Courses, programs and any arrangements for programs including staff allocated as stated in this Handbook are an expression of intent only. The University reserves the right to discontinue or vary arrangements at any time without notice. Information has been brought up to date as at 10 December 1999, but may be amended without notice by the University Council.

© The University of New South Wales
# Contents

## Introduction
1

## Faculty of Engineering Websites
2

## Changes to Academic Programs in 2000
3

## Calendar of Dates
5

## Staff
7

## Handbook User Guide
15

### Faculty Information
17
- Some People Who Can Help You
- Entrance Requirements
- Units of Credit
- Enrolment Procedures
- UNSW Library Facilities
- Student Equity
- Equal Opportunity in Education Policy Statement
- Students With Disabilities
- Special Government Policies
- Professional Institutions
- Student Clubs and Societies
- General Information

### Undergraduate Study – Summary of Programs
21
- Full-time Programs
- Combined Degree Programs
- Concurrent Degree Programs
- Other Engineering Programs at UNSW
- Co-op Program
- Transfer Programs
- Program Revision
- General Rules for Progression
- Honours
- Industrial Experience Requirements
- Access to Exam Information
- General Education Program
- Bachelor of Engineering Program Rules
- Bachelor of Science in Industrial Chemistry Program Rules

### Graduate Study – Summary of Programs
25
- English Language Requirements
- Research Degrees
- Doctor of Philosophy
- Master of Engineering/Master of Science
- Coursework Masters Degrees
- Master of Engineering Science
- Graduate Diplomas
- Graduate Certificate
- Graduate Courses
- Research and Project Areas
- Biomedical Engineering
- CANCES
- Chemical Engineering and Industrial Chemistry

---

### Undergraduate Study – Summary of Programs

<table>
<thead>
<tr>
<th>Section</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>Full-time Programs</td>
<td>21</td>
</tr>
<tr>
<td>Combined Degree Programs</td>
<td>21</td>
</tr>
<tr>
<td>Concurrent Degree Programs</td>
<td>21</td>
</tr>
<tr>
<td>Other Engineering Programs at UNSW</td>
<td>22</td>
</tr>
<tr>
<td>Co-op Program</td>
<td>22</td>
</tr>
<tr>
<td>Transfer Programs</td>
<td>22</td>
</tr>
<tr>
<td>Program Revision</td>
<td>22</td>
</tr>
<tr>
<td>General Rules for Progression</td>
<td>22</td>
</tr>
<tr>
<td>Honours</td>
<td>22</td>
</tr>
<tr>
<td>Industrial Experience Requirements</td>
<td>23</td>
</tr>
<tr>
<td>Access to Exam Information</td>
<td>23</td>
</tr>
<tr>
<td>General Education Program</td>
<td>23</td>
</tr>
<tr>
<td>Bachelor of Engineering Program Rules</td>
<td>24</td>
</tr>
<tr>
<td>Bachelor of Science in Industrial Chemistry Program Rules</td>
<td>24</td>
</tr>
</tbody>
</table>

### Graduate Study – Summary of Programs

<table>
<thead>
<tr>
<th>Section</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>English Language Requirements</td>
<td>25</td>
</tr>
<tr>
<td>Research Degrees</td>
<td>25</td>
</tr>
<tr>
<td>Doctor of Philosophy</td>
<td>25</td>
</tr>
<tr>
<td>Master of Engineering/Master of Science</td>
<td>26</td>
</tr>
<tr>
<td>Coursework Masters Degrees</td>
<td>26</td>
</tr>
<tr>
<td>Master of Engineering Science</td>
<td>26</td>
</tr>
<tr>
<td>Graduate Diplomas</td>
<td>27</td>
</tr>
<tr>
<td>Graduate Certificate</td>
<td>27</td>
</tr>
<tr>
<td>Graduate Courses</td>
<td>27</td>
</tr>
<tr>
<td>Research and Project Areas</td>
<td>28</td>
</tr>
<tr>
<td>Biomedical Engineering</td>
<td>28</td>
</tr>
<tr>
<td>CANCES</td>
<td>28</td>
</tr>
<tr>
<td>Chemical Engineering and Industrial Chemistry</td>
<td>28</td>
</tr>
</tbody>
</table>
School of Chemical Engineering and Industrial Chemistry

Undergraduate Study

Program Outlines

3040 Chemical Engineering/Master of Commerce – Full-time Program
3042 Chemical Engineering/Computer Science – Full-time Program
3048 Chemical Engineering/MBioMedE - Full-time Program
3100 Industrial Chemistry - Full-time Program
Industrial Chemistry/Master of Commerce – Full-time Program
3102 Industrial Chemistry/Bachelor of Computer Science - Full-time Program
Part-time programs
3050 Chemical Engineering - Part-time Program
3110 Industrial Chemistry - Part-time Program

Postgraduate Study

Program Outlines

Master of Engineering Science Degree Programs
8016 Process Engineering

Course Descriptions

School of Civil and Environmental Engineering

Undergraduate Study

Program Outlines

3620 Civil Engineering – Full-time Program
3625 Environmental Engineering – Full-time Program
Combined Programs
3621 BE BA in Civil Engineering – Full-time Program
3626 BE BA in Environmental Engineering – Full-time Program
3730 BE BSc in Civil Engineering – Full-time Program
Combined Program BE(Civil) BSc(Computer Science)
3735 BE BSc in Environmental Engineering – Full-time Program
Combined Program BE(Environmental) BSc(Computer Science)
3631 BE in Civil Engineering BE in Environmental Engineering
3148 BE in Civil Engineering BE in Mining Engineering – Full-time Program
4775 BE LLB in Civil Engineering and Law – Full-time Program
4777 BE LLB in Environmental Engineering and Law – Full-time Program
BE/MCom Bachelor of Engineering/Master of Commerce
3622 BEMEngSc in Civil Engineering – Full-time Program
3627 BE MEngSc in Environmental Engineering – Full-time program

Postgraduate Study

Course Work Programs
8612 Master of Engineering Science
8615 Master of Environmental Engineering Science
8617 Master of Engineering Science
8619 Master of Environmental Engineering Science
Graduate Diplomas in Civil and Environmental Engineering
5459 Graduate Diploma
5454 Graduate Diploma
Certificate in Civil and Environmental Engineering

Course Descriptions

School of Computer Science and Engineering

Undergraduate Study

Program Outlines

Computer Engineering - Full-time Program
Software Engineering - Full-time Program
Software Engineering Combined Programs
3651 BE BSc in Software Engineering
3652 BE BA in Software Engineering
Combined Programs
3728 Computer Engineering/Biomedical Engineering – Full-time Course
3722 BE BA in Computer Engineering
School of Electrical Engineering and Telecommunications

Undergraduate Study
Program Outlines
ELECA13640 Electrical Engineering - Full-time Program
TELEA13643 Telecommunications Engineering Full Time Program
ELECA13640 and TELEA13643 Electrical Engineering and Telecommunications – Part-time Programs
COMPA13645 Computer Engineering – Full-time Program
Professional Electives – all programs
Combined Degree Programs
BE (Electrical Engineering) Combined Degree Programs in Science and Arts
BE (Telecommunications) Combined Degree Programs in Science and Arts
BE (Electrical Engineering) BE (Telecommunications) Combined Degree Programs with Master of Commerce
Rules for all Combined Degrees

Postgraduate Study
Coursework Programs
ELEC(A-F)S8501 Master of Engineering Science in Electrical Engineering
Core Postgraduate Electives
Postgraduate Electives
TELEAS8502 Master of Engineering Science in Telecommunications
Core Postgraduate Telecommunications Electives
Postgraduate Electives
ELEC(A-F)S5458 Graduate Diploma in Electrical Engineering
TELEAS5450 Graduate Diploma in Telecommunications

School of Geomatic Engineering

Undergraduate Study
Program Outlines
3741 Geomatic Engineering
Combined Programs
3746 Combined Bachelor of Engineering in Geomatic Engineering/Bachelor of Science in Computer Science Program
3747 Combined Bachelor of Engineering (Geomatic Engineering)/Bachelor of Arts Program
3748 BE/MCom Fast Track Program Structure Combined Bachelor of Engineering (Geomatic Engineering)/Master of Commerce program

Postgraduate Study
8651 Geomatic Engineering
8651 Geomatic Engineering (External Mode Delivery)
8652 Geographic Information Systems
8653 Land Administration
8641 Remote Sensing
5492 Graduate Diploma in Geomatic EngineeringGradDip
5493 Graduate Diploma in Land Administration GradDipLandAdmin
5496 Graduate Diploma in Remote Sensing

Course Descriptions

School of Mechanical and Manufacturing Engineering

Undergraduate Study
Program Outlines
Single Degree Program
Aerospace Engineering Plan
Manufacturing Engineering and Management Plan
Mechanical Engineering Plan
Mechatronic Engineering Plan
Naval Architecture Plan 137
Combined Degree Programs 137
3712 Bachelor of Engineering/Bachelor of Arts 138
Concurrent Degree Programs 139
Manufacturing Engineering and Management (BE MCom) Plan 139
Mechanical Engineering (BE MCom) Plan 139

Postgraduate Study 140
8710 Master of Engineering Science Program 140
5710 Graduate Diploma Program 141

Course Descriptions 142

School of Mining Engineering 155
Undergraduate Study 156
Program Outlines 156
3140 Bachelor of Engineering 156
BE(Mining Engineering)/MCom Fasttrack Program 156
3142 BE(Mining)/BSc 157
3144 BE(Mining)/BA 157
3146 BE(Civil BE(Mining) in Civil Engineering and Mining Engineering - Full-time Cours 157

Postgraduate Study 157
Program Outlines 157
8055 Mining Engineering Master of Engineering Science 157
5040 Mining Engineering Graduate Diploma 158
7335 Graduate Certificate in Mining Engineering 158

Course Descriptions 159

School of Petroleum Engineering 165
3045 Petroleum Engineering - Full Time Program (Hons) 166
5031 Petroleum Engineering - Full Time / Part Time Internal /External 166
Combined Degree Bachelor of Engineering (Petroleum) / Master Commerce 167
Open Learning Programs 167
7335 Petroleum Engineering - Part Time External Graduate Certificate 167
8655 Petroleum Engineering - Part Time External MEngSc 167

Course Descriptions 168

Graduate School of Biomedical Engineering 171
Concurrent Degree Programs 171
Professional Recognition 171

Undergraduate Study 172
Course Outlines 172
3048 Chemical Engineering/Biomedical Engineering Full-time Program 172
3683 Mechanical Engineering/Biomedical Engineering – Full-time Program 173
3723 Telecommunication Engineering/Biomedical Engineering Full-time Program 174
3727 Electrical Engineering/Biomedical Engineering Full-time Program 174
3728 Computer Engineering/Biomedical Engineering – Full-time Program 176

Postgraduate Study 177
Course Work Programs 177
8660 Master of Biomedical Engineering 177
8665 Master of Engineering Science 177
5445 Graduate Diploma in Biomedical Engineering 178

Course Descriptions 179

Graduate Programs in Business and Technology 183
MBT Program 183
Course Outlines 183
8616 Master of Business and Technology 183
5457 Graduate Diploma in Industrial Management 184
Course Descriptions 184
8007 Master of Technology Management 186
Course Descriptions 187
### Centre for Photovoltaic Engineering

197

**Undergraduate Study**

197

**Postgraduate Study**

200

- 8501 Master of Engineering Science in Electrical Engineering, Majoring in Photovoltaics
- 5458 Graduate Diploma in Electrical Engineering

### Faculty Centres

203

- Centre for Advanced Numerical Computation in Engineering and Science
- Centre for Applied Polymer Science
- Centre for Particle and Catalyst Technologies
- Centre for Remote Sensing and Geographic Information Systems
- Centre for Water and Waste Technology
- Energy Research, Development and Information Centre (ERDIC)
- UNESCO Centre for Membrane Science and Technology
- Munro Centre for Civil and Environmental Engineering
- Centre for Postgraduate Studies in Civil and Environmental Engineering
- UNSW Groundwater Centre

### Servicing Course Descriptions

207

### Conditions for the Award of Degrees

229

**First Degrees**

- Doctor of Philosophy (PhD)

**Higher Degrees**

- Master of Biomedical Engineering (MBiomedE)
- Master of Business and Technology (MBT)
- Master of Computer Science (MCompSc)
- Master of Engineering (ME) and Master of Science (MSc)
- Master of Engineering (ME) and Master of Science (MSc) without supervision
- Master of Environmental Engineering Science (MEnvEngSc)
- Master of Information Science (MInfSc)
- Graduate Diploma (GradDip)
- Graduate Diploma in Industrial Management (GradDip)

### Scholarships

239

**Undergraduate Scholarships**

240

**Postgraduate Scholarships**

254

### Prizes

268
This Handbook provides information about undergraduate and postgraduate programs offered by the Faculty of Engineering at UNSW. It also contains descriptions of the programs offered and lists areas in which research may be undertaken.

The Faculty comprises the Schools of Chemical Engineering and Industrial Chemistry, Civil and Environmental Engineering, Computer Science and Engineering, Electrical Engineering and Telecommunications, Geomatic Engineering, Mechanical and Manufacturing Engineering, Mining Engineering and Petroleum Engineering as well as the Graduate School of Biomedical Engineering and the Graduate Programs in Business and Technology. The Faculty has several research Centres and is also actively engaged with nine co-operative Research Centres (CRC's).

The Faculty of Engineering is dedicated to scholarship, teaching and research in technology and their application for the benefit of the community. The Schools of the Faculty offer undergraduate programs leading to the award of the Bachelor of Engineering (BE). There are also numerous combined programs leading to the award of the BE in combination with the BSc BA and LLB degrees and concurrent programs for the BE and the Master of Biomedical Engineering as well as 'fast-track' programs leading to the Master of Commerce following an Engineering undergraduate program.

Postgraduate study in the Faculty can lead to the award of Graduate Diplomas and coursework Masters degrees as well as Masters and PhD degrees by research.

The Faculty is committed to developing the scientific, technical and creative skills of its students. Programs also focus on skills and knowledge required to direct and manage engineering activities. These latter require an ability to work in teams, an understanding of human and physical environments and a highly developed skill in communication with other members of the profession and the public.

In order to develop innovation and a reappraisal of current practice, the Faculty provides postgraduate programs for the continuing education of its graduates.

As part of the development of the engineering professional, the Faculty encourages its students to play an active part in the entire life of the University. Student activities and professional organisations are amongst the opportunities to do this.

MS Wainwright
Dean
Faculty of Engineering
## Faculty of Engineering Websites

- **Faculty of Engineering**
  
  [http://www.eng.unsw.edu.au](http://www.eng.unsw.edu.au)

- **School of Chemical Engineering and Industrial Chemistry**
  
  [http://www.ceic.unsw.edu.au](http://www.ceic.unsw.edu.au)

- **School of Civil and Environmental Engineering**
  
  [http://www.clveng.unsw.edu.au](http://www.clveng.unsw.edu.au)

- **School of Computer Science and Engineering**
  
  [http://www.cse.unsw.edu.au](http://www.cse.unsw.edu.au)

- **School of Electrical Engineering and Telecommunications**
  
  [http://www.ee.unsw.edu.au](http://www.ee.unsw.edu.au)

- **School of Geomatic Engineering**
  
  [http://www.gmat.unsw.edu.au](http://www.gmat.unsw.edu.au)

- **School of Mechanical and Manufacturing Engineering**
  
  [http://www.eng.unsw.edu.au](http://www.eng.unsw.edu.au)

- **School of Mining Engineering**
  
  [http://www.mining.unsw.edu.au](http://www.mining.unsw.edu.au)

- **School of Petroleum Engineering**
  
  [http://www.petrol.unsw.edu.au](http://www.petrol.unsw.edu.au)

- **Graduate School of Biomedical Engineering**
  
  [http://www.gsbme.unsw.edu.au](http://www.gsbme.unsw.edu.au)
Changes to Academic Programs in 2000

From the start of 2000, the University will move to a new academic structure that will be common to all undergraduate and postgraduate programs. The new structure will lead to greater flexibility and improved educational opportunities for students.

While many programs are already structured in a way consistent with the new direction, others have been revised for 2000 to take advantage of the benefits of the new structure.

What is the New Academic Structure?

The new academic structure is based on units of credit, which replace credit points. A full-time enrolment for one year is defined as 48 units of credit. A normal full-time enrolment for one semester is 24 units of credit. (You will be regarded as full-time if you enrol in at least 18 units per semester.)

Courses (subjects) will also change to reflect the new structure. Most courses will be worth 6 units of credit. Some courses will have a higher or lower value: for example, undergraduate General Education courses will be worth 3 units of credit.

A full-time student in an undergraduate or graduate coursework program will typically enrol in four x 6 unit courses per semester.

Units of Credit

From January, 2000 the University will move to a new academic structure based on units of credit. A full-time enrolment for one year is defined as 48 units of credit (24 per semester). A course will have the same unit of credit value and generate the same load for HECS and fees irrespective of the program or stage in which it is taken. All courses will be measured in whole units of credit. The normal workload expectations are 25 - 30 hours per semester for each unit of credit, including class contact hours, preparation and time spent on all assessable work.

Terminology

Along with the change from credit points to units of credit there will be other changes in terminology from 1 January 2000. What you know as your course (Example: 3502 Bachelor of Commerce) will become your program and what you know as a subject (Example: ACCT2522) will become a course.

Further Information

For information specific to your program, including advice about enrolment, your standing and study options contact your program office.

For general information about these changes and updates to arrangements:

NewSouth Q (Kensington) - 9385 3093
Student Centre, College of Fine Arts - 9385 0684
UNSW Website - www.unsw.edu.au
NewSouth Solutions - nss.admin.unsw.edu.au/student/student_info.html
The academic year is divided into two sessions, each containing 14 weeks for teaching. Between the two sessions there is a break of approximately six weeks, which includes a one-week study period, two weeks for examinations, and three weeks recess. There is also a short recess of one week within each session.

Session 1 commences on the Monday nearest 1 March.

Faculties other than Medicine, AGSM and University College, ADFA

<table>
<thead>
<tr>
<th>Session 1</th>
<th>2000</th>
<th>2001</th>
</tr>
</thead>
<tbody>
<tr>
<td>(14 weeks)</td>
<td>28 February to 20 April</td>
<td>26 February to 12 April</td>
</tr>
<tr>
<td>1 May to 9 June</td>
<td>23 April to 8 June</td>
<td></td>
</tr>
<tr>
<td>Mid-session recess</td>
<td>21 April to 30 April</td>
<td>13 April to 22 April</td>
</tr>
<tr>
<td>AVCC Common dates:</td>
<td>16 April to 20 April</td>
<td>9 June to 14 June</td>
</tr>
<tr>
<td>Study period</td>
<td>10 June to 14 June</td>
<td>15 June to 3 July</td>
</tr>
<tr>
<td>Examinations</td>
<td>15 June to 29 June</td>
<td></td>
</tr>
<tr>
<td>Mid-year recess</td>
<td>30 June to 16 July</td>
<td>4 July to 22 July</td>
</tr>
<tr>
<td></td>
<td>AVCC Common dates: 2-6 July</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Session 2</th>
<th>2000</th>
<th>2001</th>
</tr>
</thead>
<tbody>
<tr>
<td>(14 weeks)</td>
<td>17 July to 10 September</td>
<td>23 July to 21 Sept</td>
</tr>
<tr>
<td>7 October to 17 November</td>
<td>1 October to 2 November</td>
<td></td>
</tr>
<tr>
<td>Mid-session recess</td>
<td>11 September to 6 October</td>
<td>22 September to 30 September</td>
</tr>
<tr>
<td>Study period</td>
<td>18 November to 22 November</td>
<td>3 November to 8 November</td>
</tr>
<tr>
<td>Examinations</td>
<td>23 November to 7 December</td>
<td>9 November to 27 November</td>
</tr>
</tbody>
</table>

**Important dates for 2000**

**January 2000**

- S 1 New Year's Day - Public Holiday
- M 3 Public Holiday
- T 6 Medicine V - Term 1 begins
- M 10 Medicine IV - Term 1 begins
- W 26 Australia Day - Public Holiday

**February 2000**

- M 7 Medicine VI - Term 2 begins
- AGSM Executive MBA Program - Session 1 begins
- M 14 AGSM MBA Program - Year 1 classes - Term 1 begins
- M 21 AGSM MBA Program - Year 2 classes - Term 1 begins
- M 28 Session 1 begins - for Faculties other than Medicine, AGSM and University College, ADFA

**March 2000**

- M 6 University College, ADFA - Session 1 begins
- F 10 Last day applications are accepted from students to enrol in Session 1 courses

**April 2000**

- Su 2 Medicine VI - Recess ends
- M 3 Medicine VI - Term 3 begins
- F 21 Mid-session recess begins - for Faculties other than Medicine, AGSM and University College, ADFA
- Good Friday - Public Holiday
- S 22 Easter Saturday
- Su 23 Easter Sunday
- M 24 Easter Monday - Public Holiday
- Medicine IV - Recess begins
- T 25 Anzac Day - Public Holiday
- Su 30 Mid-session recess ends - for Faculties other than Medicine, AGSM and University College, ADFA
- Medicine IV - Recess ends
- AGSM MBA Program - Year 1 classes - Term 1 ends
- AGSM MBA Program - Year 2 classes - Term 1 ends

**May 2000**

- M 1 Medicine IV - Term 3 begins
- AGSM MBA Program - all classes - Examinations begin
- F 5 AGSM MBA Program - all classes - Examinations end
- S 6 University College, ADFA - Mid-session recess begins
- T 9 Publication of provisional timetable for June examinations
- Su 14 Medicine VI - Term 3 ends
- M 15 Medicine VI - Term 4 begins
- W 17 Last day for students to advise of examination clashes
- F 19 AGSM Executive MBA Program - Session 1 ends
- Su 21 Medicine V - Term 2 ends
- University College, ADFA - Mid-session recess ends
June 2000

