in class 2.00 hours per week. Assumed knowledge: First degree in Engineering or a related discipline. Assessment: Through semester assessment (100%) Campus: Camperdown/Darlington Mode of delivery: Normal (lecture/lab/tutorial) Day
Associated degrees: Grad Dip E, M P E, M P L, M P M.
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.

ENGG5215
International Eng Strategy & Operations
Engineering and Information Technologies
Credit points: 6 Session: Semester 2 Classes: Lecture 2 hours per week, Tutorial 2 hours per week. Project Work - in class 2 hours per week. Assumed knowledge: Soud competence in all aspects of engineering, and some understanding of issues of engineering management and globalisation Assessment: Through semester assessment (100%) Campus: Camperdown/Darlington Mode of delivery: Normal (lecture/lab/tutorial) Day
Associated degrees: Grad Dip E, M P E.
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.

PMGT5873
Project Economics and Finance
Engineering and Information Technologies
Credit points: 6 Session: Semester 1. Semester 2 Classes: Session 1: Block mode; Session 2: On-line Assessment: Through semester assessment (100%) Campus: Camperdown/Darlington Mode of delivery: On-line
Associated degrees: Grad Cert P M, Grad Dip E, M P E.
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.

PMGT5875
Project Innovation Management
Engineering and Information Technologies
Credit points: 6
Session: Semester 1, Semester 2
Classes: Session 1: Block mode; Session 2: Online
Assessment: Through semester assessment (100%)
Campus: Camperdown/Darlington
Mode of delivery: On-line
Associated degrees: B C S T (Hons), B P M, Grad Cert P L, Grad Cert P M, Grad Dip E, M P E.
This course focuses 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
Engineering and Information Technologies
Credit points: 6
Session: Semester 1, Semester 2
Classes: Session 1: Block Mode; Session 2: Online
Prohibitions: WORK6026
Assessment: Through semester assessment (100%)
Campus: Camperdown/Darlington
Mode of delivery: On-line
Associated degrees: B P M, Grad Cert I T, Grad Cert Inf Tech Man, Grad Cert P L, Grad Cert P M, Grad Dip E, Grad Dip I T, M P E.
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.

PMGT5879
Strategic Portfolio & Program Management
Engineering and Information Technologies
Credit points: 6
Session: Semester 1, Semester 2
Classes: Session 1: Block Mode; Session 2: On-line
Assessment: Through semester assessments (100%)
Campus: Camperdown/Darlington
Mode of delivery: Block Mode
Associated degrees: B P M, Grad Cert P M, Grad Dip E, M P E.
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.

PMGT5888
Global Project Management
Engineering and Information Technologies
Credit points: 6
Session: Int January, Semester 1, Semester 2, Summer Late
Classes: Session 1: On-line; Session 2: Block Mode; Int Jan: Block Mode
Assessment: Through semester assessment (100%)
Campus: Camperdown/Darlington
Mode of delivery: Online (lecture/lab/tutorial) Day
Associated degrees: Grad Cert P M, Grad Dip E, M P E.
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
Engineering and Information Technologies
Credit points: 6
Session: Semester 1, Semester 2
Classes: Session 1: On-line; Session 2: Block Mode
Assessment: Through semester assessment (50%), Final Exam (50%)
Campus: Camperdown/Darlington
Mode of delivery: Block Mode
Associated degrees: Grad Cert P M, Grad Dip E, M P E.
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)

**PMGT5891**

**Project Risk Management**

**Engineering and Information Technologies**

**Credit points:** 6  
**Session:** Semester 1, Semester 2  
**Classes:** Session 1: Block mode & on-line; Session 2: Block mode & on-line  
**Assessment:** Through semester assessment (100%)  
**Campus:** Camperdown/Darlington  
**Mode of delivery:** Block Mode or On-line

**Associated degrees:** Grad Cert P L, Grad Cert P M, Grad Dip E, M P E.

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

**PMGT5893**

**Statistical Methods in PM**

**Engineering and Information Technologies**

**Credit points:** 6  
**Session:** Semester 1  
**Classes:** 3hrs Weekly (evening)  
**Assessment:** Through semester assessment (40%), Final Exam (60%)  
**Campus:** Camperdown/Darlington  
**Mode of delivery:** Normal (lecture/lab/tutorial) Evening