**F 9** Session 1 ends - for Faculties other than Medicine, AGSM and University College, ADFA
**S 10** Study period begins - for Faculties other than Medicine, AGSM and University College, ADFA
**Su 11** Medicine IV - Term 3 ends
**M 12** Queen’s Birthday - Public Holiday
**T 13** Medicine IV - Term 4 begins
**W 14** Study period ends - for Faculties other than Medicine, AGSM and University College, ADFA
**Th 15** Examinations begin - for Faculties other than Medicine, AGSM and University College, ADFA
**F 16** University College, ADFA - Examinations begin
**T 17** Examinations end - for Faculties other than Medicine, AGSM and University College, ADFA
**F 23** Mid-year recess begins - for Faculties other than Medicine, AGSM and University College, ADFA

July 2000

**F 7** Medicine VI - Term 4 ends
   University College, ADFA - Examinations end
   University College, ADFA - Mid-year recess begins
**S 8** Medicine VI - Recess begins
**M 10** AGSM - Executive MBA Program - Session 2 begins
**Su 16** Mid-year recess ends - for Faculties other than Medicine, AGSM and University College, ADFA
   Medicine VI - Recess begins
   University College, ADFA - Mid-year recess ends
   University College, ADFA - Session 2 begins
**M 17** Session 2 begins - for Faculties other than Medicine, AGSM and University College, ADFA
   Medicine VI - Recess ends
   University College, ADFA - Mid-year recess begins
   University College, ADFA - Session 2 begins
**Su 23** AGSM MBA Program - all classes - Term 2 ends
**M 24** AGSM MBA Program - all classes - Examinations begin
**F 28** AGSM MBA Program - all classes - Examinations ends

August 2000

**Su 6** Medicine IV - Term 4 ends
   Medicine V - Term 4 begins
   AGSM MBA Program - all classes - Term 3 begins
**M 7** Medicine IV - Term 5 begins
**Th 17** Medicine VI - Term 5 begins
**Su 27** Medicine VI - Term 5 ends
**M 28** Medicine VI - Term 6 begins
**Th 31** Last day for students to discontinue without failure Session 2 courses
   HECS Census date for Session 2

September 2000

**S 2** Open Day
**S 9** Medicine V - Recess begins (Olympic Break)
**M 11** Mid-session recess begins - for Faculties other than Medicine, AGSM and University College, ADFA
**Th 14** Closing date for ‘on-time’ applications to the Universities Admissions Centre
**S 16** University College, ADFA - Mid-session recess begins
**Su 17** Medicine IV - Term 5 ends
**M 18** Medicine IV - Recess begins (Olympic Break)

October 2000

**Su 1** Medicine IV - Recess ends (Olympic Break)
   Medicine V - Recess ends (Olympic Break)
**M 2** Labour Day - Public Holiday
   Medicine IV - Term 6 begins
**F 6** Mid-session recess ends - for Faculties other than Medicine, AGSM and University College, ADFA
   University College, ADFA - Mid-session recess ends
**T 17** Publication of provisional timetable for November examinations
**W 25** Last day for students to advise of examination clashes

November 2000

**F 3** University College, ADFA, Study period ends
**S 4** University College, ADFA - Examinations begin
**T 7** Publication of timetable for November examinations
**F 10** AGSM MBA Program - all classes - Term 3 ends
**Su 12** Medicine IV - Term 6 ends
**M 13** AGSM MBA Program - all classes - Examinations begin
**F 17** Session 2 ends - for Faculties other than Medicine, AGSM and University College, ADFA
   University College, ADFA - Examinations end
   AGSM MBA Program - all classes - Examinations end
   AGSM MBA Program - all classes - Examinations ends
**S 18** Study period begins - for Faculties other than Medicine, AGSM and University College, ADFA
**W 22** Study period ends - for Faculties other than Medicine, AGSM and University College, ADFA
**Th 23** Examinations begin - for Faculties other than Medicine, AGSM and University College, ADFA

December 2000

**Th 7** Examinations ends - for Faculties other than Medicine, AGSM and University College, ADFA
**M 25** Christmas Day - Public Holiday
**T 26** Boxing Day - Public Holiday
Comprises Schools of Chemical Engineering and Industrial Chemistry, Civil and Environmental Engineering, Computer Science and Engineering, Electrical Engineering and Telecommunications, Geomatic Engineering, Mechanical and Manufacturing Engineering (incorporating Aerospace Engineering, Mechatronic Engineering and Naval Architecture), Mining Engineering, Petroleum Engineering, the Graduate School of Biomedical Engineering and Graduate Programs in Business and Technology. Other Centres in the Faculty are the Centres for Advanced Numerical Computation in Engineering and Science, Applied Polymer Science, Minerals Engineering, Particle and Catalyst Technologies, Photovoltaic Devices and Systems, Manufacturing and Automation, Water and Waste Technology, and the Munro Centre for Civil and Environmental Engineering. The Faculty is also associated with the Centre for Remote Sensing and Geographic Information Systems, the UNESCO Centre for Membrane Science and Technology, the UNSW Groundwater Centre, Australian Photonics Co-operative Research Centre, and the Co-operative Research Centres for Waste Management and Pollution Control, and Aerospace Structures.

Dean
Mark Sebastian Wainwright, MAppSc Adel., PhD McM., CEng, FTSE, FRACI, FIEAust

Presiding Member
Rodney Phillip Chaplin, BSc PhD Adel, CChem, MACS, FRACI

Associate Dean (Research)
Vacant

Associate Dean (Academic)
Vacant

Associate Dean (International)
Vacant

Executive Officer
Robyn Christine Horwood, BA DipEd UNSW

Student Industry Liaison Unit
George Nawar, BScEng MEngSc UNSW, CEng, MIEAust

Marketing Officer
Marjorie E Fox, BBus PR/Mktg QUT

Student Liaison Officer
Donna Jayne Bailey

Personal Assistant to the Dean
Maureen Ellen Noonan

Personal Assistant to the Associate Deans
Cheryl Anne Kally

Executive Assistant
Hemaxi Ghelani

Clerk
Jacqueline Yvonne Alexander

Information Technology Support Unit
Maurice Meezs
Paul Eccleston
Shu Fai Mok

Senior Accountant
Stefan Backman, BEcon Gothborg, CPA

Senior Assistant Accountant
Shateesh Chand, BCom Auck., Dip CompSci La Trobe, AACS
School of Chemical Engineering and Industrial Chemistry

Professor of Chemical Engineering and Head of School
Anthony Gordon Fane, BSc PhD DIC Lond, CEng, FIChemE, FIEAust, FTSE

Professors of Chemical Engineering and Industrial Chemistry
Robert Paul Burford, BSc PhD Adel, FPRI(Aust), FRACI, FIM, FIEAust, CChem, CEng, MACS
Christopher Joseph Dalzell Fell, BSc UNSW, PhD Camb, CEng, FTSE, FIChemE, FIEAust, AICE
Neil Russell Foster, BSc PhD UNSW, FRACI, AiChe, FIEAust
Maria Skylas-Kazacos, BSc PhD UNSW, FRACI, MES, FIEAustCPE
David Lawrence Trim, BSc PhD Exe, DIC Lond, CEng, FTSE, FRACI, FIChemE, FIEAust
Mark Sebastian Wainwright, BSc Adel, PhD McMaster, FRACI, FIEAust, FTSE

Associate Professors
Adesoji Adediran, BSc Lagos, MASc PhD
Waterlo, MIEAust, CEng, MAICHE
Michael Paul Brungs, BSc PhD UNSW, FSQT
Rodney Phillip Chaplin, BSc PhD Adel, CChem, MACS, FRACI
Thomas Paul Davis, BSc PhD Salford, CChem, MRSC
John Frank Stubington, BE Qld, PhD Camb, CEng, FAIE, FIChemE
Tuan Quang Pham, BE PhD Cant, MChemEng, AAIFST
Tam Tran, BSc PhD UNSW, MAusIMM, MAIME

Senior Lecturers
Rosa Amal, BE PhD UNSW, MChemE, MiWAQ
Vicki Chen, BSc(Eng) MIT, PhD Minnesota, MAICHE, ACS
Phillip Thomas Crisp, BSc PhD Syd, ARACI
Dianne Elizabeth Wiley, BAppSc DIAE, DipEd Armidale CAE,
PhD UNSW, CChem, CEng, MRACI, MChemE

Lecturers
Jie Bao, BE Zhejiang, MScEE Zhejiang, PhD UQ
Götz Bickert, Dipl-Ing, Dr-Ing Universität Karlsruhe
Graeme Craig Bushell, BE UNSW, PhD UNSW
Frank Lucien, BE PhD UNSW
Roya Sheikholeslami, BSc Kansas, MASc PhD British Columbia,
PEng, MAICHE, MCICE

Administrative Officer
Vivienne Brennan

Professional Officers
Robert Edmund Brand, BSc BE UNSW, ASTC
Van Bong Dang, BSc MAppSc Gunma, MSc UNSW, AIE
Barry William Edenborough, BE PhD UNSW
Deyan Guang, BE Dalian University, PR China, MSc PhD UNSW
Katia Simeonova Nasev, ME Higher InstChemTech, Sofia, Grad IEAust
John McEwan Starling, BE UNSW

Technical Officers
Philip McAuley
Andrew Chau, BE UNSW
Elizabeth Dobrinsky, BE Moscow Tech Inst, Grad IEAust
Steve Jacenik

Computer Systems Officer
Frank Fan, BSc ME UNSW

Administrative Assistants
Lorraine Bonner
Barbara Carter
Kay French

Ling Lau
Director of Teaching and Learning
Associate Professor MP Brungs

Director of Research and Postgraduate Programs
Associate Professor PR Chaplin

Centre for Applied Polymer Science

Director
Professor RP Burford

Centre for Particle and Catalyst Technologies

Director
Dr R Amal

UNESCO Centre for Membrane Science and Technology

(In association with the Faculty of Science and Technology)

Director, Chemical Engineering
Professor AG Fane

Deputy Director, Chemical Engineering
Dr DE Wiley

Director, Biophysics
Professor HG Coster

School of Civil and Environmental Engineering

Professor of Civil Engineering and Head of School
Raymond Ian Gilbert, BE PhD UNSW, CEng, FIEAust

Senior Administrative Officer
Karenne May Irvine, BA UNSW

Executive Assistant to Head of School
Stephen James Foster, BE NSWIT, MEngSc PhD UNSW

Professors of Civil Engineering
Mark Andrew Bradford, BSc BE PhD Syd, DSc UNSW, CEng, MASCE, FIEAust, MStructE
David Gordon Carmichael, BE MEngSc PhD Syd, Cant, CEng, FIEAust, MASCE, AIABRA
Robin Fell, BE MEngSc Qld, CEng, FIEAust
Francis Shay Khiet Tin Loi, BE PhD Monash, CEng, MIEAust
Somasundaram Valliaapan, BE Annam, MS Northeastern, PhD DSc Wales, CEng, FIEAust, FASCE
Trevor David Walte, BSc Tas, GradDip RMIT, MAppSc Monash,
PhD MIT, FRACI

Associate Professors
Nicholas John Ashbolt, BAgSc PhD Tas, MASM
James Edward Bail, ME PhD Nicle(NSW), CEng, MIEAust,
MASCE, MAHA, MIAWMA
Ian Cordery, ME PhD UNSW, CEng, FIEAust
Ronald John Cox, BE PhD UNSW, CEng, FIEAust
Jerry Ongerth, BSCa//r,MS Michigan, PhD Michigan
Brian Shackel, BE Sheff, MEngSc PhD UNSW, CEng, MIEAust
Senior Lecturers
Richard Ian Acworth, BSc Leeds, MSc PhD Birm, FGS
Mario Maria Altard, BE PhD UNSW, MIEAust, MCIA
Peter John Blais, BE UNSW, MSc DIC Lond, ASTC, CEng, MIEAust
Bruce Cathers, BE Syd, DipHE Del/it, MEngSc UNSW, PhD Manc
Stephen James Foster, BE NSWIT, MEngSc PhD UNSW
Nadarajah Gopiralan, BSc(Eng) Moratuwa, MSc PhD Leeds, MIEAust
Peter Hidas, MEng DipTP PhD Bud
Nasser Khalili-Naghadesh, BSc Tehran, MSc Birm, PhD UNSW
Raymond Eric Lawther, BE PhD UNSW
David Andrew Lukatina, BE PhD WA, CEng, MIEAust
Stephen James Moore, BE UNSW, MEngSc Adel, CEng, MIEAust
Jonathan Brian O'Brien, BE UNSW, MAsc Tor, CEng, MIEAust
Gareth Edward Swarbrick, BE Adel, PhD UNSW, GradeIAust
Brian Uy, BE PhD UNSW, CEng, MIEAust, MASCE
Upali Vandebona, BSc(Eng) Ceylon, MEng AIT, PhD Monash
Ronald Richard Wakefield, BE UNSW, MSE Prin, PhD UNSW, CEng, MIEAust

Lecturers
Steven Davis, BE UNSW
Kurt Douglas, BE Syd, PEng, GradeIAust
George Nawar, BScEng MEngSc UNSW, CEng, MIEAust
Ashish Sharma, BE Roorkee, MTEh I.I.T.Delhi, PhD Utah State

Professional Officers
Gautam Chattopadhyay, BE PhD Jadavpur, MS Youngstown
Chris Gianopoulos, BBuild UNSW
Kenneth Brian Higgs, MSc Aston, MAIP
Peter Kenneth Maguire, BSc NE, GradDip UNSW
Lindsay John O'Keeffe, BSc UNSW
Vir Abhimanyu Sardana, BScEng, MSc IIT, PhD UNSW, MISB, CEng, MIEAUST, MACS
Alf Wojcik, MForestryE, Krakow

Computer Systems Officers
Robert Peter Hegedus, BSc, MEngSc UNSW, MACS, MACM
Jong Hwai Perng, BE NTU, ME TKU

Senior Technical Officers
John Baird
Mark Groskops
Paul Jonathon Gwynne
Anthony Macken
William Terry

Hydrographer
James Herbert Tilley

Administrative Assistants
Alison Blackbourn
Janice Hutchinson
Patricia Mary McLaughlin
Mary Seaborne O'Connell, BA UNSW
Julie May O’Keeffe
Gillian Phillips, BA NE
Angela Rita Spano
Betty Wong
Alice Yau

Honorary Visiting Professors
John Andrew Black, BA Manc MTCP Sydney, PhD Brad, CEng, FIEAust
Thomas Grandin Chapman, BSc PhD UNSW, FIEAust
Colin Raymond Dudgeon, ME PhD UNSW, CEng, MIEAust, MASCE

Honorary Visiting Fellows
William Henry Cogill, MS CapeT, MS Camb, PhD UNSW, FIEAust, MICE
Penelope Anne Fitzgerald, BSc Syd, PhD UNSW, CEng, MIEAust, MAMWA, MRACI

Centre for Water and Waste Technology

Director
Professor Trevor David Waite

Deputy Director
Associate Professor Nicholas John Ashbolt

Program Managers
Andrew Fietz, BE Qld, PhD UNSW
John Kai-yun Jiang, BE China Textile Uni, MIE UNSW
Sven Lundie, BE Karlsruhe, PhD Luebeck
David Tolmie, BScApp Qld, MBA UNSW, MRACI, MAICHE, CChem, CEng

Business Managers
Ian Manzie, BSc Syd, BEng, MAEng, MIEAust, FAusIMM, GSA, ASA
Lyn Manzie, BSc Syd, GSA

Water Research Laboratory, Manly Vale

Director
Associate Professor Ronald John Cox

Centre for Postgraduate Studies in Civil and Environmental Engineering

Director
Associate Professor Ronald John Cox

Administrator
Gillian Phillips

Munro Centre for Civil and Environmental Engineering

Director
Associate Professor Ronald John Cox

Administrator
Gillian Phillips

School of Computer Science and Engineering

Associate Professor of Computer Science and Head of School
Arun K Sharma, MSc BITS, PhD SUNY Buffalo

Professors of Computer Science
Paul J Compton, BSc MSc UNSW
Norman Y Foo, BE ME Canterbury, MA PhD Michigan
Ross Quinlan (Adjunct), BSc Sydney, PhD Washington, FAAAI, FACS
Claus A Sammut, BSc PhD UNSW
Associate Head of School
William H Wilson, BSc MSc ANU, PhD Syd, DipCompSc Qu, MACM

Associate Professors
Hossam EI-Gindy, BE Cairo, BSc Ain Shams, MSc PhD McGill
Ian Gorton (Adjunct), BSc PhD, Sheffield
Gernot Heiser, BSc Freiburg, MSc Brock, PhD ETH, MIEEE, MACM
Albert Nymeyer, BMath DipComSc PhD, Newcastle
John Potter, BSc Adv, BE PhD Newcastle
Arthur Ramer, MS Warsaw, PhD SUNY
Kenneth A Robinson, BSc BE Syd MACM
Jingling Xue, BSc MSc Tsinghua, PhD Edinburgh
Ron van der Meyden, BA(Hons) MA(Hons) Syd, PhD Rutgers

Associate Head of School
William H Wilson, BSc MSc ANU, PhD Syd, DipCompSc Qu, MACM

Senior Lecturers
Lucy Chubb (Adjunct), BSc MSc PhD UNSW, MIEEE, MACM
Achim G Hoffmann, MSc PhD DSc TU Berlin, MIEEE
Jayasooriah, BE Sing, MEng N.U.S., PhD UNSW, MIEEE
Sanjay Jha, MEng Lvov, PhD UTS, MIEEE
Jesse Sheng Jin, BSc J.T.U. MSc C.T.U. Shanghai, PhD Otago, MIEEE, MACM
Xuemin Lin, BSc Fudan, PhD U.O., MACM, MIEEE
Piush Maheshwari, BE ME Roorkee, PhD Manchester, MIEEE, MACM
William Stephen Matheson, BE MEngSc Melb, PhD Br. Col. CEng, MIEEE, MIEEE
Annie Hee Hong Ngu, BSc PhD W.A.
Nandan Parameswaran, BE Madr., ME, IITKanpur I.T., PhD I.I.Sc. Bangalore
John Plaice, BMath Waterloo, DEA, PhD INPG Grenoble, SMIEEE, MACM
John A Shepherd, BSc MSc PhD Melb.
Arcot Sowmya, BSc Madr., MSc MTech PhD I.I.T. Bombay
Andrew Taylor, BSc PhD Syd.
Geoffrey Robert Whale, BE PhD UNSW
John Zic, BE PhD Syd.

Lecturers
Richard Buckland, BEd BSc(Hons) Macq.
Manuel Chakravarty, Dipl Inf Karlsruhe, PhD TU, MIEEE, MACM
Kai Engelhardt, Dipl Inf PhD Kiel
Timothy D Lambert, BMath N’cle. (N.S.W.), MSc PhD Manil.
Ashesh Mahadadia, BE MEngSc UNSW
Graham A Mann, BSc UWA, MEngSc UNSW, PhD UNSW
Daniel Woo, BSc BE PhD UNSW

Associate Lecturers
Nasser Esmaili, BScEng Kerman
Peter S Ho, BSc UNSW
Mohammed W Kadous, BE (Medal) UNSW
Daryoush Litkouhi, BE IUST Tehran, ME Asian I.T.
Anthony J Papagelis, BE UNSW
Malcom R K Ryan, BSc UNSW
Charles Willock, BSc(Hons) UWA, MEngSc UNSW
Man To Wong, BSc(Eng) MSc(Eng) HKU

Research Associates
Rex Kwok, BSc PhD Syd
Eric Martin (Senior), PhD Paris
Yusuf Pisan, BSc PhD North Western
Dongmo Zhang, PhD Nanjing

Visiting Fellows
Stephen Russell, BSc Syd.
Samuel Matsushima, BE Adv., MIEEE
Jerry Vochteloo, BSc(Hons) PhD UNSW

Senior Administrative Officer
Bill Atherton, BSc N’cle. upon Tyne

School Office Manager
Cassandra J Nock

Administrative Assistants
Rita Bautarau
Yvonne Balakian
Sonia Tjia, BSc UNSW

Administrative Assistant to HoS
Ann Baker

Clerks
Colin Taylor

Professional Officers
Samir Omar, BE(Hons) Mansoura, CPEng MIEAust, SMIEEE
Serge Poplavsky, Dipl Ing Bratislava, ME UNSW
Keith W Titmus, BScTech MEngSc UNSW

Computer Systems Officers
Neil F Brown, BSc UNSW
Stephen Fischer
Walter Guan, BCom BInfoTech UQ MSCE
Zebee Johnstone
Peter Linich
Van Dung Ly, BSc(Hons) UNSW
Tiina Muukkonen, BAppSc UTAS
Geoff M Oakley (Manager), BSc UNSW
Andrew J O’Brien
Zain Rahmat, BSc UNSW
Trent Swift
Tanya Warmenhoven, BSc(Hons) UNSW

Web Development Officer
Magdalena Szczepanik, BSc UNSW

CSO & Laboratory Manager
John Albani, BSc InfoSys UNSW

CSO & Laboratory Supervisor
David Brunato, BAppSc Southern Cross

Help Desk Admin Manager
Angie Schweis, BSc UNSW

Purchasing and Assets Officer
David Pisch

Stores Clerk
Leslie Sharpley

Senior Technical Officers
Ric Forster
David Johnson

Technical Officer
Amalan Silavigu

School of Electrical Engineering and Telecommunications

Professor of Electrical Engineering and Head of School
Brancko George Celler, BSc BE PhD UNSW, FIREE, MIEEE, MAPPs

Professors of Electrical Engineering
Pak Lim Chu, ME PhD UNSW, CPEng, FIEAust, SMIEEE, MIEEE, FOSA
Aruna Prasada Seneviratne, BSc PhD Bath

Associate Professor and Director of Academic Studies
Tim Hesketh, BSc MSc PhD Massey, MIEEE

Administrative Officer
Shirley Ratinac, BA Macquarie
Administrative Assistant
Maria V Spano

Professional Officers
Chee Yee Kwok, BSc BE PhD, MIEE
Associate Professor
Electronics
Walter Lachs, BE MEngSc
Visiting Fellow(s)
Ronald Stillman, ME PhD, MIEEE
Adjunct Professor
Chee Yee Kwok, BSc BE PhD, MIEEE

Systems and Control
Associate Professors
Timothy Hesketh, BSc Eng CapeT, PhD Massey, MIEEE
Khiang Wee Lim, BE Malay, DPhil Oxf, MIEEE
Peter Douglas Neilson, BScEng PhD UNSW

Senior Lecturers
David James Clements, BSc Qld, ME PhD N'cle(NSW), MIEEE, MIEEE
Gang (Gary) Peng, MEng Nanjing AeronlInst, PhD Melb, SMIEEE

Project Scientist
Trevor Wayne Whitbread, BE BSc UNSW, MIEEE

Telecommunications
Professor and Head of Discipline
Aruna Prasada Seneviratne, BSc PhD Bath
Professor
Pak Lim Chu, ME PhD UNSW, FIEAust, MIEEE, FOSA, FTSE

Senior Lecturers
Eliathamby Ambikairajah, BScEng PhD Kees, CEng, MIEEE, MIEEE, MESCA
Andrew Bradley, BEng PhD Plymouth, CEng, MIEEE, MIEEE
William John Dewar, MScEng Qu, PhD UNSW, MIEEE
Hassan Mehrpour, BE MSc Boston, PhD UNSW, MIEEE
Gang-Ding Peng, BSc Fudan, MSc PhD Jiao Tong, MIEEE
Rodica Ramer, BSc ME PhD Bucharest, MIEEE, MAPS
Predrag Rapajic, BE ME PhD Sydney,SMIEEE
Iain Murray Skinner, BSc Qld, PhD ANU
David Taubman, BSc BE MS PhD Berkeley, MIEEE

Electric Power Engineering
Associate Professor and Head of Discipline
Colin Grantham, BSc PhD N’cle(UK), CEng, FIEEE

Associate Professors
Trevor Robert Blackburn, BSc Adel, PhD Flin, CEng, MAIP, MIEEE, MIEEE
Hugh Ronald Outhred, BSc BE PhD Sydney, AMIE, FIEAust, MIEEE
Fazlur Muhammed Rahman, BScEng BUET(Ban), MSc PhD UMIST, MIEEE, AMIE, MISA

Senior Lecturers
Kevan Charles Daly, BSc BE PhD UNSW, CEng, MIEEE, MIEEE
Roland John Kaye, BE MEngSc Melb, PhD Calif, MIEEE

Lecturer
Edward Douglas Spooner, ME UNSW

Adjunct Professor
Ronald Edward James, BSc(Eng) PhD Lond, CEng, CIEEE, FIEAust, MIEEE, MIMechE, SMIEEE

Visiting Fellow(s)
Walter Lachs, BE MEngSc Syd, PhD UNSW, FIEE, MIEEE
Ronald Stillman, ME PhD, FIE(Aust), SMIEEE

School of Geomatic Engineering
Associate Professor and Head of School
Arthur Harry William Kearsley, MSurvSc PhD UNSW, MIEEE, SMIEEE

Associate Professors
Christopher Rizos, BSurv PhD UNSW
Jean Marc Rueger, Dipling ETH Zurich, PhD UNSW, ACSM, LSSwitz, MIEEE, FIEAust

Senior Lecturers
Shao Wei Han, MSurv W'TUSM, PhD UNSW
Bruce Raymond Harvey, BSurv GradDipHed PhD UNSW, MIEEE, MIEEE
Ewan Gerald Masters, BSurv PhD UNSW, MIEEE

Lecturer
Michael Green, BS URSV MEngSc UNSW, DipED STC, MIEEE, Registered Surveyor

Administrative Officer
Leon Daras, BA UNSW

Professional Officers
Brian Edward Donnelly, BSurv UNSW, MSurv N’cle(NSW), GradDipCompStud Canberra CAE
Philip Hong Lam, BE(GeomEng) UNSW, MRE UNSW

Visiting Professors
Bruce Crosby Forsster, MSurv Melb, MSc PhD UNSW, MIEEE, MISA, LSVic, SMIEEE, FIEAust
John Charles Trinder, BSurv PhD UNSW, MSc ITC Delft, FISAust, FIEAust

Visiting Fellow
Sabapathy Ganeshan, BSc Ceyl

School of Mechanical and Manufacturing Engineering
Incorporates Aerospace Engineering, Mechatronic Engineering and Naval Architecture

Head of School
Kerry Patrick Byrne, BE MEngSc Qld, BSc Melb, PhD So’ton

Executive Assistant to Head of School
John Michael Challen, BE MEngSc Syd, PhD UNSW, MIEEE

Director of External Affairs
Eric Joseph Hahn, BE BSc PhD UNSW, CEng, FIEAust, MASME

Electronics
Associate Professor
Chee Yee Kwok, BSc BE PhD UNSW, MIEEE
Director of Laboratories
Graham Lindsay Morrison, BE PhD Melb, FIEAust, CPEng

Director of Research and Research Students
Masud Behnia, BSME, MSME PhD Purdue, PE, CEng, MASME, MAIAA, FIEAust

Director of Teaching
Robin Arthur Julian Ford, BScEng PhD Lond, CEng, ACGI, MIEAust

Aerospace Engineering Plan Co-ordinator
John Randall Page, BSc Hart, MSc Cran IT, CEng, FBIS, MRAes, MAIAA

Manufacturing Engineering and Management Plan Co-ordinator
Hartmut Kaebernick, Dipl-Ing Dr-Ing TU Berlin, CEng, FIEAust, SMSME, VDI

Mechanical Engineering Plan Co-ordinator
Robert Bond Randall, BTech Adel, BA Melb, CEng, MIEAust, MAAS

Mechatronic Engineering Plan Co-ordinator
Richard Adrian Willgoss, BSc PhD So' ton, CEng, MIEE, FIEAust, FWTIA

Naval Architecture Plan Co-ordinator
Lawrence Julian Doctors, BE MEngSc Syd, PhD Mich, CEng, FRINA, MSNAME, FIEAust

Professors
M Behnia
KP Byrne
EJ Hahn
H Kaebernick
Eddie Leonard, BScEng PhD UNSW, CEng, MASME, MIEAust, MASHRAE
GL Morrison

Associate Professors
John Edward Baker, MSc Syd, BE MEngSc PhD UNSW
LJ Doctors
Raj Ford
Richard Butler Frost, BE UNSW, CEng, FIEAust, FRSA
Donald Wainwright Kelly, BE Syd, PhD Lond
Roger Malcolm Kerr, BSc Lond, MSc Bath, DPhil Ox
d Chakravarti Varadachar Madhusudana, BE Mys, ME IIsc, PhD Monash, CEng, MIEAust, MASME
Philip Mathew, BE PhD UNSW, CEng, MIEAust

Senior Lecturers
Noor-e-Alam Ahmed, BSc Strath, PhD Cran IT, CEng, MIMechE
Anthony John Barratt, BE NSWIT
JM Challen
Ka Ching Chan, MASc Tor, PhD UNSW, CEng, MIEAust
Mahluddin Chowdhury, BScEng BanglUT, PhD N'cle (UK), Eur Ing, FRINA, MIEAust
Philip John Helmore, BE MEngSc UNSW, CEng, MIEAust, MSNAME
Atiya Berman Kayis, BSc MS METU, PhD Istanbul TU
See Seng Leong, BE PhD UNSW, CEng, MIEAust
Ian Lachlan Macalpine-cross, BE Melt, PhD Monash, MIEAust

JR Page
Hugh Lighthgow Stark, BSc PhD Strath, CEng, FIMechE, MIEAust, RPEQ
RA Willgoss
Khosrow Zarrabi, MSc PhD UMIST, MIEAust

Lecturers
Robert Thomas Casey, BE MEngSc PhD Qld
Jayanthi Katupitiya, BScEng Sri Lanka, PhD Leuven, MASME, MIEE, MIEE
Associate Professor
David Clement Laurence BSc BE ME Syd, MBA UNE, MAusIMM, MSME

Adjunct Associate Professor
Roy Moreby BSc PhD, Camborne, FMVSSA

Senior Lecturers
Duncan Ronald Chalmers, BE UNSW ME(Hons), UOW, GradDip ITATE, FIQ
Paul Carter Hagan, BE PhD UNSW, FAusIMM
John Ormiston Watson, BScEng Nott, PhD S'ton

Lecturer
Christopher Raymond Daly, BE MSc PhD GradDip(Higer Ed) UNSW, GradDip(Min Ecs), Macq, MAusIMM

Senior Research Fellows
Yuejun Cai, BE PhD CSUT, MSc UQ
John Christopher William Fowler BSc Manch, PhD UNSW, CEng, MICE, MExpE

Research Fellow
Ben Bin Lin BE ME CSUT, PhD UNSW, MAusIMM, MISRM

Visiting Fellows
Anil Krishna Bhattacharyya, BSc Glas, MSc Duth, PhD N'ole(UK), CEng, MAmI, MIEAust, FIAM, FIAME, PhD Stevens Geoffrey Gemell, BE Syd, FAusIMM, AIMM, PhD Edmund James Malone, MSc Syd, MBA Macq, FAusIMM, FAIM, MGSA
Anthony Charles Partridge, BSc Leeds, MSc PhD McGill, CEng, MIMM
Vankata Satyanarayana Vutukuri, BScEng Ban, MS Wisconsin, PhD TechSc Poland, MAIME

Director of Development
James Close, BE UNSW

Administrative Assistants
Carol Bell
Kim Russell

School of Petroleum Engineering

Director
Wolf Val Pinczewski, BE Nicle(NSW), PhD UNSW, CPEng, MChemE

Associate Professor
Sheikh Rahman, BSc Chitt, MSc Strath, PhD Clausthal

Senior Lecturers
Henry Alfred Salisch, BSc Quito Poly Inst, MSc Oklahoma, MS Venezuela Central
Patrick Wong, BE ME PhD UNSW

Senior Fellow
Guy Allinson, BSc Leeds, DipSocSci Birm

Visiting Fellow
Ferda Akgun, BSc Ankara, MSc USL, PhD CSM

Visiting Lecturers
Arthur Castle, BSc Surrey, ARMIT
Barry Walsh, BE PhD Syd

Professional Officer
Juan Carlos Zajaczkowski, BE Buenos Aires

Administration Officer
Jennifer Ruth Lippiatt

Secretary
Rachel Goldberg

Energy Research Development and Information Centre (ERDIC)

Director
Vacant

Graduate School of Biomedical Engineering

Associate Professor and Head of School
Bruce Kenneth Milthorpe, BA Macq, PhD ANU

Professor of Biomedical Engineering
Klaus Schindhelm, BE PhD UNSW, FiE Aust, CPEng (Biomed)

Adjunct Professor
Branko George Celler, BSc BE PhD UNSW, MIEE, MAPPs

Associate Professors
Alberto Pompeo Avolio, BE PhD UNSW
Christopher David Bartram, MA DPhil Ox FI Aust
Anne Simmons, BE MBiomedE UNSW

Adjunct Associate Professor
John Campbell Woodard, BE MSc PhD UNSW, MIEE, MASAIO

Visiting Professors
Peter Craig Farrell, BE Syd, SM MIT, PhD Wash, DSc UNSW, MASAIO
Barry Stuart Gow, BDS MDS PhD Syd

Senior Lecturer
Nigel Hamilton Lovell, BE PhD UNSW, MIAust, MIEE
Laura Anne Poole-Warren, BSc PhD UNSW

Adjunct Senior Lecturer
William Robert Walsh, BA (Chem) BA (Biol) Bucknell, PhD Rutgers

Lecturers
Ross Alexander Odell, BSc Prin, PhD MIT

Professional Officer
Peter Roman Slowiaczek, BSc Nicle(NSW)

Administrative Officer
Sacha Maurice Sadler

Visiting Fellows
John Brydon, BA Camb, MSc Lond, PhD UNSW
Allan Jones, BAppSc UTS, PhD UNSW
Andrew John Ruys, BE PhD UNSW

Centre for Advanced Numerical Computation in Engineering and Science

(Ind association with the Faculty of Science and Technology)

Professor and Director
Clive Allen John Fletcher, BScEng Lond, MSc CranIT, PhD UnivCalif(Berkeley), CPEng, MRAes, MAIAA

Adjunct Associate Professor
Jiyuan Tu, BE, PhD Stockholm

Visiting Professor
Richard Morrow, PhD Adel
Manager, Technology Diffusion Program
Matthew Grant Wood, BE(Chem), PhD UQ

Manager, Industrial Research Liaison Program
Ana Corpuz, MIAH, MIAWR, MAppScI

Visiting Fellow
Dr S Di, BSc, PhD China
Dr N Al-Khalidy, PhD Poland

Administrative Contact Officers
Karen Hahn
Jenny Hartley

Centre for Remote Sensing and Geographic Information Systems
(in association with the Faculty of Science and Technology)

Director
Richard Lucas (School of Geography), PhD Bristol

UNSW Groundwater Centre
(in association with the Faculty of Science and Technology)

Director
Dr J Jankowski, MSc PhD Wroc

Graduate Programs in Business and Technology

Director and Adjunct Professor
John Toohey, BSocWk Qld., MSW Carle., PhD Macq.

Deputy Director and Adjunct Associate Professor
Michael McGuirk, MAppSc Melb., MBA Macq.

Co-ordinator MBT Program
Margaret Brennan

Co-ordinator – Quality and Resources
Alan Williamson

Student Liaison Officer – Distance
To be advised

Co-ordinator MTM Program
Agnes Heah

Centre for Photovoltaic Engineering

Head of Centre
Professor SR Wenham

Director of Research
Professor MA Green

Director of Academic Studies
Dr CB Honsberg

Administrative Office Manager
L Cahill
This handbook is divided into separate sections for each School/Unit, identified by a four-letter code (e.g. CENV, School of Civil and Environmental Engineering). This code appears on the top right corner of each page relating to the School/Unit. Each School/Unit section is divided into Undergraduate and Graduate Study and includes program outlines and course descriptions.

Read the opening sections of the handbook first, and then read the information contained under **Summary of Programs (Undergraduate or Graduate as appropriate)**. These sections cover all degrees and diplomas offered by the Faculty. Detailed information on each course then appears under **Course Descriptions**, which includes session(s) offered, pre/corequisite details, class hours, units of credit, etc.

You will find that almost any program of study you wish to undertake has courses from other Schools, and even other Faculties. This means that in your engineering program, courses are listed from other Schools in the Faculty of Engineering, each with their own identifying code, as well as from the School in which you are planning to study. If, for example, this is Mechanical and Manufacturing Engineering (MECH), all the courses for Mechanical and Manufacturing Engineering are described in the section for that School. As Mechanical and Manufacturing Engineering also includes Aerospace Engineering (AERO), Manufacturing Engineering and Management (MANF) and Naval Architecture (NAV), these courses are also included with the School.

Any course which is not an Engineering course (i.e. a course offered by another Faculty, but included in a program), appears under the **Servicing Course Descriptions** section.

As changes may be made to information provided in this Handbook, students should frequently consult the noticeboards of the schools and the official noticeboards of the University.

**Undergraduate Study**

It is most important that you read the opening sections of the Handbook for general information on the Faculty of Engineering, **Faculty Information**, and **Undergraduate Study Summary of Programs**. Both of these contain specific information relating to undergraduate degrees, including Enrolment Procedures, Honours, Professional Practice, program Transfers and a number of other details with which you should be familiar.

**Graduate Study**

No matter which graduate degree program you plan to undertake you must read the general summary of graduate program in the section, **Graduate Study Summary of Programs**. This covers both research degrees and coursework programs. Information relating to the various Masters degrees by coursework and Graduate Diplomas is detailed in the appropriate School sections.

You will also need to read the **Conditions for the Award of Degrees** at the back of the Handbook for the formal rules governing each degree.

Most importantly, staff in the Faculty of Engineering are only too pleased to help you with any queries you might have or problems that need to be sorted out. As a first step, contact the School Office, or there is a list of people who can help you at the beginning of **Faculty Information**. You can then be directed to other staff members who can assist you if there are very specific matters that need to be solved.

**Information Key**

The following key provides a guide to abbreviations used in this book:

<table>
<thead>
<tr>
<th>UOC</th>
<th>units of credit</th>
</tr>
</thead>
<tbody>
<tr>
<td>F</td>
<td>full year (Session 1 plus Session 2)</td>
</tr>
<tr>
<td>HPW</td>
<td>hours per week</td>
</tr>
<tr>
<td>L</td>
<td>lecture</td>
</tr>
<tr>
<td>P/T</td>
<td>part-time</td>
</tr>
<tr>
<td>S1</td>
<td>Session 1</td>
</tr>
<tr>
<td>S2</td>
<td>Session 2</td>
</tr>
<tr>
<td>SS</td>
<td>single session, but which session taught is not known at time of publication</td>
</tr>
<tr>
<td>T</td>
<td>tutorial/laboratory</td>
</tr>
<tr>
<td>U</td>
<td>unit value</td>
</tr>
<tr>
<td>WKS</td>
<td>weeks of duration</td>
</tr>
<tr>
<td>X</td>
<td>external</td>
</tr>
<tr>
<td>X1</td>
<td>summer session</td>
</tr>
<tr>
<td>X2</td>
<td>winter session</td>
</tr>
</tbody>
</table>
Prefixes
The identifying alphabetical prefixes for each organisational unit offering courses to students in the Faculty of Engineering follow.

<table>
<thead>
<tr>
<th>Prefix</th>
<th>Organisational Unit</th>
<th>Faculty/Board</th>
</tr>
</thead>
<tbody>
<tr>
<td>ACCT</td>
<td>School of Accounting</td>
<td>Commerce &amp; Economics</td>
</tr>
<tr>
<td>AERO</td>
<td>School of Mechanical and Manufacturing Engineering</td>
<td>Engineering</td>
</tr>
<tr>
<td>ANAT</td>
<td>School of Anatomy</td>
<td>Medicine</td>
</tr>
<tr>
<td>ANCE</td>
<td>Centre for Advanced Numerical Computation in Engineering and Science</td>
<td>Engineering/Science</td>
</tr>
<tr>
<td>BIOM</td>
<td>Graduate School of Biomedical Engineering</td>
<td>Engineering</td>
</tr>
<tr>
<td>BIOS</td>
<td>School of Biological Science</td>
<td>Life Sciences</td>
</tr>
<tr>
<td>BIOT</td>
<td>Department of Biotechnology</td>
<td>Life Sciences</td>
</tr>
<tr>
<td>CEIC</td>
<td>School of Chemical Engineering &amp; Industrial Chemistry</td>
<td>Engineering</td>
</tr>
<tr>
<td>CHEM</td>
<td>School of Chemistry</td>
<td>Science and Technology</td>
</tr>
<tr>
<td>CHEN</td>
<td>Department of Chemical Engineering</td>
<td>Engineering</td>
</tr>
<tr>
<td>CENV</td>
<td>School of Civil and Environmental Engineering</td>
<td>Engineering</td>
</tr>
<tr>
<td>COMP</td>
<td>School of Computer Science &amp; Engineering</td>
<td>Commerce &amp; Economics</td>
</tr>
<tr>
<td>ECOH</td>
<td>Department of Economic History</td>
<td>Commerce &amp; Economics</td>
</tr>
<tr>
<td>ECON</td>
<td>School of Economics, Departments of Econometrics and Economics</td>
<td>Commerce &amp; Economics</td>
</tr>
<tr>
<td>ELEC</td>
<td>School of Electrical Engineering and Telecommunications</td>
<td>Engineering</td>
</tr>
<tr>
<td>FINS</td>
<td>School of Banking and Finance</td>
<td>Commerce &amp; Economics</td>
</tr>
<tr>
<td>FUEL</td>
<td>School of Chemical Engineering and Industrial Chemistry</td>
<td>Engineering</td>
</tr>
<tr>
<td>GEOG</td>
<td>School of Geography</td>
<td>Science and Technology</td>
</tr>
<tr>
<td>GEOL</td>
<td>School of Geology</td>
<td>Engineering</td>
</tr>
<tr>
<td>GMAT</td>
<td>School of Geomatic Engineering</td>
<td>Engineering</td>
</tr>
<tr>
<td>GBAT</td>
<td>Graduate Programs in Business and Technology</td>
<td>Commerce &amp; Economics</td>
</tr>
<tr>
<td>INDC</td>
<td>School of Chemical Engineering and Industrial Chemistry</td>
<td>Engineering</td>
</tr>
<tr>
<td>INF5</td>
<td>School of Information Systems</td>
<td>Commerce &amp; Economics</td>
</tr>
<tr>
<td>IROB</td>
<td>School of Industrial Relations &amp; Organisational Behaviour</td>
<td>Commerce &amp; Economics</td>
</tr>
<tr>
<td>LAWS</td>
<td>School of Law</td>
<td>Law</td>
</tr>
<tr>
<td>LEGT</td>
<td>Department of Legal Studies and Taxation</td>
<td>Commerce and Economics</td>
</tr>
<tr>
<td>LIBS</td>
<td>School of Information, Library &amp; Archive Studies</td>
<td>Professional Studies</td>
</tr>
<tr>
<td>MANF</td>
<td>School of Mechanical &amp; Manufacturing Engineering</td>
<td>Engineering</td>
</tr>
<tr>
<td>MARK</td>
<td>School of Marketing</td>
<td>Commerce &amp; Economics</td>
</tr>
<tr>
<td>MATH</td>
<td>School of Mathematics</td>
<td>Science and Technology</td>
</tr>
<tr>
<td>MATS</td>
<td>School of Materials Science &amp; Engineering</td>
<td>Engineering</td>
</tr>
<tr>
<td>MECH</td>
<td>School of Mechanical &amp; Manufacturing Engineering</td>
<td>Engineering</td>
</tr>
<tr>
<td>MINE</td>
<td>School of Mining Engineering</td>
<td>Engineering</td>
</tr>
<tr>
<td>NAVL</td>
<td>School of Mechanical and Manufacturing Engineering</td>
<td>Engineering</td>
</tr>
<tr>
<td>PETRL</td>
<td>School of Petroleum Engineering</td>
<td>Medicine</td>
</tr>
<tr>
<td>PHPH</td>
<td>School of Physiology and Pharmacology</td>
<td>Science and Technology</td>
</tr>
<tr>
<td>PHYS</td>
<td>School of Physics</td>
<td>Architecture</td>
</tr>
<tr>
<td>PLAN</td>
<td>School of Town Planning</td>
<td>Arts &amp; Social Sciences</td>
</tr>
<tr>
<td>POLS</td>
<td>School of Political Science</td>
<td>Engineering</td>
</tr>
<tr>
<td>POLY</td>
<td>Department of Polymer Science</td>
<td>Science and Technology</td>
</tr>
<tr>
<td>SAFE</td>
<td>Department of Safety Science</td>
<td>Engineering</td>
</tr>
<tr>
<td>SENG</td>
<td>School of Computer Science &amp; Engineering</td>
<td>Engineering</td>
</tr>
<tr>
<td>SOLA</td>
<td>Centre for Photovoltaic Engineering</td>
<td>Engineering</td>
</tr>
</tbody>
</table>
Faculty Information

Some People Who Can Help You

If you require advice about enrolment, degree requirements, progression within programs, course content and requirements, contact the appropriate school representative listed below:

Faculty of Engineering, Dean's Office
Ms Donna Bailey, Room 508, Geography and Surveying Building, Tel. (02) 9385 5437

School of Chemical Engineering and Industrial Chemistry
Ms V Brennan, Room 316, Applied Science Building, Tel. (02) 9385 4318

School of Civil and Environmental Engineering
Ms K Irvine, Room 406, Civil Engineering Building, Tel. (02) 9385 5061

School of Computer Science and Engineering
Dr WH Wilson, Ground Floor, Samuels Building, Tel. (02) 9385 3986 or Ms C Nock, School Office, 3rd Floor, Electrical Engineering Building, Tel. (02) 9385 4728

School of Electrical Engineering and Telecommunications
Dr T Hesketh, G6, School Office, Electrical Engineering Building, Tel. (02) 9385 4002

School of Geomatic Engineering
Mr L Daras, School Office, Room 529, Geography and Geomatic Engineering Building, Tel. (02) 9385 4182.