**Note:** Department permission required for enrolment.

**Associated degrees:** B P M, Grad Cert P M, Grad Dip E, M P E.

**Aims:** Students should achieve an understanding of the applications of statistical methods in project environments.

**Objectives:** Students should be able to:
- Conduct hypothesis test and draw conclusions;
- Apply regression analysis to examine relationships between variables;
- Explain the relationships between variables;
- Describe the distributions of variables;
- Draw conclusions based on results observed in a sample;
- Discuss the application of statistical model for project selection;
- Apply the statistical techniques learned to a range of different “real world” situations;
- Apply R in analyzing and evaluating statistical information.

By the end of this unit of study, students should be able to:
- Discuss the applications of statistical methods;
- Evaluate a project situation based on statistical results; and
- Apply simple statistical methods to problem-solving in project management.

**PMGT6887**

**Quantitative Methods: Project Management**

**Engineering and Information Technologies**

**Credit points:** 6  
**Session:** Semester 1, Semester 2  
**Classes:** Session 1: 3 hours per week (evening); Session 2: 3 hours per week (evening) & on-line

**Assessment:** Through semester assessment (40%), Final Exam (40%)  
**Campus:** Camperdown/Darlington  
**Mode of delivery:** Normal (lecture/lab/tutorial) Day

**Associated degrees:** B P M, Engineering PG Cross-Inst, Engineering PG Non-Degree, Engineering UG Cross-Inst, Engineering UG Non-Degree, Grad Cert I T, Grad Cert Info Tech Man, Grad Cert P M, Grad Dip E, M P E.

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.

**Professional Practice units**

Candidates select 6 credit points of Professional Practice units.

**ENNG5205**

**Professional Practice in PM**

**Engineering and Information Technologies**

**Credit points:** 6  
**Session:** Semester 1, Semester 2  
**Classes:** Lecture 3hrs per week, E-Learning 1hr per week  
**Assumed knowledge:** Basic engineering or science knowledge. At least 2-3 years of work experience preferred.  
**Assessment:** Through semester assessment (80%), Final Exam (40%)  
**Campus:** Camperdown/Darlington  
**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.

**Associated degrees:** Grad Cert P M, Grad Dip E, M P E.

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 at different stages of a project and to take lessons from these;
6. Consider the roles of project manager in the organization and management of people;
provide a path for students seeking improvements in their project management expertise.

**ENGG5811**  
**Critical and Systems Thinking**  
**Engineering and Information Technologies**  
Credit points: 6  
Session: Semester 1, Semester 2  
Classes: 3hr seminar/workshop per week.  
Assessment: Through semester assessment (100%)  
Campus: Camperdown/Darlington  
Mode of delivery: Normal (lecture/lab/tutorial) Day  
Note: Department permission required for enrolment.  

Associated degrees: Grad Dip E, M E, M P E, M P M.  

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.

As first in the sequence, 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, 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 foundations for the broader, more thorough-going analysis of complex system dynamics and the potential implications of particular management strategies to be developed in the subsequent Critical Thinking & Complex Systems Assessment unit of study and in other advanced Project Management units.

**ENGG5812**  
**Critical Thinking and Systems Assessment**  
**Engineering and Information Technologies**  
Credit points: 6  
Session: Semester 1, Semester 2  
Classes: 3hr seminar/workshop per week.  
Assessment: Through semester assessment (100%)  
Campus: Camperdown/Darlington  
Mode of delivery: Normal (lecture/lab/tutorial) Day  
Note: Department permission required for enrolment.  

Associated degrees: Grad Dip E, M E, M P E, M P M.  

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.

**PMGT5872**  
**People and Leadership**  
**Engineering and Information Technologies**  
Credit points: 6  
Session: Int December, Semester 1, Semester 2  
Main Classes: Session 1: Weekly, Block mode & on-line Session 2: Block mode;  
Dec Int : Block Mode.  
Assessment: Through semester assessment (100%)  
Campus: Camperdown/Darlington  
Mode of delivery: Block Mode  

Associated degrees: Grad Cert I T, Grad Cert Int Tech Man, Grad Cert P M, Grad Dip E, M Int Tech Man, M P E.  