School of Mechanical and Manufacturing Engineering
Dr JM Challen, Room 105, Mechanical and Manufacturing Engineering Building, Tel. (02) 9385 4154.

School of Mining Engineering
Dr C Daly, Room 37, Old Main Building, Tel. (02) 9385 4514.

School of Petroleum Engineering
Ms J Lippiatt, Room 115, Petroleum Engineering Building, Tel. (02) 9385 4144.

Graduate School of Biomedical Engineering
Mr S Sadler, 9th Floor, Samuels Building, Tel. (02) 9385 3917.

Graduate Programs in Business and Technology
Ms M Brennan, Room 420A, Geography and Surveying Building, Tel. (02) 9385 5543.

Important: As changes may be made to information provided in this handbook, students should frequently consult the noticeboards of the schools and the official noticeboards of the University.

Entrance Requirements

Students are selected for programs offered by the Faculty according to the Universities Admission Index (UAI) obtained in the New South Wales Higher School Certificate (NSW HSC). Other students are admitted on the basis of their previous academic work. In addition, students are expected to have reached the following standards in the NSW HSC subjects or an equivalent standard:

Program Prerequisites
Mathematics
2u (60–100) or
2u and 3u (100–150) or
3u and 4u (100–200)

Some First year courses have course pre-requisites in addition to the overall program pre-requisites

Students are advised that the lack of specified course prerequisite/s do not preclude their selection to any program but the required standard must be achieved before enrolment in the University subject is permitted.

The University conducts Bridging Programs to assist in remediating deficiencies in course levels. Further details are available in the UAC Guide.

Introductory courses are also available to students who do not have the required prerequisite/s in Mathematics, Chemistry or Physics. Remedial English is also available for students who do not have the required prerequisite in English.

Additional subject prerequisites for Civil, Computer, Environmental and Mechanical and Manufacturing Engineering
Mathematics
2u (90–100)

and

English
2u Contemporary (60–100) or
2uG (53–100) or
2u (49–100) or
3u (1–50)

and

Science
2u Physics (57–100) or
2u Chemistry (60–100) or
3u (90–150) or
4u (1–200)

Additional subject prerequisites for Electrical Engineering
Mathematics
2u (90–100)

and

English
2u Contemporary (60–100) or
2uG (60–100) or
2u (53–100) or
3u (1–50)

and

Science
2u Physics (65–100) or
2u Chemistry (65–100) or
3u (90–150) or
4u (1–200)

Additional subject prerequisites for Geomatic Engineering
Mathematics
2u (90–100)

and

English
2u Contemporary (60–100) or
2uG (53–100) or
2u (49–100) or
3u (150)
Additional subject prerequisites for Software Engineering
Mathematics
2u (90-100)
and
English
2u Contemporary (60-100) or
2uG (60-100) or
2u (53-100) or
3u (1-50)

Additional subject prerequisites for Chemical Engineering
and Industrial Chemistry, Mining Engineering and Petroleum
Engineering
Mathematics
2u (90-100)
and
Science
2u Physics (65-100) or
2u Chemistry (65-100) or
3u (90-150) or
4u (1-200)

UNSW Library Facilities

Although any of the university libraries may meet specific needs, the staff and students of the Faculty of Engineering are served mainly by the Physical Sciences Library.

The Physical Sciences Library

The Physical Sciences Library, located on levels 5, 6 and 7 of the Library Building, provides information for students and staff from the Faculties of Science and Technology, Engineering, and the Built Environment.

During the academic year the Library is open from 8.00 am to 10.00 pm Monday to Thursday, 8.00 am to 6.00 pm on Friday and 12.00 pm to 5.00 pm Saturday and Sunday. During vacations, these hours will vary.

Staff assisted services are available after 10.00 am including help with catalogue, CD Roms, inter-library loans, maps and online searching. An information skills program is in place with emphasis on developing basic information access and management skills for first year and advanced skills for final year and postgraduate students.

The Library's catalogue and selected CD-Rom databases are available over the Campus Wide Network.

Student Equity

The University of New South Wales is committed to providing an educational environment that is free from discrimination and harassment. Both Commonwealth and State anti-discrimination law requires the University not to discriminate against students or prospective students on the following grounds: sex, race/ethnicity, age, disability, sexual harassment, racial harassment, disability harassment, marital status, pregnancy, sexual preference, HIV/AIDS. Also included are acts of vilification on the grounds of: race and HIV/AIDS.

Complaint/Disputes

The University has internal dispute handling procedures to deal with complaints against staff or other students. The Discrimination and Harassment Grievance Procedures are handled by the Student Equity Unit of the Equal Employment Opportunity Unit. Complaints that largely concern academic matters are usually handled through the Head of School.

Advocacy and Support

Students can seek assistance getting disputes resolved, either in relation to discrimination or academic matters. Assistance can be sought from various areas in the University including:

Equity and Diversity Unit; Student Guild Advocacy Service; Student Counselling; Equal Employment Opportunity Unit; Course Coordinators; Senior Academic Staff; Heads of School.

Students may be confident that their interests will be protected by the University if a complaint is lodged. This means that students should not be disadvantaged or victimised because they have, in good faith, sought to assert their rights to equal opportunity in education.

Equal Opportunity in Education Policy

Statement

Under the Federal Racial Discrimination Act (1975), Sex Discrimination Act (1984), and Disability Discrimination Act (1992) and the New South Wales Anti-Discrimination Act (1977), the University is required not to discriminate against students or prospective students on the grounds of age, disability, homosexuality (male or female), marital status, pregnancy, race (including colour,
nationality, descent, ethnic, ethno-religious or national origin, and immigration), religious or political affiliation, views or beliefs, sex, and transgender or transsexuality. Under the University of New South Wales Act (1989), the University declares that it will not discriminate on the grounds of religious or political affiliations, views or beliefs.

University Commitment to Equal Opportunity In Education
As well as recognising its statutory obligations as listed, the University will eliminate discrimination on any other grounds which it deems to constitute disadvantage. The University is committed to providing a place to study free from harassment and discrimination, and one in which every student is encouraged to work towards her/his maximum potential. The University further commits itself to course design, curriculum content, classroom environment, assessment procedures and other aspects of campus life which will provide equality of educational opportunity to all students.

Special Admissions Schemes
The University will encourage the enrolment of students who belong to disadvantaged groups through programs such as the University Preparation Program and the ACCESS Scheme. Where members of disadvantaged groups are particularly under-represented in certain disciplines, the responsible faculties will actively encourage their enrolment.

Support of Disadvantaged Students
The University will provide support to assist the successful completion of studies by disadvantaged group members through such means as the Aboriginal Education Program and the Learning Centre. It will work towards the provision of other resources, such as access for students with impaired mobility, assistance to students with other disabilities, the provision of a parents' room on the upper campus, and increased assistance with English language and communication.

Course Content, Curriculum Design, Teaching and Assessment, and Printed Material
Schools and faculties will monitor course content (including titles), teaching methods, assessment procedures, written material (including study guides and handbook and Calendar entries) and audiovisual material to ensure that they are not discriminatory or offensive and that they encourage and facilitate full participation in education by disadvantaged people.

Equal Opportunity Adviser Scheme
The University will continue its Equal Opportunity Adviser Scheme for students who feel that they have been harassed or who consider they have been disadvantaged in their education by practices and procedures within the University.

Harassment Policy
The University is committed to ensuring freedom from harassment for all people working or studying within the institution. It will continue to take action, including disciplinary action, to ensure that freedom from harassment is achieved.

Students With Disabilities
The University of New South Wales has a policy of equal opportunity in education and seeks wherever possible to ensure maximum participation of students with disabilities.

The University offers a range of assistance: examination support; specialised equipment; educational support; parking provisions; library assistance.

A Resource Guide for students and staff with disabilities and a map showing wheelchair access is available from the Coordinator for Disability Support Services, the Equity and Diversity Unit, the Library, the Student Guild, and the Student Equity Unit.

It is advisable to contact the Coordinator for Disability Support Services during the enrolment period, to discuss any support needs.

The Coordinator for Disability Support Services can be contacted on (02) 9385 4770 or at the Equity and Diversity Unit, in the East Wing of the Quadrangle Building.

Special Government Policies

The NSW Health Department and the NSW Department of Education and Training have special requirements and policies of which students of health-related and education programs should be aware. The requirements relate to:

- clinical/internship placements which must be undertaken as part of your program and
- procedures for employment after you have completed the program

Health-related programs
Criminal record checks
The NSW Health Department has a policy that all students undertaking clinical placements, undergo a criminal record check prior to employment or placement in any capacity in the NSW Health System. This check will be conducted by the NSW Police Service and will be co-ordinated by the Department of Health.

Infectious diseases
Students required to complete clinical training in the NSW hospital system will be subject to various guidelines and procedures laid down for health workers by the NSW Department of Health relating to vaccination and infection control.

An information sheet is available from your program officer and further details can be obtained from your Program Authority.

Professional Institutions

1. The Institution of Engineers, Australia

The professional body for engineering in Australia is the Institution of Engineers, Australia (IEAust), which has as its first objective to promote the science and practice of engineering in all its branches. The IEAust has its national headquarters in Canberra and functions through a series of Divisions, the local one being the Sydney Division. Within each division, branches represent the main interests within the profession, eg civil, mechanical, electrical, engineering management and environmental engineering.

Students of an approved school of engineering may join the Institution as a student member (StudIEAust). Student members receive the monthly publication Engineers Australia and for a small fee they also receive The Transactions which contains articles on a particular branch of engineering.

Student members are invited to participate in the Excellence Award for Work Experience, the National Young Engineer of the Year Award and to avail themselves of other IEAust services including the Mentor Scheme and industrial experience guidance.

For more information and membership application forms, write to The Institution of Engineers, Australia, Sydney Division, 1st Floor, 118 Alfred Street, Milsons Point 2061, Tel 9929 8544

2. The Institution of Surveyors, Australia

During their years as undergraduates, students in the Geomatic Engineering course are encouraged to take the first steps in joining in the activities of the professional body which represents them - The Institution of Surveyors, Australia. The aims of the Institution
are to promote scientific, technical and educational aspects of geomatic engineering and to maintain high professional standards of practice and conduct. Student members receive the quarterly journal of the Institution, The Australian Surveyor and Azimuth which is published by the New South Wales Division of the Institution. Membership also entitles the student to attend all meetings of the Institution and to attend the annual Congress at a special concessional rate. Membership application forms are available at the office of the School of Geomatic Engineering and from the Institution Office, Third Floor, Guild House, 363 Pitt Street, Sydney 2000.

3. The Association of Professional Engineers, Scientists and Managers, Australia

APESMA is a professional organisation that represents the industrial interests of its members with a major focus on providing advice and assistance on employment related matters, including individual representation and improving salaries and conditions for professional engineers, scientists and managers.

Students are invited to become affiliate members (free of charge) of the Association while they are studying. This membership gives students access to information and advice on industrial experience, salary rates for graduates and contracts of employment. Student members receive The Student Update, a publication designed specifically for students, three times a year. This gives students some practical insight into aspect of the workplace to which they may not have given much thought, in particular the employment issues that affect them as professional engineers. More information and student membership application forms can be obtained from APESMA, Level 1, 491 Kent Street, Sydney 2000, Telephone 9264 9500.

Student Clubs and Societies

Students have the opportunity of joining a wide range of clubs and societies. Many of these are affiliated with the Student Guild. There are numerous religious, social and cultural clubs and also many sporting clubs which are affiliated with the Sports Association. Clubs and societies seeking to use the name of the University in their title, or seeking University recognition, must submit their constitutions either to the Student Guild or the Sports Association if they wish to be affiliated with either of these bodies, or to the Academic Registrar for approval by the University Council.

The various Undergraduate Societies promote the interests of students within the Faculty of Engineering:

- Biomedical Engineering Society
- Chemical Engineering Undergraduate Society (CEUS)
- Civil and Environmental Engineering Society (CEVSOC)
- Computing Science Society (COMPSOC)
- Electrical Engineering Society (ELSOC)
- Geomatic Engineering Society (GSPOT)
- Industrial Chemistry Undergraduate Society (ICUS)
- Mechanical Engineering Society (MECHSOC)
- The Mining Engineering Society
- Society for Petroleum Engineering (SPE)

Students are encouraged to participate in the activities of their societies. Enquiries should be directed initially to the general offices of the respective Schools.

General Information

While this Handbook has been specially designed as a detailed source of reference in all matters related to the Faculty, the University's Student Guide is intended to provide general information on some of the most important rules and procedures and introduce students to many of the services available to them. The Guide, which helps to put the Faculty into perspective within the University as a whole, is issued free of charge to all enrolled students. For fuller details about some aspects of the University and its activities students might also need to consult the University Calendar.
Full-time Programs
The Faculty of Engineering offers the following full-time undergraduate programs:

Bachelor of Engineering
BE
in:
Aerospace Engineering 3610
Chemical Engineering 3040
Civil Engineering 3620
Computer Engineering 3645
Electrical Engineering 3640
Environmental Engineering 3625
Geomatic Engineering 3741
Manufacturing Engineering and Management 3663
Mechanical Engineering 3680
Mechatronic Engineering 3685
Mining Engineering 3140
Naval Architecture 3700
Petroleum Engineering 3045
Photovoltaics & Solar Energy 3542
Software Engineering 3648

Bachelor of Science
BSc
Industrial Chemistry 3100

These full-time programs are designed to be taken over a period of four years.

Bachelor of Science (Technology)
BSc(Tech)
Chemical Engineering 3050
Industrial Chemistry 3110

Combined Degree Programs
Full-time programs are available for the award of the following degrees:

Bachelor of Engineering Bachelor of Science
BE BSc
(5 years duration) in:
Aerospace Engineering 3611
Chemical Engineering 3042
Civil Engineering 3730
Computer Engineering 3726
Electrical Engineering 3725
Environmental Engineering 3626
Geomatic Engineering 3746
Industrial Chemistry
Manufacturing Engineering and Management 3664
Mechanical Engineering 3681
Mechatronic Engineering 3685
Naval Architecture 3701
Software Engineering

Bachelor of Engineering Bachelor of Arts
BE BA
(5 years duration) in:
Aerospace Engineering 3612
Computer Engineering 3722
Civil Engineering 3621
Electrical Engineering 3720
Environmental Engineering 3626
Geomatic Engineering 3747
Manufacturing Management 3665
Mechanical Engineering 3662
Mechatronic Engineering 3687
Naval Architecture 3702
Software Engineering

Bachelor of Engineering Bachelor of Laws
BE LLB
(6 years duration) in:
Civil Engineering 4775
Environmental Engineering 4777

Bachelor of Engineering Bachelor of Engineering
BE BE
(5 years duration) in:
Civil Engineering and Mining Engineering 3146
Chemical Engineering and Petroleum Engineering 3046

Bachelor of Science Bachelor of Science
BSc BSc
(5 years duration) in:
Industrial Chemistry 4102

Concurrent Degree Programs
Full-time programs are available for the award of the following degrees:

Bachelor of Engineering Master of Biomedical Engineering
BE MBiomedE
(5 years duration) in:
Computer Science and Engineering 3728
Electrical Engineering 3727
Mechanical Engineering 3683
Chemical Engineering 3048
Other Engineering Programs at UNSW

UNSW offers other Engineering programs in specialised areas:
Program 3025: Bachelor of Engineering (BE) in Ceramic Engineering
Program 3125: Bachelor of Metallurgical Engineering (BMetE)
Program 3615: Bachelor of Materials Engineering (BMatE)
These three programs are offered by the School of Materials Science and Engineering. Details are found in the Handbook of the Faculty of Science and Technology.

Co-op Program

The University's Co-op Program in the Faculty of Engineering consists of industry-linked, five-year programs in Aerospace Engineering, Chemical Engineering and Industrial Chemistry, Civil Engineering, Electrical Engineering, Environmental Engineering, Manufacturing Engineering, Management, Mechanical Engineering, Mechatronic Engineering, Mining Engineering, Petroleum Engineering and Naval Architecture.

Co-op scholars are selected largely on the basis of academic attainment, personal skills and motivation as well as on non-academic achievements are also considered. Further information is available from the Office of Industry-Linked Education, telephone (02) 9385 5116.

Transfer Programs

Students transferring to the University of New South Wales after successful completion of part of an engineering degree program at an Australian university would normally be admitted with advanced standing into the degree programs offered by the Faculty of Engineering.

Students who have completed the first year of an undergraduate program in one School may apply for a transfer to a program in another School of the Faculty with credit for relevant courses completed. However, as there are significant differences in the various Year 1 programs, students are not necessarily granted complete exemption from Year 1 of the program to which the transfer is made.

Enrolment quotas apply to undergraduate programs and the number of places available for transfer is limited and offers will be made on a competitive basis.

Formal advanced standing procedures apply for entry into the following Bachelor of Engineering (BE) programs at the University of New South Wales with full credit.

BE in Aerospace Engineering

Students who satisfy the requirements of the first two years of the Mechanical Engineering full-time degree program at any other Australian university may be admitted to a two-year program leading to the Bachelor of Engineering degree in Aerospace Engineering (years 1 and 2 of this program are identical with the first two years of the program in Mechanical Engineering).

BE in Naval Architecture

Students who satisfy the requirements of the first two years of the Mechanical Engineering full-time degree program at any other Australian university may be admitted to the final two years of the Bachelor of Engineering degree program in Naval Architecture. (Years 1 and 2 of this program are identical with the first two years of the program in Mechanical Engineering.)

Program Revision

Following each program revision students are assessed on the basis of the new program but retain credit for any course already completed and are not liable for the increased requirements if progression is normal.

General Rules for Progression

Progression in all undergraduate programs in the Faculty of Engineering is permitted by course. However:

1. Programs will continue to be stated and timetabled by year or stage and it cannot be guaranteed that non-standard programs can be completed in the minimum number of years. Students are not permitted to enrol in courses with clashing timetables.

2. Students must satisfy the rules governing re-enrolment. These are set out in detail in the UNSW Calendar-Summary Volume. In particular they allow for students enrolled for the first time in the first year of an undergraduate program to be advised that their academic progress is unsatisfactory if they do not pass in at least half of their program, with particular emphasis on science courses.

3. Students will also be requested to show cause why they should be:
   • allowed to repeat a course that has been failed more than once.
   • allowed to continue in the program if the School judges their academic record to be unsatisfactory.

Transfer Programs

Students transferring to the University of New South Wales after successful completion of part of an engineering degree program at an Australian university would normally be admitted with advanced standing into the degree programs offered by the Faculty of Engineering.

Students who have completed the first year of an undergraduate program in one School may apply for a transfer to a program in another School of the Faculty with credit for relevant courses completed. However, as there are significant differences in the various Year 1 programs, students are not necessarily granted complete exemption from Year 1 of the program to which the transfer is made.

Enrolment quotas apply to undergraduate programs and the number of places available for transfer is limited and offers will be made on a competitive basis.

Formal advanced standing procedures apply for entry into the following Bachelor of Engineering (BE) programs at the University of New South Wales with full credit.

BE in Aerospace Engineering

Students who satisfy the requirements of the first two years of the Mechanical Engineering full-time degree program at any other Australian university may be admitted to a two-year program leading to the Bachelor of Engineering degree in Aerospace Engineering (years 1 and 2 of this program are identical with the first two years of the program in Mechanical Engineering).

BE in Naval Architecture

Students who satisfy the requirements of the first two years of the Mechanical Engineering full-time degree program at any other Australian university may be admitted to the final two years of the Bachelor of Engineering degree program in Naval Architecture. (Years 1 and 2 of this program are identical with the first two years of the program in Mechanical Engineering.)

Honours

In the Bachelor of Engineering degree programs the same formal program is offered to both pass students and to those aiming at honours. Honours will be awarded for meritorious performance over the program: special attention is paid to a candidate's performance in the final year courses and thesis project.

In the cases of combined degrees, such as the BE BA or the BE BSc, the award of the BA or BSc degree at Honours level requires two additional sessions of study.
Students wishing to gain a degree at Honours level in Arts or in Science as part of their combined degree program must meet all the relevant requirements of the Faculty of Arts and Social Sciences or the Board of Studies in Science and Mathematics and of the appropriate School concerned. Students may enrol for the Honours year only on the recommendation of the Head of their School in the Faculty of Engineering and with the approval of the Head of the appropriate Arts or Science School. For Honours in Science, approval must also be sought from the Board of Studies in Science and Mathematics. AUSTUDY support is available for the combined degree program including the Honours level.

Industrial Experience Requirements

All students must complete at least 60 working days of approved industrial experience (or professional practice in the case of Geomatic Engineering students) prior to enrolment in the final year of their program. The award of the degree is dependent on the completion of the requisite periods of industrial employment at a standard approved by the University.

Access to Exam Information

Students in the Faculty of Engineering may request access to their own final examination scripts and may request consultation with the examiner on their performance provided that a written application is made to the Program Authority no later than fifteen working days after the date of issue of the Notification of Result of Assessment form.