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 OR online delivery OR block mode delivery  
Semester 2 = block mode delivery  
Intensive December Session = block mode 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.

**Top areas covered:**  
* Project context  
* Personal Competence  
* Interpersonal Competence  
* Team Competence

The unit references a range of Australian and global Project Management, Management and Consulting Standards. It integrates theory and practice to optimise results.

Recommended reading: A Guide to the Project Management Body of Knowledge (PMBoK® Guide)

**PMGT5876**  
**Strategic Delivery of Change**  
**Engineering and Information Technologies**  
Credit points: 6  
Session: Semester 1, Semester 2  
Classes: Session 1; Block Mode; Session 2; Online Prohibitions: WOR6526  
Assessment: Through semester assessment (100%)  
Campus: Camperdown/Darlington  
Mode of delivery: On-line  

Associated degrees: B P M, Grad Cert I T, Grad Cert Int Tech Man, Grad Cert P L, Grad Cert P M, Grad Dip E, Grad Dip I T, M P E.  

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.

**PMGT5879**  
**Strategic Portfolio & Program Management**  
**Engineering and Information Technologies**  
Credit points: 6  
Session: Semester 1, Semester 2  
Classes: Session 1; Block Mode; Session 2; On-line  
Assessment: Through semester assessments (100%)  
Campus: Camperdown/Darlington  
Mode of delivery: Block Mode  

Associated degrees: B P M, Grad Cert P M, Grad Dip E, M P E.  

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.

PMGT6869
Advanced Knowledge in Project Management

Engineering and Information Technologies

Credit points: 8 Session: Semester 1, 2 Classes: Session 1: 8 weekly classes, Session 2: Block mode Assumed knowledge: PMBoK Guide Assessment: Through semester assessment (60%), Final Exam (40%)

Campus: Camperdown/Darlington Mode of delivery: Block mode

Note: Department permission required for enrolment.

Associated degrees: Engineering PG Cross-Inst, Engineering PG Non-Degree, Grad Cert P M, Grad Dip E, M P E.

This unit builds upon and challenges traditional views of project management. It concentrates on creating environments for the success of multiple, large, and complex projects. Particular attention is paid to the potential causes of project failure. Projects and problems are viewed as "systems" composed of interacting, interrelated, and interdependent components.

Topics:
- Project Failure
- Systems Thinking
- Business Case Development
- Large and Multiple Projects
- International Project Teams
- Organisational Learning
- Corporate Law
- Organisational Design
- Performance and Benefit Measurement
- Project Management Methodologies
- Systems and Data Integration

Unit outcomes include an ability to:
* identify complex problems and situations
* analyse situations and apply research findings to cases / projects
* integrate diverse considerations
* examine multiple views
* prioritise information
* differentiate between process and content
* synthesise findings

Recommended reading: A Guide to the Project Management Body of Knowledge (PMBOK® Guide)

Elective units
Candidates select 6 credit points of Elective units.

Choose elective units from Foundation, Specialisation or Professional Practice units.

Graduate Certificate in Project Management

To qualify for the award of the Graduate Certificate in Project Management a candidate must complete 24 credit points as follows:
(a) 2 Foundation units
(b) 1 Specialist unit
(c) 1 Elective or Professional Practice unit

Candidates admitted to the Graduate Certificate, after completing the requirements, may proceed to the Master of Project Management by achieving a Credit (65%) average or above. Candidates intending to transfer to the Master of Project Management should plan their enrolment accordingly to ensure they meet the degree requirements of the MPM.

Foundation units
Candidates select 12 credit points of Foundation units.