General Education Program

UNSW requires that all undergraduate students undertake a structured program in general education as an integral part of studies for their degree. The University believes that a general education complements the more specialised learning undertaken in a student's chosen field of study and contributes to the flexibility which graduates are increasingly required to demonstrate. Employers repeatedly point to the complex nature of the modern work environment and advise that they highly value graduates with the skills provided by a broad general education, as well as the specialised knowledge provided in more narrowly defined degree programs. As well, over many years graduates of this University have reported that they greatly valued their General Education studies, which are found to be relevant to both career and personal development.

The General Education Program at UNSW intends to broaden students' understanding of the environment in which they live and work and to enhance their skills of critical analysis.

Objectives of the General Education Program

The following objectives were approved by the Council of the University in December 1994.

1. To provide a learning environment in which students acquire, develop, and deploy skills of rational thought and critical analysis.
2. To enable students to evaluate arguments and information.
3. To empower students to systematically challenge received traditions of knowledge, beliefs and values.
4. To enable students to acquire skills and competencies, including written and spoken communication skills.
5. To ensure that students examine the purposes and consequences of their education and experience at University, and to foster acceptance of professional and ethical action and the social responsibility of graduates.
6. To foster among students the competence and the confidence to contribute creatively and responsibly to the development of their society.
7. To provide structured opportunities for students from disparate disciplines to co-operatively interact within a learning situation.
8. To provide opportunities for students to explore discipline and paradigm bases other than those of their professional or major disciplinary specialisation through non-specialist courses offered in those other areas.
9. To provide an environment in which students are able to experience the benefits of moving beyond the knowledge boundaries of a single discipline and explore cross- and interdisciplinary connections.
10. To provide a learning environment and teaching methodology in which students can bring the approaches of a number of disciplines to bear on a complex problem or issue.

General Education Requirements

The basic General Education requirements are the same for students in all single degree programs. Within a degree program students:

- satisfactorily complete a minimum of 12 units of credit in General Education courses, or their equivalent;
- undertake an additional fifty-six (56) hours of study which ensures that students examine the purposes and consequences of their education and experience at university, and fosters acceptance of professional and ethical action and social responsibility. This fifty-six hours of study may be distributed throughout the program, or exist as a separate course, depending on the program.

Because the objectives of General Education require students to explore discipline and paradigm bases other than those of their professional or major disciplinary specialisation, all students are excluded from counting courses toward the fulfilment of the General Education requirement, which are similar in content or approach to courses required in their program.

Faculty Requirements

Each Faculty has responsibility for deciding what courses are able to be counted towards the General Education requirement for their students. The Faculty of Engineering is committed to providing the widest range of choice of general education electives for its students. It strongly encourages students to make the best use of this flexibility. In general, the only restrictions, apart from the usual need for prerequisite knowledge, on the choice of courses is that, in all but exceptional circumstances, students may not take courses offered by the Faculty of Engineering, or by Schools which offer other courses already in the student's program.

For a fuller explanation of the requirement and objectives of General Education, and a guide to the choice of specific courses, students should obtain a copy of the free publication, General Education Handbook, which is widely available in schools.

Additional information for undergraduate students who first enrolled before 1996

Transitional arrangements

It is intended that no student will be disadvantaged by the change to the new General Education Program. The old Program had specific requirements to complete four session length courses (or their equivalent) in designated categories A and B. The new General Education Program does not categorise courses in the same way.

As a result, students who enrolled prior to 1996 will be given full credit for any General Education courses completed up to the end of Session 2 1995.

From the Summer Session of 1995-96, students will be required to satisfy the unfilled portion of their General Education requirement under the terms of the new Program.
The exemption of General Education requirements for some double or combined degree programs will continue to apply for students who enrolled in these exempt programs prior to 1996.

Bachelor of Engineering Program Rules

1. The Bachelor of Engineering is awarded following the completion of a minimum of 192 units of credit.
2. The specific requirements for the Bachelor of Engineering in the various disciplines are set out in the relevant sections of this Handbook.
3. The degree may be awarded with Honours, based upon the overall performance in the program and in accordance with Faculty and School policies. Honours are awarded in the following classes – Class 1, Class 2 Division 1, Class 2 Division 2.
4. The standard duration of the program is four years, or eight Sessions, of full-time study each comprising 24 units of credit. Students may undertake the program over a longer period on the basis of part-time study.

5. Each student is required to complete a minimum of 60 days of approved experience in industry prior to graduation.
6. General Education electives may only be attempted after the student has attempted at least 24 units of credit.

Bachelor of Science in Industrial Chemistry

Course 3100 Program Rules

1. The BSc in Industrial Chemistry is awarded following the completion of a minimum of 192 units of credit.
2. The specific requirements for the BSc in Industrial Chemistry are set out in this Handbook.
3. The degree may be awarded with Honours, based upon the overall performance in the program and in accordance with Faculty and School policies. Honours are awarded in the following classes – Class 1, Class 2 Division 1, Class 2 Division 2.
4. The standard duration of the program is four years, or eight Sessions, of full-time study each comprising 24 units of credit. Students may undertake the program over a longer period on the basis of part-time study.
5. Each student is required to complete a minimum of 60 days of approved experience in industry prior to graduation.
6. General Education electives may only be attempted after the student has attempted at least 24 units of credit.
The Faculty awards higher degrees as follows: Research – Doctor of Philosophy, Master of Engineering and Master of Science; Coursework Masters Master of Biomedical Engineering, Master of Cognitive Science, Master of Computer Science, Master of Engineering Science (available in a number of areas of specialisation), Master of Environmental Engineering Science and Master of Information Science. In addition, the degrees of Doctor of Science and Master of Science may be awarded for research conducted in, or in association with, the Faculty of Engineering.

The Graduate Programs in Business and Technology within the Faculty of Engineering is responsible for the MBT Program offering the Master of Business and Technology, the Graduate Diploma in Industrial Management and the Graduate Certificate in Industrial Management as well as the Master of Technology Management (see Graduate Programs in Business and Technology section in this Handbook).

Conditions governing the award of higher degrees and graduate diplomas are set out later in this handbook in Conditions for the Award of Degrees. Conditions for the award of the degree of Doctor of Science may be found in the University Calendar.

English Language Requirements

Applicants whose first language is not English or who have not undertaken a previous degree where English was the primary language of instruction are required to provide proof of their competence by presenting acceptable results from one of the following tests or by satisfying the program authority as to their level of proficiency. A pass in the writing component of the tests listed below is strongly recommended.

Minimum Acceptable Score

1. The Test of English as a Foreign Language (TOEFL), (paper-based) 550 or (computer based) 213.
2. International English Language Testing Service (IELTS) overall band 6.0.
3. Combined Universities Language Test (CULT) 65%.
4. Indonesia-Australia Language Foundation (IALF)* Cat 1 or 2.
5. UNSW Institute of Languages, English Entry Course (UEEC) C (grade point = 6.5).

*Research students must have a writing score of 5 as well as 550 in TOEFL.

Research Degrees

Research degrees may be undertaken in the Faculty of Engineering as follows:

PhD

Biomedical Engineering 1710
Chemical Engineering 1010
Civil and Environmental Engineering 1830
Computer Science and Engineering 1650

Doctor of Philosophy PhD

This degree is awarded for a thesis considered to be a substantially original contribution to the course concerned. The degree is becoming a prerequisite for appointments in government and industrial research and development laboratories and in higher education. Research for this degree may be taken at, or externally to, the University. However the Faculty recommends that periods of residency at the University totalling at least six months be included in the candidate's research program.

Admission Guidelines: A candidate for registration for the degree of Doctor of Philosophy should hold an honours degree from the University of New South Wales or an honours degree of equivalent standing from another approved university. Applications for admission should be made to the Registrar on the prescribed form at least one calendar month before the commencement of the session in which registration is to begin.

Period of Candidature: The normal period is six academic sessions (full-time) and eight academic sessions (part-time) from the date of enrolment. In special cases the minimum period of registration may be reduced by up to two academic sessions. The maximum period of registration is ten academic sessions (full-time) and twelve academic sessions (part-time). In special cases an extension of these times may be granted.

Concurrent Coursework: All new PhD candidates in the Faculty of Engineering must complete and pass three courses as approved by the Head of School, normally in the first year of candidature.
Master of Engineering/Master of Science
ME/MSc

These are research degrees in which a thesis embodies the result of an original investigation, or design, or engineering development. Candidates for the award of the degree of ME may be required to carry out a program of advanced study.

Admission Guidelines: A candidate for registration for the degree of Master of Engineering or Master of Science should hold a Bachelor's degree from the University of New South Wales or from another approved university. Applications for admission should be made to the Registrar on the prescribed form at least one calendar month before the commencement of the session in which registration is to begin.

Period of Candidature: The normal period is three academic sessions (full-time) and six academic sessions (part-time) from the date of enrolment. In special cases the minimum period of registration may be reduced by up to one academic session. The maximum period of registration is six academic sessions (full-time) and ten academic sessions (part-time). In special cases extensions may be granted.

Concurrent Coursework: All new Masters research candidates in the Faculty of Engineering must complete and pass three courses as approved by the Head of School, normally in the first year of candidature.

Coursework Masters Degrees

Coursework programs: Detailed information on coursework programs is available from the Schools offering the programs and can be found in this Handbook under the appropriate School section.

Admission Guidelines: An acceptable qualification is a degree at Honours level, or at Pass level to a superior standard in a four-year program in an approved discipline. The latter is defined as an average of 65% over the last two years of a full-time program (or last three stages of a part-time program) taken in minimum time. If the degree concerned is not in an acceptable discipline, or was of less than four years full-time study, a bridging or qualifying program is required. This is normally arranged by enrolment in the appropriate Graduate Diploma with the possibility of transferring to the Masters program after completion of requirements prescribed by the Faculty.

Applications for admission to a program of study leading to the award of a Masters degree by coursework commencing in first session should apply to the Registrar on the prescribed form by the 31st October of the year before the year in which enrolment is to begin. Where application is for registration commencing in the second session, applicants should apply at least two months before the commencement of session.

It may be necessary to limit entry to formal programs due to quota restrictions. In such cases, applications may be placed on a reserve list and considered subject to the availability of places. If a firm offer of admission is made, it will be subject to acceptance within three weeks.

Programs of study leading to the award of coursework Masters degrees may be undertaken in the Faculty as follows:

Internal Mode Delivery

MCompSc
Computer Science and Engineering 8680

MBimedE
Biomedical Engineering 8660

MEngSc
Biomedical Engineering 8665
Computer Science and Engineering 8685
Construction Management 8612
Electrical Engineering 8501

Engineering Construction and Management 8612
Geotechnical Engineering 8612
Geomatic Engineering 8652
Land Administration 8653
Manufacturing Engineering 8531
Mechanical Engineering 8541
Mining and Mineral Engineering 8055
Process Engineering 8016
Project Management 8612
Remote Sensing 8641
Structural Engineering 8612
Transport Engineering 8612
Water Engineering 8612
Water and Wastewater Treatment 8612
Waste Management 8612

MEEnvEngSc
Civil and Environmental Engineering 8615

MInfSc
Computer Science and Engineering 8508

MTM
Master of Technology Management 8007

External Mode Delivery

All external programs are offered only on a full fee paying basis.

MEngSc
Manufacturing Management 8531
Engineering Construction and Management 8617
Project Management 8617
Construction Management 8617
Waste Management 8617
Water and Wastewater Treatment 8616

MEEnvEngSc
Civil and Environmental Engineering 8618

MBT
Business and Technology 8616

Master of Engineering Science
MEngSc

The Master of Engineering Science is a Faculty-wide degree allowing for flexibility of choice between formal coursework and project work. The Schools in the Faculty have developed recommended programs of study leading to specialisation in certain areas and further information is available under each School section in this handbook.

Candidates who enrolled from 1996 are required to complete a program totalling a minimum of 48 units of credit. A degree may be awarded for formal coursework only or for the completion of formal coursework and a report on a project depending on the program being offered.

Candidates may undertake interdisciplinary studies and, subject to approval, are able to take courses from any school in the Faculty, other faculties of the University and other universities or institutions. By means of this system, programs of studies best suited to the needs of the candidates may be selected.

Before enrolment an applicant should submit an intended program for approval by the school or division offering the majority of the credit points to ensure that the prerequisite background held is adequate for all courses including those taken in other schools or institutions.

From 1997 all coursework Masters programs are fee-paying. A schedule of fees is available on enquiry.

Period of Candidature: The minimum period is two academic sessions (full-time) or four academic sessions (part-time) from the date of enrolment. The maximum period of candidature is four academic sessions (full-time) and eight academic sessions (part-time). In special cases an extension of time may be granted.
Graduate Diplomas

Programs of study leading to the award of a Graduate Diploma in the Faculty of Engineering provide graduates with opportunities to extend their professional knowledge. In most cases, candidates may choose from a range of courses in the special area of their choice. There are also opportunities to select courses from other professional areas in which candidates may be interested.

Before enrolment, an applicant should submit an intended program for approval by the school or centre offering the majority of the units of credit. Candidates must usually complete a program totalling 36 units of credit. The program may contain courses from other schools of the Faculty, other faculties of the University and other universities or institutions subject to meeting the prerequisite requirements.

If an applicant nominates a program of study taken from the list below, at least half of the units of credit should come from the courses taken in that area.

It should be noted that some candidates who have partially completed the requirements but not taken out the award may be considered for upgrading to the relevant Master program with advanced standing. Since the policy on upgrading varies between different Schools and Centres, further enquiries should be made with the School or Centre concerned.

Applicants for admission to a program of study leading to the award of a Graduate Diploma commencing in first session should apply to the Registrar on the prescribed form by 31 October of the year before the year in which enrolment is to begin. Where application is for registration commencing in the second session, applicants should apply at least two months before the commencement of session. It may be necessary to limit entry to formal programs due to quota restrictions. In such cases, applications may be placed on a reserve list and considered subject to the availability of places. If a firm offer of admission is made, it will be subject to acceptance within three weeks.

From 1997 all Graduate Diploma programs offered by the Faculty of Engineering are fee paying. A schedule of fees is available on enquiry.

Programs of study leading to the award of a Graduate Diploma may be undertaken in the Faculty of Engineering as follows:

<table>
<thead>
<tr>
<th>Internal Mode Delivery</th>
<th>5445</th>
</tr>
</thead>
<tbody>
<tr>
<td>Biomedical Engineering</td>
<td>5454</td>
</tr>
<tr>
<td>Civil and Environmental Engineering</td>
<td>5459</td>
</tr>
<tr>
<td>Computer Science</td>
<td>5452</td>
</tr>
<tr>
<td>Electrical Engineering</td>
<td>5458</td>
</tr>
<tr>
<td>Electrical Power Engineering</td>
<td>5435</td>
</tr>
<tr>
<td>Geomatic Engineering</td>
<td>5492</td>
</tr>
<tr>
<td>Manufacturing Management</td>
<td>5457</td>
</tr>
<tr>
<td>Information Science</td>
<td>5453</td>
</tr>
<tr>
<td>Industrial Engineering</td>
<td>5455</td>
</tr>
<tr>
<td>Land Administration</td>
<td>5493</td>
</tr>
<tr>
<td>Mechanical Engineering</td>
<td>5456</td>
</tr>
<tr>
<td>Mining and Mineral Engineering</td>
<td>5040</td>
</tr>
<tr>
<td>Remote Sensing</td>
<td>5496</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>External Mode Delivery</th>
<th>5454</th>
</tr>
</thead>
<tbody>
<tr>
<td>Engineering Construction and Management</td>
<td>5454</td>
</tr>
<tr>
<td>Waste Management</td>
<td>5454</td>
</tr>
<tr>
<td>Water and Wastewater Treatment</td>
<td>5454</td>
</tr>
<tr>
<td>Project Management</td>
<td>5454</td>
</tr>
<tr>
<td>Construction Management</td>
<td>5454</td>
</tr>
<tr>
<td>Petroleum Engineering</td>
<td>5031</td>
</tr>
</tbody>
</table>

Further details of the recommended programs of study may be obtained from the relevant schools.

Graduate Certificate

Programs of study leading to the award of a Graduate Certificate in the Faculty of Engineering provide graduates with opportunities to extend their professional knowledge. In most cases, candidates may choose from a range of courses in the special area of their choice. There are also opportunities to select courses from other professional areas in which candidates may be interested.

Before enrolment, an applicant should submit an intended program for approval by the relevant school or centre. Candidates must usually complete a program totalling 24 units of credit. It should be noted that some candidates who have partially completed the requirements but not taken out the Certificate may be considered for upgrading to the other programs with advanced standing. Since the policy on upgrading varies between different Schools and Centres, further enquiries should be made with the School or Centre concerned.

Applicants for admission to a program of study leading to the award of a Graduate Certificate commencing in first session should apply to the Registrar on the prescribed form by 31 October of the year before the year in which enrolment is to begin. Where application is for registration commencing in the second session, applicants should apply at least two months before the commencement of session.

It may be necessary to limit entry to formal programs due to quota restrictions. In such cases, applications may be placed on a reserve list and considered subject to the availability of places. If a firm offer of admission is made, it will be subject to acceptance within three weeks.

All Graduate Certificate programs offered by the Faculty of Engineering are fee paying. A schedule of fees is available on enquiry.

Programs of study leading to the award of a Graduate Certificate may be undertaken in the Faculty of Engineering as follows:

<table>
<thead>
<tr>
<th>Internal Mode Delivery</th>
<th>7335</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mining Engineering</td>
<td>7333</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>External Mode Delivery</th>
<th>7335</th>
</tr>
</thead>
<tbody>
<tr>
<td>Industrial Management</td>
<td>7333</td>
</tr>
</tbody>
</table>

Graduate Courses

The courses which may be available for candidates proceeding to the award of the degree of Master of Biomedical Engineering, Master of Computer Science, Master of Engineering Science, Master of Environmental Engineering Science, Master of Information Science, Master of Mining Management and Graduate Diploma can be found in each School section. Not all electives are necessarily offered in any particular year.

Many graduate courses assume that students have prior, or preliminary, knowledge of the area of study. It is the responsibility of students to acquaint themselves with this level of assumed prior knowledge and take steps, if necessary, to obtain it. This may, for example, involve a program of preparatory reading before commencing the course.

In some cases the assumed level of knowledge for a specific course is indicated in this Handbook by the statement of assumed knowledge. This is intended as a guide to the assumed prior knowledge and often uses the description of other courses in the Handbook to indicate the content and level which the lecturer will assume. Students who are in doubt as to the adequacy of their preparation should contact the lecturer concerned and discuss the matter. The lecturer in charge of a course has the authority to decide whether or not the student has the appropriate level of assumed knowledge.
Research and Project Areas

**Biomedical Engineering**

Analysis of patient therapies  
Arterial haemodynamics  
Arterial morphometry  
Artificial blood vessels  
Automatic modulation of cardiovascular function  
Bioactive materials  
Biocompatibility: tissue/materials interactions  
Biomaterials  
Biomechanics of joints and limbs  
Biomedical instrumentation and computer acquisition  
Biomedical polymers and acrylic cements  
Bioprosthesis  
Blood pressure and heart rate variability  
Cardiovascular effects of body movement  
Cell separation technologies  
Computer-aided histological analysis  
Connective tissue healing  
Cytometry  
Endothelial cell/biomaterial interactions  
Extracorporeal therapies  
Flow in collapsible tubes  
Flow visualisation and measurement  
Image analysis of cells  
Implantable sensors  
Infection associated with medical devices  
In vivo mechanisms of polymer degradation  
Mechanisms of age related arterial degradation and hypertension  
Medical image processing  
Modelling of artificial kidney therapy  
Modelling of cardiac electrical potentials  
Modelling of mass transfer processes in medicine  
Non-invasive blood pressure measurement  
Nonlinear dynamical systems analysis  
Orthopaedic applications of hydroxyapatite  
Orthopaedic implants  
Percutaneous access devices  
Processing and interpretation of biomedical signals  
Pulmonary image analysis  
Pulsatile crossflow filtration  
Ultrasonic distance measurement  
Ventricular assist devices

**CANCES**

**Chemical Engineering and Industrial Chemistry**

**Industrial Chemistry**

Chemical reaction engineering, catalysis and synthetic fuel production and processing; petrochemistry; conversion processes of coal to oil; catalytic methods and reactors; catalytic methods for air pollution control; kinetic modelling of catalytic processes; catalyst activation and de-activation studies; car exhaust catalysts  
Solid state, molten salt and aqueous electrochemistry; electrochemistry of glass and chemistry of glass melting; physical and chemical characterisation of glasses  
Metal electrowinning; battery research, vanadium redox cell development. Electrode kinetics and mechanistic studies. Aluminum electrolysis; electrolytic decomposition of organochlorines. Conducting polymer electrodes evaluation and development of solid state gas sensors  
Environmental chemistry; Analysis of industrial pollutants; air and water pollution monitoring; chemical strategies for emission control; occupational health chemistry; development of new analytical methods for process control and environmental monitoring; environmental catalysis; air pollution control

**Polymer Science**

Preparative and analytical polymer chemistry  
Membrane preparation and properties  
Polybutadiene polymerisation by Ziegler-Natta catalysts, molecular weight properties  
Elastomer filler applications in rubber and plastics  
Thermal analysis of elastomer and plastics  
Interpenetrating polymer networks, fracture toughness of polymercomposites and thermoplastics  
Conducting polymers; polymer fractals; radiation grafting and crosslinking, conducting polymer membranes  
Structure-Property relationships of optical polymers  
Free-radical polymerisation kinetics  
Hydrogels and Biomaterials  
Rigid-rigid polymer blends  
Conducting polymer composites  
Rheology of polymeric systems

**Chemical Engineering**

Particle dynamics; fluidisation and spouted bed processes dying, carbonisation, devolatisation and gasification; sedimentation and thickening; filtration mechanisms, dewatering of filter cakes; characterisation of particulate materials; particle coating; preparation of novel photocatalysts; aggregation kinetic modelling; electrostatic charge determination; Non-Newtonian fluid-particle systems  
Reaction engineering, mass transfer with chemical reaction in heterogeneous systems; effect of mixing and nonideal transport; complex consecutive reactions, catalytic reaction engineering, pressure reactors; mathematical modelling. Multiphase photocatalytic reactors. Catalytic distillation processes

**Membrane processes**

Membrane fabrication for ultrafiltration and reverse osmosis; membrane characterisation; ultrafiltration of proteinaceous solutions;
desalination of brackish water; ion separation; pervaporation; membrane distillation; gas fractionation, cross flow filtration; liquid membranes; membrane bioreactors; environmental applications; dynamic membranes; ceramic membranes; hydrogel coatings

**Pollution studies**
Unit operations in water pollution control, biological treatment methods, advance treatment methods; unit operations in air pollution control; bio-filtration, odour control processes; fabric filtration monitoring; hot gas cleaning

**Process design and control**
Computer aided design; systems analysis and process identification; plant simulation; strategies for fault analysis; process optimisation studies

**Separations science**
Development and evaluation of new methods for solid-liquid, liquid-liquid and gas-gas separations; Energy conservation and waste minimisation; improved design procedures for heat exchange networks; mass exchange networks for waste minimisation

**Mineral Processing**
Hydrometallurgy; minerals dissolution and leaching processes; liquor purification processes, metal recovery by precipitation, adsorption, ion-exchange, cementation and electrolytic processes, dewatering of minerals

**Heat Transfer**
Refrigeration, heat transfer and food engineering; neural networks; genetic algorithms and other optimisation methods; computational fluid dynamics; phase change and inverse heat transfer; food refrigeration. Heat exchanger failing.