PMGT5871
Project Process Planning and Control
Engineering and Information Technologies

Credit points: 8 Session: Int December, Int July, Semester 1, Semester 2, Summer Late Classes: Session 1: Evening, Online Session 2: Evening, Online, Block mode July Int and Dec Int: Block mode

Assessment: Through semester assessment (60%), Final Exam (40%)

Campus: Camperdown/Darlington

Mode of delivery: Block mode or On-line or Normal (lecture/lab/tutorial) Evening

Associated degrees: Grad Cert I T, Grad Cert Inf Tech Man, Grad Cert P M, Grad Dip E, M Inf Tech Man, M P E.

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.

PMGT5877
Management of Project Organisations
Engineering and Information Technologies

Credit points: 8 Session: Semester 1, Semester 2 Classes: Session 1: on-line; Session 2: 3 hours per week (evening)

Assessment: Through semester assessment (60%), Final Exam (40%)

Campus: Camperdown/Darlington

Mode of delivery: On-line

Associated degrees: Grad Cert P M, Grad Dip E, M P E.

This course examines the challenges and approaches of managing project-oriented organisations. These could be independent business units or divisions within a larger corporation. Examples are construction contractors, ICT services, R&D units and many internal business units that are project-oriented.

Today, more organisations are adopting project management as a management strategy to provide effective and timely solutions to clients. They are managing organisational architecture to support both "business as usual" and projects that are increasingly important to the organisation.

Focus is on the relationship between project management and the following: organisational culture, structure, processes, cross-functional teams, project governance, performance management, organisational learning, change and knowledge management. The assessment comprises a series of case study based assignments, quizzes and exams.

PMGT5886
System Dynamics Modelling for PM
Engineering and Information Technologies

Credit points: 6 Session: Semester 2 Classes: Session 2: 3hrs per week - evening

Assessment: Through semester assessment (60%), Final Exam (40%)

Campus: Camperdown/Darlington

Mode of delivery: Normal (lecture/lab/tutorial) Evening

Associated degrees: B P M, Grad Cert P M, Grad Dip E, M P E.

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

Unit of study descriptions

485
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 graphs such as S curves relating estimating and cost control from order-of-magnitude numbers to appropriation grade budgets.

**PMGT5985**

**Contracts Management**

**Engineering and Information Technologies**

Credit points: 6  Session: Semester 1, Semester 2  Classes: Session 1: evening; Session 2: on-line  Assumed knowledge: Risk Management and People & Leadership skills. Assessment: Through semester assessment (50%), Final Exam (50%)  Campus: Camperdown/Darlington  Mode of delivery: Normal (lecture/lab/tutorial) Evening  

**Associated degrees:** Grad Cert P M, Grad Dip E, M I D M, M P E.

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.

**Specialisation units**

Candidates select 6 credit points of Specialisation units.

**ENGG5203**

Quality Engineering and Management
This course focuses 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 a user driven approach; distribution of innovation over many independent but collaborating actors; and the importance of diverse thinking tools (for example: design thinking, systems thinking, integrative thinking, and hybrid thinking) that empower users to innovate for themselves.

**PMGT5876**

**Strategic Delivery of Change**

**Engineering and Information Technologies**

**Credit points:** 6  
**Session:** Semester 1, Semester 2  
**Classes:** Session 1: Block Mode; Session 2: Online  
**Prohibitions:** WOR65026  
**Assessment:** Through semester assessment (100%)  
**Campus:** Camperdown/Darlington  
**Mode of delivery:** Online

**Associated degrees:** B P M, Grad Cert I T, Grad Cert Inf Tech Man, Grad Cert P L, Grad Cert P M, Grad Dip E, Grad Dip I T, M P E.

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.

**PMGT5879**

**Strategic Portfolio & Program Management**

**Engineering and Information Technologies**

**Credit points:** 6  
**Session:** Semester 1, Semester 2  
**Classes:** Session 1: Block Mode; Session 2: Online  
**Assessment:** Through semester assessment (100%)  
**Campus:** Camperdown/Darlington  
**Mode of delivery:** Block Mode

**Associated degrees:** B P M, Grad Cert P M, Grad Dip E, M P E.

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.