**Supercritical Fluid Technology**
Fundamental studies and novel applications in the pharmaceutical environmental and natural product industries

**Fuel technology fuel science and engineering**
Fuel processing; chemical and physical properties of chars; pyrolysis of coal and composition of the volatile products; fluidised bed gasification; thermochromatography of gas-solid reactions in fluidised beds; thermogravimetric analysis of chars; kinetics of carbon gasification; lubricating oil and bitumen from oil shale. Combustion; fluidised bed combustion; flames, burners and flame stability; oil-coal suspensions; incinerator design for gaseous liquid and solid wastes; industrial applications of natural gas; furnace modelling; High efficiency natural gas burners; low emission gas burners. Fuel efficiency; studies on fuel efficiency systems; energy and resource recovery from wastes; efficiency of fuel conversion processes

Fuel constitution; analysis, constitution and characterisation of primary and derived fuels
Air pollution; workplace atmospheres; combustion generated pollutants gaseous and particulate
Solid wastes; pyrolysis of waste material; resource recovery; energy analysis; incineration

**Concrete Technology**
Specification and quality control of concrete; investigation of alternative cementitious materials; Examination of pozzolanic potential of indigenous materials; Utilisation of industrial waste materials in concrete; Chemistry and mineralogy of cement and lime stabilisation; Durability of concrete; High strength and high performance concrete; Ductility of concrete through the use of polymer fibres; Supplementary cementitious materials such as fly ash, slag and silica fume; Properties of polymer modified concrete

**Concrete Structures**
Time effects including creep and shrinkage in reinforced and prestressed concrete structures; Finite element modelling of reinforced concrete including beam-column-slab connections; Collapse load behaviour of reinforced concrete slabs; Durability and ductility of concrete structures; Non-metallic tendons for prestressed concrete applications; Behaviour and strength of slender reinforced concrete columns; Studies on high-strength concrete; Reinforced concrete deep beams; Partially prestressed concrete beams; Analysis and design of end blocks for post-tensioned beams; Strength of precast prestressed concrete planks; Continuous prestressed concrete structures

**Composite Structures**
Strength and time dependent characteristics of steel-concrete composite structures; Behaviour of composite beams in negative bending; Concrete composite members

**Environmental Fluid Mechanics**
Two-fluid systems with small density differences; Pollutant dispersion; Stratified flows; Physics of inland and coastal waters; Turbulence in water bodies and the atmosphere; Atmospheres/ocean interactions; Computational algorithms; Numerical modelling

**Environmental Microbiology**
Microbiology of waste treatment (including composting); Environmental pathogens; Wastewater recycle

**Geotechnical Engineering**
Shear strength of jointed rock, soft rock and clay soils; Expansive soils; Mine tailings disposal; Uncertainty in geotechnical engineering; Risk assessment for slopes and dams; Landfill design; Contaminant transport; Site remediation; Embankment dams; Landsliding – groundwater response to rainfall, progressive failure, probability of failure; Influence of soil fabric and mineralogy on properties; Predicting excavatability of rock

**Groundwater**
Dryland salinity studies; Geophysical methods for contamination detection; Remote sensing using Landsat and Radar; Contaminated site assessment techniques; Pollutant movement in groundwater systems; Groundwater modelling

**Hydraulics and Coastal Engineering**
Open channel flow and hydraulic structures; Fluvial and estuarine hydraulics; Catchment drainage and water quality; Sediment transport
Wave action and coastal processes
Coastal structures and port engineering
Numerical and physical modelling

Hydrology
Methods of flood estimation
Design based on flood estimates
Economics of data collection
Assessment, modelling, forecasting of drought
Computational hydraulics
Rainfall-runoff relationships
Water quality
Urban drainage
Catchment management
Computer applications in hydrology
Fluid mechanics

Numerical Methods in Geomechanics
Finite element techniques and their applications in geotechnical engineering including static and dynamic loading
Numerical modelling of contaminant flow and flow in fractured and porous media
Numerical modelling of partially saturated flow
Numerical techniques in static and dynamic fracture mechanics and damage mechanics
Application of artificial intelligence and fuzzy-sets in geotechnical engineering

Pavement Engineering
Industrial and airport pavements
Pavement management and rehabilitation
Interlocking concrete block pavements
Accelerated trafficking studies of pavements and pavement materials
 Constitutive relationships of soils and pavement materials
Pavement design and analysis

Steel Structures
Thin walled sections and buckling of steel members
Crashworthiness of vehicles and components
Instability of structures
Elastoplastic analysis and shakedown of steel frames
Computer aided design of steel structures

Structural and Numerical Analysis, Geometric Modelling
Stability analysis using bubble functions
Optimal structural design
Non linear and large displacement analysis
Lightweight and large span structures
Finite element analysis of hyperbolic paraboloid cooling towers
Development and application of finite element techniques
Investigation of elastic stability

Timber Engineering and Masonry Structures
Timber shell structures
Dynamic behaviour of timber utility poles in car crashes
Non destructive testing of timber
Limit State design methods
Stress laminated timber bridges and design procedures for flat orthotropic plates
Finite element analysis of structural connection

Transport Engineering
Problems of land use and transport interaction
Theories of traffic structure and flow
Measurements, planning and control of traffic
Transport systems analysis
Transport and the environment – accidents, energy, intrusion, noise and pollution
Road and traffic noise
Transport and the community
Urban and rural transport system design
Economic evaluation of transport investments
Transport planning – local, urban, and regional systems
Investigations into transport economics, policy and decision making
Investigations of the geometric shape of the road alignment
Study of road alignment design in three dimensions

Water and Wastewater Treatment
Municipal wastewater and sludge treatment
Mathematical modelling of wastewater treatment
Low cost treatment systems
Water quality
Nutrient control in wastewater treatment
Management of water quality in municipal supplies
Water quality management
Potable, environmental and industrial identification and control of public health risks in water supply

Water Resources Engineering
Interactions and processes involving particles and surfaces with application in the water and wastewater treatment industries and in natural and industrial aqueous systems
Experimental and computational studies of the fate and effects of pollutants
Hydro geochemistry of subsurface environments
Application of geographic information systems (GIS) to water resource management
Remote sensing in hydrologic modelling and resources management

Waste Management
Hazardous waste management
Modelling hazardous waste generation
Waste minimisation
Waste audits
Environmental management plans
High temperature incinerator
Solid waste management strategies
Transfer stations
Recycling incineration
Landfill management plans
Leachate generation and control

Computer Science and Engineering
Active vision
Advanced database systems
Algorithm animation
Application of logic programming
Architectural support for languages and operating systems
Artificial intelligence
Automatic index generation
Belief revision
Cognitive and situated robotics
Cognitive engineering
Cognitive modelling
Combinatorial algorithms
Combinatorial problems and algorithms
Communication protocols
Communication systems
Compiler technology
Compilers and parsing
Computational algebra
Computational geometry
Computer aided design
Computer architecture
Computer arithmetic
Computer assisted Learning
Computer graphics
Computer networks
Computer organisation
Computer security
Computer vision
Computer vision and control for robotics
Computers and Biology
Connectionist modelling of human analogical reasoning & relational cognition
Cooperative information systems
Data mining
Data modeling
Database implementation & performance modelling
SUMMARY OF COURSES

- Database in web environment
- Database management
- Database systems
- Dataflow computing
- Decision making under uncertainty
- Decision support systems
- Deductive databases
- Diagrammatic reasoning
- Distributed applications
- Distributed computing
- Distributed database
- Distributed operating system
- Distributed simulation
- Electronic commerce
- Expert systems
- Fault diagnosis & reliability of digital systems
- Fault tolerant computer systems
- Formal methods
- Formal methods of Reasoning
- Functional programming
- Fuzzy databases
- Fuzzy systems and evidence theory
- Graph-theoretic algorithms
- Heterogeneous computing
- Human computer interaction
- Image mensurational modelling
- Image processing
- Information retrieval
- Information retrieval/filtering
- Information processing
- Intelligent agents
- Intensional programming
- Knowledge acquisition
- Knowledge acquisition/representation
- Knowledge based systems
- Knowledge discovery
- Knowledge engineering
- Knowledge extraction from training neural networks
- Knowledge representation
- Languages
- Learning algorithms
- Learning theory
- Logic programming
- Logic programming systems
- Logics of action
- Machine Learning
- Management of uncertainty and possibility theory
- Microprocessor based equipment
- Mobile computing
- Model based reasoning
- Multimedia
- Multimedia systems
- Multiprocessor architectures
- Natural language processing
- Natural language understanding
- Natural language
- Neural networks
- Nonmonotonic reasoning
- Object orientation
- Object oriented databases
- Object oriented design and technology
- Object oriented distributed systems
- Operating systems
- Parallelism
- Parallel and distributed computing
- Parallel and distributed systems
- Parallel processing
- Parsing & translation
- Pattern recognition
- Performance specification
- Philosophical foundations of AI
- Plagiarism detection
- Planning
- Process algebras
- Production systems
- Program similarity
- Program transformation
- Programming environments
- Programming language and implementation
- Query language testing
- Reactive systems
- Real time systems
- Recurrent network architectures
- Reverse engineering
- Robotics
- Scientific computing
- Signal recognition
- Simulation and modelling
- Software configuration
- Semiconductor device simulation
- Software engineering
- Specification and refinement
- Specification and verification of real-time concurrent systems
- Theory of computation
- Theory of database systems
- Theory of neural networks
- Temporal logic
- Tensor product networks
- Timed systems
- Version control
- Versioned software engineering
- Virtual environments
- Visualisation
- VLSI systems
- Web operating systems (WOS)
- Workflow modelling

Electrical Engineering

Communications

(i) Optical Communications
- Optical communications
- Optical fibres and integrated optics
- Electro-optic devices
- Sensors
- Nonlinear optical switching
- Optical solitons

(ii) Microwaves and Antennas
- Microwave circuits and devices
- Microwave measurements and electronics
- Antennas and phased arrays
- CAI in electromagnetic applications
- SAW devices
- Nonlinear effects in optical fibres
- Soliton Propagation in optical fibres

(iii) Signal Processing
- Signal processing and analysis
- Active and adaptive filtering
- Digital Filters
- Digital signal processor chip
- Acoustic and seismic signal processing
- Speech processing and coding
- Digital image processing and video signal processing
- SAW Signal Processing

(iv) Digital Communications
- Digital communications
- Digital radio and modulation methods

(v) Communications Networks
- Computer communications and local area networks
- New architectures for local area
- Network reliability and service availability
- BISDN, ATM protocols

(vi) Communications Systems
- Radar and navigational aids
- Land & Satellite Mobile Communications
- Mobile satellite communications
Electric Power
(i) Power Systems
Power System analysis
Power System Protection
Stability, Dynamics and Control
Distribution System Planning and Operation
Optimisation of Hydro-electric Power Systems
Electromagnetic Transient Analysis
Static VAR Compensation
Power System Planning and Economics
Load Management and Control
Renewable Energy Sources Photovoltaic Systems
Remote area supply
Harmonic
Flexible AC Transmission System

(ii) Electrical Power Equipment and Utilisation
High Voltage and high current phenomena
Insulating material application
Voltage disturbances in LV and MV systems
Electrical measurements and data acquisition
Electrical machines and drives
Arcing fault characteristics
Partial discharge detection and location
Gaseous discharges and insulation
Equipment for hazardous atmospheres
Synthetic loading of machines
Computer aided teaching
Electrical machine modelling
Electrical safety
Vector control of induction and synchronous motor drive

(iii) Power Electronics
DC/DC converters
High frequency power transformers
Inverters for machine drives
Microprocessor control of power electronics
Variable speed drives
Dynamics of drives, speed observer techniques
Power electronic simulation study
Electronic commutation
Remote area supplies

Electronics
Semiconductor device physics
Novel semiconductor devices
Integrated circuit design
Integrated circuit technology
Optical and infrared detector arrays
Microelectronic sensors
Photovoltaic solar energy conversion
Silicon solar cells
Computer-aided IC design
Plasma processing
Integrated circuits for advanced signal processing
Photovoltaic module design
Microstructured devices
GaAs devices

Systems and Control
Multivariable Control, simulation, modelling, expert systems in control design, advanced control of power plant, computer aided design and optimal control
Cybernetic engineering and advanced robotics: signal, pattern, image and scene, analysis and processing, brain modelling, neural computing and learning machines, vision robotics and assembly, adaptive control, hierarchical control, formal systems and functional representation
Robust control, computation issues in control, adaptive control
Adaptive and multivariable systems, multirate control, robust digital control, robust digital control, motion control systems
Digital and adaptive control, real-time computing, multivariable control
Biomedical engineering, biological signal analysis, physiological systems modelling and analysis, computer hardware and software, data acquisition, signal processing ecg analysis

Control and simulation, digital system and digital signal processing, physiological system modelling, biological signal processing, computer modelling of information processing, neural computing and learning machines, adaptive control
Robust adaptive control Theory and Applications, Robot control, Fuzzy control systems, Neural Networks for identification and control, Multirate digital control systems, Adaptive noise cancellation, Process control systems

On-line Measurement Systems; Systems Analysis, Identification and Control: Digital Image Processing in Measurements and Control; Computer Simulations of Power Generation and Industrial Processes, their Optimisation and Control; Computer Simulations in Education

Geomatic Engineering
Analysis of deformation measurements
Applications of inertial technology
Computer assisted mapping
Computer controlled surveying
Coordinate transformation
Digital image analysis for photogrammetry and remote sensing
Digital elevation models from aerial and satellite images
Electronic distance measurement
Geoid determination
Geodesy
Geopotential model testing
GPS geodynamics
GPS and GIS
GPS heighting
GPS surveying
Height datum determination
High-precision surveying
Imaging radar
Land information management
Land use and urban monitoring
Least squares estimation and alternatives
Machine vision applications of digital photogrammetry
Metrology and dimensional measurement
Monitoring of structures and terrain
Photogrammetry
Precise satellite orbit determination
Precise GPS navigation
Quality issues in land information systems
GPS data management
Radar altimetric analysis for oceanography
Remote sensing
Satellite geodesy
Survey network adjustment
Voice recognition for surveying instruments

Mechanical and Manufacturing Engineering

Aerospace Engineering
Composites
Finite element analysis
Fatigue, fracture mechanics and damage tolerance
Computational aerodynamics
Unsteady boundary layers
Turbulence
Laser anemometry
Flow simulation
Compressor aerodynamics
Design of aircraft
Aerospace CAM/CA
Initial project design
Aerospace policy studies
Distributed logic satellite control systems
Applied Mechanics
- Mechanics of solids
- Stress analysis
- Fracture mechanics
- Impact mechanics
- Spatial and planar linkages
- Mechanics of machines
- Rotor bearing dynamics
- Vibrations
- Metallic friction, wear and lubrication
- Hydrodynamic dampers
- Noise and vibration control
- Creep analysis

Design
- Biomechanics
- Bulk materials handling
- Design of surgical equipment
- Computer aided design
- Concurrent design
- Development of engineering design
- Design methodology
- Design projects: analysing testing and development for industry
- Maintenance management
- Wind energy systems
- Design with mechatronics
- Life assessment

Fluid and Thermal Engineering
- Computational fluid dynamics
- Solidification in earth and microgravity
- Energy conversion and energy conservation
- Engine performance and emissions
- Heat transfer
- Gas dynamics, transonic flow, shock waves
- Optical measuring methods
- Refrigeration and air conditioning
- Solar energy
- Two-phase flow with and without heat transfer

Industrial Technology and Management
- Production planning and control
- Job shop scheduling
- Artificial intelligence in manufacturing management
- Experimental and theoretical investigations of the following processes: machining, electric discharge machining, laser cutting, performance of single and multipoint cutting tools, including tool life and economics of machining
- Properties of materials at high rates of strain
- Engineering design analysis and tolerance technology
- Quality function deployment
- Metrology studies
- Flexible fixtures
- Applications of genetic algorithms and neural nets in manufacturing
- Intelligent control of manufacturing systems
- Design for manufacture
- Ecologically sustainable manufacturing techniques
- Cellular manufacturing strategies
- Concurrent engineering
- CAD/CAM
- Computer-integrated manufacturing
- Machine vision for manufacturing inspection
- Performance measures
- Quality management
- Human factors in technology and society

Mechatronics
- Applications of Artificial Intelligence in engineering
- Computer interfacing
- Electromagnetic systems in manufacturing
- Logic programming
- Microcomputer control
- Neural nets
- Reliability engineering
- Robotics and manufacturing

Naval Architecture
- Computer-aided ship design
- Ships design methodology
- Hydrodynamics of planing surfaces
- Hydrodynamics of high-speed ferries, catamarans, hovercraft, hydrofoils, surface-effect ships
- Problems in wave resistance
- Boundary element methods
- Water jets
- Light weight ship structures
- Nonlinear structural analysis
- Resistance
- Propulsion
- Stability

Mining Engineering
- Subsidence of strata overlying underground coal workings and related damage effects; development of a 'Generalised Empirical Method' for subsidence prediction, enabling the empirical data from one coalfield to be employed for predictions elsewhere, after appropriate modifications through the use of a parameter reflecting the lithological character of the undermined strata; comparison of the efficiencies of different ground sealing materials in containing leachates from land fill disposal of various wastes.
- Application of computing to mining engineering, operations research and computer simulation of processes; mine safety including lighting, ergonomics in mining, vibration and jarring of machine operators; general occupational health and safety; attitudes to safety; windblasts in underground coal mines due to roof falls.
- Improving safety and strata control in coal mining, including both field performance of local mine designs to establish mechanisms of behaviour and development of the theoretical knowledge base to address these mechanisms in design; avoidance of sudden uncontrolled collapses of strata in underground coal mines; minimising the hazards from windblasts in coal mines arising from the piston effect of massive strata collapses; use of electrostatically charged water sprays to suppress respirable dust at the coal face; impact breakage of rock.
- Mining management, motivating and managing change in the future; management structures for a changing environment; application of TQM techniques in lieu of statutory regulation.
- Instrumentation development for frictional ignition and rock cuttability testing; exploration and mining of gemstone deposits.
- Minerals engineering, especially coal: residence times and kinetics in flotation; image analysis of coal sections; mathematical modeling of fluid flow in coal distributors.
- Mining explosives: the effect of stemming confinement on fragmentation and movement in blasting, including investigation of the size of the stemming material on the effect of blasting efficiency and of fragmentation size and the explosive cavity for the same blasthole diameter to stemming size ratio; design and use of linear shaped charges to form radial cracks along a predetermined line; depth penetration in the target material.
- Air leakage in ventilation ducting; compressive strength of mine pillars; failure criteria for rock and rock mass; role of chemical solutions in rock fracturing; role of tensioning in rock bolting.
- Geomechanics: boundary element methods for the computation of stress near underground openings; boundary element methods for the prediction of crack propagation in rock, as applied in rock cutting technology, blasting technology and hydro fracturing; finite element methods for the analysis of wind blast in underground coal mines due to goaf collapse.
Petroleum Engineering

Improved Oil and Gas Recovery
Fundamental studies of physical mechanisms for multi-phase flow through porous media. Network modelling and prediction of capillary pressure, relative permeability and residual oil saturation. Effect of correlated heterogeneity on network model predictions. Constant rate injection porosimetry and measurement of heterogeneity on the pore and core scales. Scale-up from pore-scale to core and well log scales. Prediction of petrophysical properties. Gas injection processes and recovery of waterflood residual oil.

Formation Evaluation
Conventional log analysis/petrophysics and formation evaluation. Log interpretation and evaluation in sandstones and shaly sandstones
Petrophysical study in multi-mineral and lithologically complex formations. Petrophysical evaluation of limestone reservoirs.
Special log analysis, petrophysics and formation evaluation. Determination from well logs of the mineral composition and clay distribution in a reservoir. Estimation and evaluation of permeability from well logs in heterogeneous formations. Electrofacies evaluation in lithologically complex formations. Identification of lithofacies and depositional facies from well logs. Interwell prediction of petrophysical parameters in reservoirs
Application of state-of-the-art technology in Petrophysics.
Application of optimisation techniques in log interpretation.
Application of neural network techniques in log analysis and formation evaluation. Application of pattern recognition techniques in log analysis and formation evaluation. Application of the hydraulic flow units concept and theory in log analysis and petrophysical evaluations
Application of geostatistics in the spatial distribution study of petrophysical parameters.
Geological uncertainty and quantification. Statistical analysis of geological data. Determination of petrophysical properties from well logs.

Drilling Optimisation, Simulation and Equipment Design
The South-East Asia region including Australia continues to grow in importance as a major oil and gas producing region. The operators realise the value of developing fields using contemporary drilling and completion techniques to create highly deviated, extended reach and multilateral wells, mono-bore wells, slim hole wells, etc. These new technologies offer economic benefits through a mix of lower development costs, higher production rate and improved recovery. A number of obstacles to the effective application of these techniques include:

Borehole instability in shales. Directional control in drilling horizontal and multilateral wells. Instability of drill pipes for deep and slim holes,
Managing incompatibilities between drilling muds and formations. Formation damage due to drilling and completion fluids. Drilling equipment and processes for high temperatures. Hydraulic fracture treatments in high stress and low permeability rocks. Disposal of drill cuttings and mud waste.
The School of Petroleum Engineering has established leading-edge research facilities to improve the understanding of processes and mechanisms involved in the above areas and develop drilling and completion technologies to reduce field development costs and improve recovery efficiency. The research facilities include well equipped laboratories and computer modeling capabilities; rock and fracture mechanics laboratory; petrophysical laboratory; drilling fluid and cementing laboratory; formation damage analysis laboratory (dynamic filtration, fluid displacement, SEM, petrographic, etc.); borehole stability analysis laboratory (chemical potential, pore pressure penetration, swelling of shales, transient pressure pulse permeameter etc); torque and drag evaluation in slim-holes; design and optimisation of drilling muds and cements, stability analysis of tubulars including drill pipes and casings; design of well trajectories and completions for different in-situ stress and hole conditions and production strategies; design of hydraulic fracture stimulation programs for tight gas and geothermal reservoir(HDR) development; acid stimulation of low permeability sandstones; and design and planning of mud waste and cutting disposal in deep isolated formations by hydraulic fracturing.

Remote Sensing and GIS
Incorporation of auxiliary data into classification procedures
Urban area studies
Determining the characteristics of surface reflectance
Analysis of image and map quality
Application of satellite imagery to small scale mapping
Multispectral linear transformations
Application of spaceborne synthetic aperture radar data
Application of aircraft and satellite data to arid land studies
Application of satellite data to geological studies
Synergism of radar, visible and infrared remotely sensed data
Analysis of high resolution SPOT and Landsat TM data
Application of remote sensing to pollution and environmental monitoring
Artificial intelligence in remote sensing and GIS
Forest inventory and monitoring
Visualisation
Multimedia
Analysis of errors in DEM determination from radar interferometry
Development of a geographic information probability system (GIPS)
Vertical topology in GIS
Quality issues in hydrographic information systems
GIS in transport planning
The School provides a Bachelor of Engineering in Chemical Engineering and a Bachelor of Science in Industrial Chemistry. Both degrees are full-time four year degrees accredited by the Institute of Engineers Australia; the BE Chemical Engineering is also accredited by the Institution of Chemical Engineers (UK).

Combined degrees are also available for suitably qualified students. The BE/BSc (Computer Science) and BSc/BSc (Computer Science) provide accredited degrees in Chemical Engineering and Industrial Chemistry plus professional skills in computing. The BE/M.Comm. and BSc/M.Comm. allow advanced standing in the Masters of Commerce and the BE/MBimed E allows advanced standing in the Masters of Biomedical Engineering.

The School has a vigorous postgraduate training program focused on national and international areas of importance. A postgraduate program work based Master's degree in Process Engineering (8016) is offered. Research degrees include a Master of Science in Industrial Chemistry (2016) and in Chemical Engineering (2010) and a Master of Engineering in Chemical Engineering (2150). A doctoral research program is offered in Chemical Engineering (1010) and Industrial Chemistry (1016).

Chemical Engineering is the application of the principles of the physical sciences, together with the principles of economics and human relations, to fields in which matter undergoes a change in state, energy content or composition. The chemical engineer is generally responsible for the design, construction and operation of plant and equipment used in the chemical processing industries. Chemical Engineers are employed in a very wide range of industries including the Chemical, Minerals, Pharmaceutical, Food and Energy industries. Many Chemical Engineers work in environmental management, research and development business, management and computer applications.

Industrial Chemists are applied scientists, some of whom are engaged in solving problems in forefront research areas while others are responsible for the successful operations of Australia's chemical industry. Industrial Chemists analyse raw materials, apply computers to the simulation and control of chemical plant and verify the quality of the product. A particularly important activity is the control and management of the environment of industrial processes. Industrial Chemists are capable of fulfilling a multiplicity of roles as research scientists, development chemists, technical representatives and as plant/company managers.

For the award of Honours in the Chemical Engineering and Industrial Chemistry degree programs, students need to have distinguished themselves in the formal work, in other assignments as directed by the Head of the School, and in the final year project, for which a thesis is required. It is compulsory that, before completion of the program, students in both the Chemical Engineering and Industrial Chemistry full time programs must obtain a minimum of twelve weeks professionally oriented or industrial experience. Students in the part-time programs in Chemical Engineering and Industrial Chemistry must complete an approved program of industrial experience, of not less than twelve months prior to the award of the degree.
Undergraduate Study

Students are expected to possess a calculator having exponential capabilities, however, more advanced calculators and personal computers, will be found useful. In examinations, students may be required to use calculators supplied by the University, so that no student will have an unfair advantage over another. Further information may be obtained from the Head of the School.

Students of both Chemical Engineering and Industrial Chemistry are advised to have a copy of Perry J H ed. Chemical Engineers Handbook 6th ed. McGraw-Hill. This book is used extensively for most courses and units. Certain courses and units do not have specified textbooks and in these cases reference books are used or printed notes supplied.

Program Outlines

3040
Chemical Engineering - Full-time Program

Bachelor of Engineering
BE
This program extends over four years and studies student full-time during the day for twenty-eight weeks of each year (excluding examination and recess periods).

Successful completion of the BE degree program is accepted by the Institution of Chemical Engineers, the Institution of Engineers, Australia, and Royal Australian Chemical Institute as sufficient academic qualification for corporate membership.

The Director of Teaching and Learning may approve various program patterns involving full-time or part-time study.

Combined degrees BE/BSc Computer Sci, BE/M. Comm and BE/ M. Biomed.E are also available (see below).

<table>
<thead>
<tr>
<th>Stage 1</th>
<th>HPW</th>
<th>UOC</th>
</tr>
</thead>
<tbody>
<tr>
<td>CEIC1010 Introduction to the Chemical Industry</td>
<td>3</td>
<td>0</td>
</tr>
<tr>
<td>CEIC1020 Introduction to Chemical Engineering</td>
<td>0</td>
<td>6</td>
</tr>
<tr>
<td>CHEM1011 Fundamentals of Chemistry 1A</td>
<td>6</td>
<td>0</td>
</tr>
<tr>
<td>CHEM1031 or Higher Chemistry 1C</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td>CHEM1021 Chemistry 1B</td>
<td>0</td>
<td>6</td>
</tr>
<tr>
<td>MATH1131 Mathematics 1A</td>
<td>6</td>
<td>0</td>
</tr>
<tr>
<td>MATH1241 or Higher Mathematics 1B</td>
<td></td>
<td></td>
</tr>
<tr>
<td>MATH1241 or Higher Mathematics 1B</td>
<td>0</td>
<td>6</td>
</tr>
<tr>
<td>MECH0130 Engineering Drawing and Solid Modelling</td>
<td>3</td>
<td>0</td>
</tr>
<tr>
<td>PHYS1169 Engineering Physics 1</td>
<td>6</td>
<td>0</td>
</tr>
<tr>
<td>PHYS1111 or Fundamentals of Physics</td>
<td></td>
<td></td>
</tr>
<tr>
<td>CEIC1030 Communications and Business Skills</td>
<td></td>
<td></td>
</tr>
<tr>
<td>PHYS1229 or Concepts in Engineering Physics</td>
<td>0</td>
<td>6</td>
</tr>
</tbody>
</table>

Total HPW Session 1 24
HPW Session 2 24
Units of Credit Session 1 24
Units of Credit Session 2 24

Stage 2

| CEIC2011 Instrumental Analysis - Theory | 3 | 0 | 3 | 0 |
| CEIC2012 Instrumental Analysis- Practical | 0 | 3 | 0 | 3 |
| CEIC2020 Introduction to Numeric Methods | 3 | 0 | 3 | 0 |
| CEIC2110 Material and Energy Balances | 3 | 0 | 3 | 0 |
| CEIC2120 Fluid Flow | 3 | 0 | 3 | 0 |
| CEIC2130 Heat Transfer | 0 | 3 | 0 | 3 |
| CHEN2050 Chemical Engineering Practice 1 | 0 | 3 | 0 | 3 |
| CHEN2061 Introduction to Process Chemistry 1 | 6 | 0 | 6 | 0 |
| CHEN2062 Introduction to Process Chemistry 2 | 0 | 3 | 0 | 3 |
| CHEN2140 Mass Transfer | 0 | 3 | 0 | 3 |
| ELEC0809 Electrical Engineering 1C | 2 | 0 | 3 | 0 |
| MATH2020 Mathematics 2A | 2 | 0 | 3 | 0 |
| MATH2030 Mathematics 2B | 0 | 2 | 0 | 3 |
| MATH2899 Applied Statistics | 0 | 3 | 0 | 3 |

Total HPW Session 1 22
HPW Session 2 22
Units of Credit Session 1 24
Units of Credit Session 2 24

Stage 3

| BIOT3100 Fermentation Processes | 0 | 2 | 0 | 3 |
| CEIC3070 Process Control | 0 | 4 | 0 | 4 |
| CEIC3010 Reaction Engineering | 0 | 3 | 0 | 4 |
| CEIC3110 Thermodynamics | 3 | 0 | 3 | 0 |
| CHEN3021 Systems Modelling and Analysis | 2 | 0 | 3 | 0 |
| CHEN3022 Process Modelling and Optimisation | 0 | 3 | 0 | 3 |
| CHEN3031 Advanced Transport Phenomena | 0 | 3 | 0 | 3 |
| CHEN3041 Particle & Separation Processes | 6 | 0 | 6 | 0 |
| CHEN3065 Plant & Equipment Design | 0 | 4 | 0 | 4 |
| CHEN3067 Process Design & Economics | 3 | 0 | 3 | 0 |
| CHEN3068 Process Design & Safety | 0 | 3 | 0 | 3 |
| CHEN3080 Chemical Engineering Practice 2 | 3 | 0 | 3 | 0 |

Total HPW Session 1 21
HPW Session 2 22
Units of Credit Session 1 24
Units of Credit Session 2 24

Stage 4

| CEIC4070 Automation Science | 3 | 0 | 4 | 0 |
| CEIC4101 Professional Electives Advanced | 0 | 2 | 0 | 2 |
| CEIC4102 Professional Electives | 3 | 0 | 3 | 0 |
| CEIC4106 Professional Elective - Extended | 0 | 0 | 3 | 0 |
| CEIC4120 Management and Plant Operation | 0 | 5 | 0 | 6 |
| CHEN4031 Environmental Management 1 | 3 | 0 | 3 | 0 |
| CHEN4031 Design Project | 6 | 0 | 8 | 0 |
| CHEN4091 Research Project Theory | 3 | 0 | 3 | 0 |
| CHEN4092 Research Project Practice | 0 | 10 | 0 | 12 |

Total HPW Session 1 20
HPW Session 2 21
Units of Credit Session 1 24
Units of Credit Session 2 24

Chemical Engineering/Master of Commerce – Full-time Program

Bachelor of Engineering Master of Commerce

Stage 1 to Stage 3
Same as program 3040
Total Units 24 each stage
| Stage 4 | Course Code | Course Title | UOC | HPW
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>ACCT5901</td>
<td>Accounting: A User's Perspective</td>
<td>3</td>
<td>S1 S2</td>
</tr>
<tr>
<td></td>
<td>CEIC4102</td>
<td>Professional Electives</td>
<td>3</td>
<td>S1 S2</td>
</tr>
<tr>
<td></td>
<td>CEIC4110</td>
<td>Plant Management and Operation</td>
<td>4</td>
<td>S1 S2</td>
</tr>
<tr>
<td></td>
<td>CHEN4093</td>
<td>Research Project Theory</td>
<td>4</td>
<td>S1 S2</td>
</tr>
<tr>
<td></td>
<td>CHEN4094</td>
<td>Small Research Project Practice</td>
<td>8</td>
<td>S1 S2</td>
</tr>
<tr>
<td></td>
<td>CHEN4031</td>
<td>Environmental Management 1</td>
<td>3</td>
<td>S1 S2</td>
</tr>
<tr>
<td></td>
<td>CHEN4081</td>
<td>Design Project</td>
<td>6</td>
<td>S1 S2</td>
</tr>
<tr>
<td></td>
<td>ECON5103</td>
<td>Business Economics</td>
<td>3</td>
<td>S1 S2</td>
</tr>
<tr>
<td></td>
<td>Core Computing Elective</td>
<td>3</td>
<td>S1 S2</td>
<td>0 3 0</td>
</tr>
<tr>
<td>Total</td>
<td>HPW Session 1</td>
<td>19</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>HPW Session 2</td>
<td>18</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Units of Credit Session 1</td>
<td>24</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Units of Credit Session 2</td>
<td>24</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

| Stage 5 | Course Code | Course Title | UOC | HPW
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Commerce Elective</td>
<td>3</td>
<td>S1 S2</td>
<td>0 6</td>
<td>0</td>
</tr>
<tr>
<td>Commerce Elective</td>
<td>3</td>
<td>S1 S2</td>
<td>0 6</td>
<td>0</td>
</tr>
<tr>
<td>Commerce Elective</td>
<td>3</td>
<td>S1 S2</td>
<td>0 6</td>
<td>0</td>
</tr>
<tr>
<td>Commerce Elective</td>
<td>3</td>
<td>S1 S2</td>
<td>0 6</td>
<td>0</td>
</tr>
<tr>
<td>Commerce Elective</td>
<td>3</td>
<td>S1 S2</td>
<td>0 6</td>
<td>0</td>
</tr>
<tr>
<td>Commerce Elective</td>
<td>3</td>
<td>S1 S2</td>
<td>0 6</td>
<td>0</td>
</tr>
<tr>
<td>Commerce Elective</td>
<td>3</td>
<td>S1 S2</td>
<td>0 6</td>
<td>0</td>
</tr>
<tr>
<td>Commerce Elective</td>
<td>3</td>
<td>S1 S2</td>
<td>0 6</td>
<td>0</td>
</tr>
<tr>
<td>Total</td>
<td>HPW Session 1</td>
<td>12</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>HPW Session 2</td>
<td>12</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Units of Credit Session 1</td>
<td>24</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Units of Credit Session 2</td>
<td>24</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**3042**

Chemical Engineering/Computer Science – Full-time Program

**Bachelor of Engineering Bachelor of Science in Computer Science**

The combined program of five years full-time study enables a student in the school to qualify for the award of the two degrees of Bachelor of Engineering and Bachelor of Science (BE/BSc). Graduates from this new course will have a broader range of complementary computing and engineering skills that will greatly enhance both their employment and career prospects. The School of Chemical Engineering and Industrial Chemistry administers the program.

| Stage 1 | Course Code | Course Title | UOC | HPW
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>CEIC1020</td>
<td>Introduction to Chemical Engineering</td>
<td>0</td>
<td>S1 S2</td>
<td>6 0 6</td>
</tr>
<tr>
<td>CHEM1101</td>
<td>Fundamentals of Chemistry 1A</td>
<td>6</td>
<td>S1 S2</td>
<td>0 6 0</td>
</tr>
<tr>
<td>CHEM1021</td>
<td>Chemistry 1B</td>
<td>0</td>
<td>S1 S2</td>
<td>6 0 6</td>
</tr>
<tr>
<td>COMP1011</td>
<td>Computing 1A</td>
<td>6</td>
<td>S1 S2</td>
<td>0 6 0</td>
</tr>
<tr>
<td>COMP1021</td>
<td>Computing 1B</td>
<td>6</td>
<td>S1 S2</td>
<td>0 6 0</td>
</tr>
<tr>
<td>MATH1131</td>
<td>Mathematics 1A</td>
<td>6</td>
<td>S1 S2</td>
<td>0 6 0</td>
</tr>
<tr>
<td>MATH1141</td>
<td>or Higher Mathematics 1A</td>
<td>0</td>
<td>S1 S2</td>
<td>0 0 0</td>
</tr>
<tr>
<td>MATH1231</td>
<td>Mathematics 1B</td>
<td>6</td>
<td>S1 S2</td>
<td>0 6 0</td>
</tr>
<tr>
<td>MATH1241</td>
<td>or Higher Mathematics 1B</td>
<td>0</td>
<td>S1 S2</td>
<td>0 0 0</td>
</tr>
<tr>
<td>PHYS1169</td>
<td>Physics 1 (Chem &amp; Mech Eng)</td>
<td>6</td>
<td>S1 S2</td>
<td>0 6</td>
</tr>
<tr>
<td>PHYS1111</td>
<td>or Fundamentals of Physics</td>
<td>6</td>
<td>S1 S2</td>
<td>0 6</td>
</tr>
<tr>
<td>Total</td>
<td>HPW Session 1</td>
<td>24</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>HPW Session 2</td>
<td>24</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Units Session 1</td>
<td>24</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Units Session 2</td>
<td>24</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Stage 2**

| Course Code | Course Title | UOC | HPW
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>CEIC2011</td>
<td>Instrumental Analysis - Theory</td>
<td>0</td>
<td>S1 S2</td>
</tr>
<tr>
<td>CEIC2110</td>
<td>Material and Energy Balances</td>
<td>0</td>
<td>S1 S2</td>
</tr>
<tr>
<td>CEIC2120</td>
<td>Fluid Flow</td>
<td>0</td>
<td>S1 S2</td>
</tr>
<tr>
<td>CEIC2130</td>
<td>Heat Transfer</td>
<td>0</td>
<td>S1 S2</td>
</tr>
<tr>
<td>CHEN2050</td>
<td>Chemical Engineering Practice 1</td>
<td>0</td>
<td>S1 S2</td>
</tr>
<tr>
<td>CHEN2061</td>
<td>Introduction to Process Chemistry 1</td>
<td>0</td>
<td>S1 S2</td>
</tr>
<tr>
<td>CHEN2062</td>
<td>Introduction to Process Chemistry 2</td>
<td>0</td>
<td>S1 S2</td>
</tr>
<tr>
<td>CHEN2140</td>
<td>Mass Transfer</td>
<td>0</td>
<td>S1 S2</td>
</tr>
<tr>
<td>COMP2011</td>
<td>Data Organisation</td>
<td>0</td>
<td>S1 S2</td>
</tr>
<tr>
<td>MATH2020</td>
<td>Mathematics 2A</td>
<td>0</td>
<td>S1 S2</td>
</tr>
<tr>
<td>MATH2030</td>
<td>Mathematics 2B</td>
<td>0</td>
<td>S1 S2</td>
</tr>
<tr>
<td>MATH1081</td>
<td>Discrete Maths</td>
<td>0</td>
<td>S1 S2</td>
</tr>
<tr>
<td>MATH2899</td>
<td>Applied Statistics CE</td>
<td>0</td>
<td>S1 S2</td>
</tr>
<tr>
<td>Total</td>
<td>HPW Session 1</td>
<td>22</td>
<td></td>
</tr>
<tr>
<td></td>
<td>HPW Session 2</td>
<td>23</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Units of Credit Session 1</td>
<td>24</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Units of Credit Session 2</td>
<td>24</td>
<td></td>
</tr>
</tbody>
</table>

**Stage 3**

| Course Code | Course Title | UOC | HPW
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>CEIC3070</td>
<td>Process Control</td>
<td>0</td>
<td>S1 S2</td>
</tr>
<tr>
<td>CEIC3010</td>
<td>Reaction Engineering</td>
<td>0</td>
<td>S1 S2</td>
</tr>
<tr>
<td>CEIC3110</td>
<td>Thermodynamics</td>
<td>0</td>
<td>S1 S2</td>
</tr>
<tr>
<td>CEIC4103</td>
<td>Professional Elective</td>
<td>0</td>
<td>S1 S2</td>
</tr>
<tr>
<td>CHEN3021</td>
<td>Systems Modeling and Analysis</td>
<td>0</td>
<td>S1 S2</td>
</tr>
<tr>
<td>CHEN3022</td>
<td>Process Modeling and Optimisation</td>
<td>0</td>
<td>S1 S2</td>
</tr>
<tr>
<td>CHEN3031</td>
<td>Advanced Transport Phenomena</td>
<td>0</td>
<td>S1 S2</td>
</tr>
<tr>
<td>CHEN3041</td>
<td>Particulate Separation Processes</td>
<td>6</td>
<td>S1 S2</td>
</tr>
<tr>
<td>CHEN3055</td>
<td>Plant &amp; Equipment Design</td>
<td>0</td>
<td>S1 S2</td>
</tr>
<tr>
<td>CHEN3080</td>
<td>Chemical Engineer Practice 2</td>
<td>3</td>
<td>S1 S2</td>
</tr>
<tr>
<td>COMP2021</td>
<td>Digital Systems Structures</td>
<td>5</td>
<td>S1 S2</td>
</tr>
<tr>
<td>COMP2041</td>
<td>Software Construction: Techniques and Tools</td>
<td>0</td>
<td>S1 S2</td>
</tr>
<tr>
<td>Total</td>
<td>HPW Session 1</td>
<td>22</td>
<td></td>
</tr>
<tr>
<td></td>
<td>HPW Session 2</td>
<td>22</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Units of Credit Session 1</td>
<td>24</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Units of Credit Session 2</td>
<td>24</td>
<td></td>
</tr>
</tbody>
</table>

**Stage 4**

| Course Code | Course Title | UOC | HPW
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>CEIC2012</td>
<td>Instrumental Analysis - Practical</td>
<td>0</td>
<td>S1 S2</td>
</tr>
<tr>
<td>CEIC4104</td>
<td>Professional Elective</td>
<td>3</td>
<td>S1 S2</td>
</tr>
<tr>
<td>CHEN3067</td>
<td>Process Design &amp; Economics</td>
<td>3</td>
<td>S1 S2</td>
</tr>
<tr>
<td>CHEN3068</td>
<td>Process Design &amp; Safety</td>
<td>0</td>
<td>S1 S2</td>
</tr>
<tr>
<td>COMP*</td>
<td>Computing Elective</td>
<td>0</td>
<td>S1 S2</td>
</tr>
<tr>
<td>COMP*</td>
<td>2 x Computing Electives</td>
<td>5</td>
<td>S1 S2</td>
</tr>
<tr>
<td>COMP*</td>
<td>2 x Computing Electives</td>
<td>5</td>
<td>S1 S2</td>
</tr>
<tr>
<td>Elective Course</td>
<td>0</td>
<td>S1 S2</td>
<td>6 0 6</td>
</tr>
<tr>
<td>Total</td>
<td>HPW Session 1</td>
<td>21</td>
<td></td>
</tr>
<tr>
<td></td>
<td>HPW Session 2</td>
<td>22</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Units of Credit Session 1</td>
<td>24</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Units of Credit Session 2</td>
<td>24</td>
<td></td>
</tr>
</tbody>
</table>

**Stage 5**

| Course Code | Course Title | UOC | HPW
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>CEIC4070</td>
<td>Automation Science</td>
<td>3</td>
<td>S1 S2</td>
</tr>
<tr>
<td>CEIC4101</td>
<td>Professional Electives</td>
<td>3</td>
<td>S1 S2</td>
</tr>
<tr>
<td>CEIC4102</td>
<td>Professional Electives</td>
<td>3</td>
<td>S1 S2</td>
</tr>
<tr>
<td>CEIC4106</td>
<td>Professional Elective Extended</td>
<td>0</td>
<td>S1 S2</td>
</tr>
<tr>
<td>CEIC4120</td>
<td>Management and Plant Operation</td>
<td>0</td>
<td>S1 S2</td>
</tr>
<tr>
<td>CHEN4031</td>
<td>Environmental Management 1</td>
<td>3</td>
<td>S1 S2</td>
</tr>
<tr>
<td>CHEN4081</td>
<td>Design Project</td>
<td>0</td>
<td>S1 S2</td>
</tr>
<tr>
<td>CHEN4091</td>
<td>Research Project Theory</td>
<td>3</td>
<td>S1 S2</td>
</tr>
<tr>
<td>CHEN4092</td>
<td>Research Project Practice</td>
<td>0</td>
<td>S1 S2</td>
</tr>
<tr>
<td>Elective Course</td>
<td>0</td>
<td>S1 S2</td>
<td>2 0 3</td>
</tr>
<tr>
<td>Total</td>
<td>HPW Session 1</td>
<td>20</td>
<td></td>
</tr>
<tr>
<td></td>
<td>HPW Session 2</td>
<td>21</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Units of Credit Session 1</td>
<td>24</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Units of Credit Session 2</td>
<td>24</td>
<td></td>
</tr>
</tbody>
</table>
Bachelor of Engineering Master of Biomedical Engineering

Provides route to BE in 4 years and MBiomedE in 5th year. Program is based on modified CHEN3040 with additional courses in preparation for Masters. A summary is provided below with details is based on modified CHEN3040 with additional courses in preparation for Masters. A summary is provided below with details in the section 'Graduate School of Biomedical Engineering'.