**PMGT5888**

**Global Project Management**

**Engineering and Information Technologies**

**Credit points:** 6  
**Session:** Int January, Semester 1, Semester 2, Summer Late  
**Classes:** Session 1: On-line; Session 2: Block Mode; Int Jan: Block Mode  
**Assessment:** Through semester assessment (100%)  
**Campus:** Camperdown/Darlington  
**Mode of delivery:** Normal (lecture/lab/tutorial) Day

**Associated degrees:** Grad Cert P M, Grad Dip E, M P E.

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**

**Engineering and Information Technologies**

**Credit points:** 6  
**Session:** Semester 1, Semester 2  
**Classes:** Session 1: On-line;Session 2: Block Mode  
**Assessment:** Through semester assessment (50%), Final Exam (50%)  
**Campus:** Camperdown/Darlington  
**Mode of delivery:** Block Mode

**Associated degrees:** Grad Cert P M, Grad Dip E, M P E.

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)

**PMGT5891**

**Project Risk Management**

**Engineering and Information Technologies**

**Credit points:** 6  
**Session:** Semester 1, Semester 2  
**Classes:** Session 1: Block mode & on-line; Session 2: Block mode & on-line  
**Assessment:** Through semester assessment (100%)  
**Campus:** Camperdown/Darlington  
**Mode of delivery:** Block Mode or On-line

**Associated degrees:** Grad Cert P L, Grad Cert P M, Grad Dip E, M P E.

This unit is delivered in multiple modes. Please ensure that the correct mode is selected before checking the detailed content. The modes are categorized 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

PMGT5893 Statistical Methods in PM Engineering and Information Technologies

Credit points: 6 Session: Semester 1 Classes: 3hrs Weekly (evening) Assessment: Through semester assessment (40%), Final Exam (60%) Campus: Camperdown/Darlington Mode of delivery: Normal (lecture/lab/tutorial) Evening

Note: Department permission required for enrolment.

Associated degrees: B P M, Grad Cert P M, Grad Dip E, M P E.

Aims: Students should achieve an understanding of the applications of statistical methods in project environments.

Objectives: Students should be able to:
- Conduct hypothesis test and draw conclusions;
- Apply regression analysis to examine relationships between variables;
- Explain the relationships between variables;
- Describe the distributions of variables;
- Draw conclusions based on results observed in a sample;
- Discuss the application of statistical model for project selection;
- Apply the statistical techniques learned to a range of different "real world" situations;
- Apply R in analyzing and evaluating statistical information.

By the end of this unit of study, students should be able to:
- Discuss the applications of statistical methods;
- Evaluate a project situation based on statistical results; and
- Apply simple statistical methods to problem-solving in project management.

PMGT6867 Quantitative Methods: Project Management Engineering and Information Technologies

Credit points: 6 Session: Semester 1, Semester 2 Classes: Session 1: 3 hrs per week (evening); Session 2: 3 hrs per week (evening) & on-line

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%) Campus: Camperdown/Darlington Mode of delivery: Normal (lecture/lab/tutorial) Evening


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.

Professional Practice units and Elective units

Candidates select 6 credit points.

ENGG5205 Professional Practice in PM Engineering and Information Technologies

Credit points: 6 Session: Semester 1, Semester 2 Classes: Lecture 3hrs per week, E-Learning 1 hr per week. Assumed knowledge: Basic engineering or science knowledge. At least 2-3 years of work experience preferred. Assessment: Through semester assessment (60%), Final Exam (40%) Campus: Camperdown/Darlington 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.

Associated degrees: Grad Cert P M, Grad Dip E, M P E.

This UoS teaches the fundamental knowledge on the importance, organizational context and professional practice in project management. It serves as an introduction to project management practices for non-PM students. For PM students, this UoS lays the foundation to progress to advanced PM subjects. Although serving as a general introduction unit, the focus has been placed on scope, time, cost, and integration related issues.

Specifically, the UoS aims to:
1. introduce students to the institutional, organisational and professional environment for today's project management practitioners as well as typical challenges and issues facing them;
2. demonstrate the importance of project management to engineering and organizations;
3. demonstrate the progression from strategy formulation to execution of the project;
4. provide a set of tools and techniques at different stages of a project's lifecycle with emphasis on scope, time, cost and integration related issues;
5. highlight examples of project success/failures in project management and to take lessons from these;
6. consider the roles of project manager in the organization and management of people;
7. provide a path for students seeking improvements in their project management expertise.

ENGG5111 Critical and Systems Thinking Engineering and Information Technologies

Credit points: 6 Session: Semester 1, Semester 2 Classes: 3hr seminar/workshop per week. Assessment: Through semester assessment (100%) Campus: Camperdown/Darlington Mode of delivery: Normal (lecture/lab/tutorial) Day

Note: Department permission required for enrolment.

Associated degrees: Grad Dip E, M E, M P E, M P M.

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.

As first in the sequence, 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, 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
Unit of study descriptions

PMGT5872
People and Leadership
Engineering and Information Technologies
Credit points: 6 Session: Int December, Semester 1, Semester 2 Classes: 3 hr seminar/workshop per week. Assessment: Through semester assessment (100%). Campus: Camperdown/Darlington Mode of delivery: Block Mode
Note: Department permission required for enrolment.
Associated degrees: Grad Dip E, M E, M P M.

This unit builds upon and challenges traditional views of people management capability. It covers diverse traditional and innovative theories, models and tools. It complements traditional views based on PMBoK, applying diverse approaches to contemporary project environments. Many of the unit tasks are framed in uncertain and potentially ambiguous terms as is common in many project environments.

Topic areas covered:
* Project context
* Personal Competence
* Interpersonal Competence
* Team Competence

The unit references a range of Australian and global Project Management, Management and Consulting Standards. It integrates theory and practice to optimise results.
Recommended reading: A Guide to the Project Management Body of Knowledge (PMBoK® Guide)

PMGT5876
Strategic Delivery of Change
Engineering and Information Technologies
Credit points: 6 Session: Semester 1, Semester 2 Classes: Session 1: Block Mode; Session 2: Online Prohibitions: WORK6226 Assessment: Through semester assessment (100%). Campus: Camperdown/Darlington Mode of delivery: On-line
Associated degrees: B P M, Grad Cert I T, Grad Cert Int Tech Man, Grad Cert P M, Grad Cert P M, Grad Dip E, Grad Dip I T, M P E.

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.

PMGT5879
Strategic Portfolio & Program Management
Engineering and Information Technologies
Credit points: 6 Session: Semester 1, Semester 2 Classes: Session 1: Block Mode; Session 2: On-line Assessment: Through semester assessments (100%). Campus: Camperdown/Darlington Mode of delivery: Block Mode
Associated degrees: B P M, Grad Cert P M, Grad Dip E, M P E.

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.

PMGT6869
Advanced Knowledge in Project Management
Engineering and Information Technologies
Credit points: 6 Session: Semester 1, Semester 2 Classes: Session 1: Weekly classes Session 2: Block mode Assessment: Through semester assessment (60%), Final Exam (40%). Campus: Camperdown/Darlington Mode of delivery: Block Mode
Note: Department permission required for enrolment.
Associated degrees: Engineering PG Cross-Inst, Engineering PG Non-Degree, Grad Cert P M, Grad Dip E, M P E.

This unit builds upon and challenges traditional views of project management. It concentrates on creating environments for the success of multiple, large and complex projects. Particular attention is paid to the potential causes of project failure. Projects and problems are viewed ‘as systems’ composed of interacting, interrelated, and interdependent components.
Unit of study descriptions

Topics:
- Project Failure
- Systems Thinking
- Business Case Development
- Large and Multiple Projects
- International Project Teams
- Organisational Learning
- Corporate Law
- Organisational Design
- Performance and Benefit Measurement
- Project Management Methodologies
- Systems and Data Integration

Unit outcomes include an ability to:
* identify complex problems and situations
* analyse situations and apply research findings to cases / projects
* integrate diverse considerations
* examine multiple views
* prioritise information
* differentiate between process and content
* synthesise findings

Recommended reading: A Guide to the Project Management Body of Knowledge (PMBOK® Guide)

Choose elective units from Foundation, Specialisation or Professional Practice units.

For more information on units of study visit CUSP.
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