Stage 1
BIOM1001 Professional Biomedical Studies 2 0 3 0
BIOM9010 Biomedical Engineering Practice 0 2 0 3
CEIC1020 Introduction to Chemical Engineering 0 6 0 6
CHEM1011 Fundamentals of Chemistry 1A 6 0 6 0
CHEM1021 Chemistry 1B 0 6 0 6
MATH1131 Mathematics 1A 6 0 6 0
MATH1231 Mathematics 1B 0 6 0 6
MECH1030 Engineering Drawing and Solid Modelling 3 0 3 0
PHYS1169 Physics 1 (Chem & Mech Eng) 6 0 6 0
General Education 0 2 0 3

Total Units of Credit Session 1 24
Units of Credit Session 2 22

Stage 2
BIOM9311 Mass Transfer in Medicine 0 3 0 6
CEIC2011 Instrumental Analysis - Theory 3 0 3 0
CEIC2012 Instrumental Analysis - Practical 0 3 0 3
CEIC2020 Introduction to Numeric Methods 3 0 3 0
CEIC2110 Material and Energy Balances 3 0 3 0
CEIC2120 Fluid Flow 3 0 3 0
CEIC2130 Heat Transfer 0 3 0 3
CHEN2050 Chemical Engineering Practice 1 0 3 0 3
CHEN2061 Introduction to Process Chemistry 1 6 0 6 0
CHEN2062 Introduction to Process Chemistry 2 0 3 0 3
CHEN2140 Mass Transfer 0 3 0 3
ELEC3069 Electrical Engineering 1C 2 0 3 0
MATH2020 Engineering Mathematics 2A 2 0 3 0
MATH2030 Engineering Mathematics 2B 0 2 0 3

Total Units of Credit Session 1 21
Units of Credit Session 2 22

Stage 3
BIOM9420 Clinical Laboratory Science 3 0 6 0
BIOT3100 Fermentation Processes 0 3 0 3
CEIC3070 Process Control 0 4 0 4
CEIC3010 Reaction Engineering 0 3 0 4
CEIC3110 Thermodynamics 3 0 3 0
CHEN3021 Systems Modelling and Analysis 2 0 3 0
CHEN3022 Process Modelling and Optimisation 0 3 0 3
CHEN3031 Advanced Transport Phenomena 0 3 0 3
CHEN3041 Particle & Separation Processes 6 0 6 0
CHEN3065 Plant Equipment & Design 0 4 0 4
CHEN3080 Chemical Engineering Practice 2 3 0 3
MATH2999 Applied Statistics CE 0 3 0 3
General Education 2 0 3

Total Units of Credit Session 1 24
Units of Credit Session 2 24

Stage 4
BIOM930 Research Project A 0 3 0 6
BIOM9XXX Biomedical Engineering Elective 0 3 0 6
BIOM9XXX Biomedical Engineering Elective 3 0 6 0
BIOM9XXX Biomedical Engineering Elective 3 0 6 0
CEIC4130 Plant Operation 0 3 0 3
CHEN3067 Process Design & Economics 3 0 3 0
CHEN3068 Process Design & Safety 0 3 0 3
CHEN4104 Professional Elective 3 0 3 0
PHPH2112 Physiology 1 6 0 6 0
PHPH2112 Physiology 1 0 6 0 6

Total Units of Credit Session 1 24
Units of Credit Session 2 24

Biomedical Electives

Preferred electives
BIOM9311 Mass Transfer in Medicine 0 3
BIOM9321 Physiol.Fluid Mechanics 0 3
BIOM9332 Biocompatibility 0 3
BIOM9621 Biolog. Signal Analysis 3 0
BIOM9701 Dynamics of the Cardiovascular System 3 0

Other electives
BIOM9027 Medical Imaging 0 3
BIOM9440 Biomedical Practical Measurement 0 3
BIOM9450 Clinical Information Sys. 0 3
BIOM9541 Mechanics of the human body 3 0
BIOM9551 Biomechanics of Physical Rehabilitation 3 0
BIOM9601 Biomedical Applic of Microcomputers 1 3 0
BIOM9602 Biomedical Applic of Microcomputers 2 0 3
BIOM9613 Medical Instrumentation 3 0

3100 Industrial Chemistry - Full-time Program

Bachelor of Science

Industrial Chemistry is a four-year professional (prescribed) science program that is concerned with the application of science and technology to the chemical industry.

Successful completion of the program is accepted by the Royal Australian Chemical Institute and the Institution of Engineers,
Australia as sufficient academic qualification for full corporate membership.

The Director of Teaching and Learning may approve various program patterns involving full-time and part-time study.

Combined degrees are not available (see below).

### Stage 1

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>HPW</th>
<th>UOC</th>
</tr>
</thead>
<tbody>
<tr>
<td>CEIC1010</td>
<td>Introduction to the Chemical Industry</td>
<td>3</td>
<td>0</td>
</tr>
<tr>
<td>CEIC1020</td>
<td>Introduction to Chemical Engineering</td>
<td>6</td>
<td>0</td>
</tr>
<tr>
<td>CHEM1011</td>
<td>Fundamentals of Chemistry A</td>
<td>6</td>
<td>0</td>
</tr>
<tr>
<td>CHEM1031</td>
<td>or Higher Chemistry 1C</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>CHEM1021</td>
<td>Chemistry 1B</td>
<td>0</td>
<td>6</td>
</tr>
<tr>
<td>CHEM1041</td>
<td>or Higher Chemistry 1D</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>MATH1131</td>
<td>Mathematics 1A</td>
<td>6</td>
<td>0</td>
</tr>
<tr>
<td>MATH1141</td>
<td>or Higher Mathematics 1A</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>MATH1231</td>
<td>Mathematics 1B</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>MATH1241</td>
<td>or Higher Mathematics 1B</td>
<td>0</td>
<td>6</td>
</tr>
<tr>
<td>MECH1030</td>
<td>Engineering Drawing and Solid Modelling</td>
<td>3</td>
<td>0</td>
</tr>
<tr>
<td>PHYS1621</td>
<td>Engineering Physics 1</td>
<td>6</td>
<td>0</td>
</tr>
<tr>
<td>PHYS1111</td>
<td>or Fundamentals of Physics</td>
<td>6</td>
<td>0</td>
</tr>
<tr>
<td>CEIC1030</td>
<td>Communications and Business Skills</td>
<td>6</td>
<td>0</td>
</tr>
<tr>
<td>PHYS1121</td>
<td>or Concepts in Engineering Physics</td>
<td>6</td>
<td>0</td>
</tr>
</tbody>
</table>

Total HPW Session 1: 24 Units of Credit: 12

### Stage 2

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>HPW</th>
<th>UOC</th>
</tr>
</thead>
<tbody>
<tr>
<td>CEIC2011</td>
<td>Instrumental Analysis -Theory</td>
<td>3</td>
<td>0</td>
</tr>
<tr>
<td>CEIC2012</td>
<td>Instrumental Analysis - Practical</td>
<td>3</td>
<td>0</td>
</tr>
<tr>
<td>CEIC2020</td>
<td>Introduction to Numeric Methods</td>
<td>3</td>
<td>0</td>
</tr>
<tr>
<td>CEIC2110</td>
<td>Material and Energy Balances</td>
<td>3</td>
<td>0</td>
</tr>
<tr>
<td>CEIC2120</td>
<td>Fluid Flow</td>
<td>3</td>
<td>0</td>
</tr>
<tr>
<td>CEIC2130</td>
<td>Heat Transfer</td>
<td>3</td>
<td>0</td>
</tr>
<tr>
<td>CHEM2021</td>
<td>Organic Chemistry</td>
<td>0</td>
<td>6</td>
</tr>
<tr>
<td>CHEM2839</td>
<td>Inorganic Chemistry</td>
<td>0</td>
<td>6</td>
</tr>
<tr>
<td>INDIC2040</td>
<td>Physical Process Chemistry</td>
<td>6</td>
<td>0</td>
</tr>
<tr>
<td>MATH2020</td>
<td>Mathematics 2A</td>
<td>2</td>
<td>0</td>
</tr>
<tr>
<td>MATH2030</td>
<td>Mathematics 2B</td>
<td>0</td>
<td>2</td>
</tr>
<tr>
<td>MATH2999</td>
<td>Applied Statistics CE</td>
<td>0</td>
<td>3</td>
</tr>
<tr>
<td>General Education</td>
<td></td>
<td>2</td>
<td>0</td>
</tr>
</tbody>
</table>

Total HPW Session 1: 22 Units of Credit: 11

### Stage 3

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>HPW</th>
<th>UOC</th>
</tr>
</thead>
<tbody>
<tr>
<td>BIOT3100</td>
<td>Fermentation Processes</td>
<td>0</td>
<td>2</td>
</tr>
<tr>
<td>CEIC3070</td>
<td>Process Control</td>
<td>0</td>
<td>4</td>
</tr>
<tr>
<td>CEIC3010</td>
<td>Reaction Engineering</td>
<td>0</td>
<td>3</td>
</tr>
<tr>
<td>CEIC3110</td>
<td>Thermodynamics</td>
<td>3</td>
<td>0</td>
</tr>
<tr>
<td>CHEM3829</td>
<td>Organic Chemistry</td>
<td>6</td>
<td>0</td>
</tr>
<tr>
<td>INDIC3051</td>
<td>Process Chemistry and Operations</td>
<td>0</td>
<td>4</td>
</tr>
<tr>
<td>INDIC3110</td>
<td>Industrial &amp; Environmental Chemistry</td>
<td>6</td>
<td>0</td>
</tr>
<tr>
<td>INDIC3120</td>
<td>Industrial Chemistry Practice</td>
<td>0</td>
<td>6</td>
</tr>
<tr>
<td>POLY3011</td>
<td>Polymer Science -Theory</td>
<td>3</td>
<td>0</td>
</tr>
<tr>
<td>POLY3012</td>
<td>Polymer Science-Practice</td>
<td>0</td>
<td>3</td>
</tr>
<tr>
<td>General Education course/s</td>
<td></td>
<td>4</td>
<td>0</td>
</tr>
</tbody>
</table>

Total HPW Session 1: 22 Units of Credit: 11

### Stage 4

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>HPW</th>
<th>UOC</th>
</tr>
</thead>
<tbody>
<tr>
<td>CEIC4070</td>
<td>Automation Science</td>
<td>3</td>
<td>0</td>
</tr>
<tr>
<td>CEIC4105</td>
<td>Professional Electives</td>
<td>0</td>
<td>3</td>
</tr>
<tr>
<td>CEIC4120</td>
<td>Management and Plant Operation</td>
<td>0</td>
<td>5</td>
</tr>
<tr>
<td>INDIC4061</td>
<td>Process Design A</td>
<td>4</td>
<td>0</td>
</tr>
<tr>
<td>INDIC4062</td>
<td>Process Design B</td>
<td>4</td>
<td>0</td>
</tr>
<tr>
<td>INDIC4091</td>
<td>Research Project Theory</td>
<td>11</td>
<td>0</td>
</tr>
<tr>
<td>INDIC4092</td>
<td>Research Project Practice</td>
<td>0</td>
<td>12</td>
</tr>
<tr>
<td>General Studies</td>
<td></td>
<td>0</td>
<td>2</td>
</tr>
</tbody>
</table>

Total HPW Session 1: 22 HPW Session 2: 22 Units of Credit Session 1: 24 Units of Credit Session 2: 24

### Industrial Chemistry/Master of Commerce – Full-time Program

Bachelor of Science Master of Commerce
BSc MCom

### Stage 1 to Stage 3

Same as program 3100 Total Units 24 each stage

### Stage 4

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>HPW</th>
<th>UOC</th>
</tr>
</thead>
<tbody>
<tr>
<td>ACCT5901</td>
<td>Accounting: A users Perspective</td>
<td>3</td>
<td>0</td>
</tr>
<tr>
<td>CEIC4120</td>
<td>Management and Plant Operation</td>
<td>0</td>
<td>5</td>
</tr>
<tr>
<td>ECON5103</td>
<td>Business Economics</td>
<td>0</td>
<td>3</td>
</tr>
<tr>
<td>INDIC4093</td>
<td>Small Research Project Theory</td>
<td>8</td>
<td>0</td>
</tr>
<tr>
<td>INDIC4094</td>
<td>Small Research Project Practice</td>
<td>8</td>
<td>0</td>
</tr>
<tr>
<td>INDIC4061</td>
<td>Process Design A</td>
<td>0</td>
<td>4</td>
</tr>
<tr>
<td>INDIC4062</td>
<td>Process Design B</td>
<td>0</td>
<td>4</td>
</tr>
<tr>
<td>INFS5988</td>
<td>Business Information Systems</td>
<td>3</td>
<td>0</td>
</tr>
</tbody>
</table>

Total HPW Session 1: 18 HPW Session 2: 20 Units of Credit Session 1: 24 Units of Credit Session 2: 24

### Stage 5

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>HPW</th>
<th>UOC</th>
</tr>
</thead>
<tbody>
<tr>
<td>Commerce Elective</td>
<td></td>
<td>3</td>
<td>0</td>
</tr>
<tr>
<td>Commerce Elective</td>
<td></td>
<td>3</td>
<td>0</td>
</tr>
<tr>
<td>Commerce Elective</td>
<td></td>
<td>3</td>
<td>0</td>
</tr>
<tr>
<td>Commerce Elective</td>
<td></td>
<td>3</td>
<td>0</td>
</tr>
<tr>
<td>Commerce Elective</td>
<td></td>
<td>3</td>
<td>0</td>
</tr>
<tr>
<td>Commerce Elective</td>
<td></td>
<td>3</td>
<td>0</td>
</tr>
<tr>
<td>Commerce Elective</td>
<td></td>
<td>3</td>
<td>0</td>
</tr>
<tr>
<td>Commerce Elective</td>
<td></td>
<td>3</td>
<td>0</td>
</tr>
<tr>
<td>Commerce Elective</td>
<td></td>
<td>3</td>
<td>0</td>
</tr>
</tbody>
</table>

Total HPW Session 1: 12 HPW Session 2: 12 Units of Credit Session 1: 24 Units of Credit Session 2: 24
3102
Industrial Chemistry/Bachelor of Computer Science - Full-time Program

Bachelor of Science, Bachelor of Science in Computer Science

The combined program of five years full-time study enables a student in the school to qualify for the award of the two Bachelor of Science degrees (BSc/BSc). Graduates from this new program will have a broader range of complementary computing, chemistry and engineering skills that will greatly enhance both their employment and career prospects. The School of Chemical Engineering and Industrial Chemistry administers the program.

Successful completion of the BSc (Industrial Chemistry) degree program is accepted by the Institute of Engineers, Australian and the Royal Australian Chemical Institute as sufficient academic qualification for corporate membership.

Stage 1

CEIC1020 Introduction to Chemical Engineering 0 6 0 6
COMP1011 Computing 1A 6 0 6 0
COMP1021 Computing 1B 0 0 0 6
CHEM1011 Fundamentals of Chemistry 1A 6 0 6 0
CHEM1031 Higher Chemistry 1C 0 0 0 0
CHEM1021 Chemistry 1B 0 0 0 6
CHEM1041 Higher Chemistry 1D 0 0 0 0
MATH1131 Mathematics 1A 6 0 6 0
MATH1141 Higher Mathematics 1A 6 0 6 0
MATH1231 Mathematics 1B 6 0 6 0
MATH1241 Higher Mathematics 1B 0 0 0 6
PHYS1169 Physics 1 (Chem & Mech Eng) 6 0 6
PHYS1111 Fundamentals of Physics

Total HPW Session 1 24
HPW Session 2 24
Units of Credit Session 1 24
Units of Credit Session 2 24

Stage 2

CEIC2010 Instrumental Analysis -Theory 3 0 3 0
CEIC2011 Instrumental Analysis -Practical 0 3 0 3
CEIC2110 Material and Energy Balances 3 0 3 0
CEIC2120 Fluid Flow 3 0 3 0
CEIC2130 Heat Transfer 0 3 0 3
CHEM2021 Organic Chemistry 0 6 0 6
COMP2011 Data Organisation 5 0 6 0
INDC2040 Physical Process Chemistry 6 0 6 0
MATH2020 Mathematics 2A 2 0 3 0
MATH2030 Mathematics 2B 0 2 0 3
MATH1081 Discrete Maths 0 6 0 6
MATH2899 Applied Statistics CE 0 3 0 3

Total HPW Session 1 22
HPW Session 2 23
Units of Credit Session 1 24
Units of Credit Session 2 24

Stage 3

CEIC3070 Process Control 0 4 0 4
CEIC3010 Reaction Engineering 0 3 0 4
CEIC3110 Thermodynamics 3 0 3 0
CEIC4103 Professional electives 2 0 3 0
CHEM2031 Inorganic Chemistry and Structure 6 0 6 0
COMP2021 Digital Systems Structures 5 0 6 0
COMP2041 Software Construction: Techniques and Tools 0 5 0 6

Total HPW Session 1 22
HPW Session 2 23
Units of Credit Session 1 24
Units of Credit Session 2 24

Part-time programs

Six-year part-time programs leading to the award of the degree of Bachelor of Science (Technology) in Chemical Engineering and in Industrial Chemistry are intended for students who are employed in relevant industries and who wish to prepare for a degree mainly by part-time attendance.

As part of the requirements for the award of the BSc(Tech) degree, students are required to complete an approved program of industrial training of not less than one year prior to the award of the degree. Industrial training should normally be completed concurrently with attendance in the program, but with the approval of the Head of School, may be completed after completion of the prescribed program of study.

Students who qualify for the award of the BSc(Tech) degree and who wish to proceed to the award of a BSc or BE degree will normally be required to complete further work which will involve at least one year of full-time attendance.

Holders of the degree of BSc(Tech) or BSc(Eng) will be eligible to proceed to the award of the degree of Master of Science or Master of Engineering, course to the regulations relating to these degrees.

Transfer is also possible from full-time programs to the part-time BSc(Tech) degree program, but a period of approved industrial experience must be gained before graduation. This requirement will apply to students transferring from BSc and BE degree programs within the Faculty.

Details of part time programs can be obtained from the Director of Teaching and Learning.
3050
Chemical Engineering - Part-time Program

Bachelor of Science (Technology) BSc(Tech)

3110
Industrial Chemistry - Part-time Program

Bachelor of Science (Technology) BSc (Tech)

Part time programs consist of first 3 years of the respective full time program – undertaken over a six year period.
Details of part time programs can be obtained from the Director of Teaching and Learning.

Postgraduate Study

Program Outlines

Formal programs in the School of Chemical Engineering and Industrial Chemistry lead to the award of the Master of Engineering Science in Process Engineering 8016.

The School welcomes enquiries from graduates interested in pursuing research for the award of the degrees of:

**PhD**
- Chemical Engineering 1010
- Industrial Chemistry 1016

**MSc**
- Chemical Engineering 2010
- Industrial Chemistry 2016

**ME**
- Chemical Engineering 2150

Master of Engineering Science Degree Programs

The MEngSc degree programs involve a project that must integrate and apply the principles treated in the program. It may take the form of a design feasibility study or an experimental investigation. Evidence of initiative and of a high level of ability and understanding is required in the students approach, and the results must be embodied in a report and submitted in accordance with the University’s requirements.

8016
Process Engineering

Master of Engineering Science MEngSc

The program will involve full time study at UNSW for overseas students for a period of one year. Australian citizens or permanent residents may elect to take the program in a series of modules over a somewhat longer period. The degree can be obtained by taking a combination of courses to a minimum number of 120 credit points.

Students with a recognised 4 year BE or BSc degree OR students with a recognised 3 year BE or BSc plus satisfactory industrial experience OR students who submit satisfactory evidence of other academic or professional attainments will be permitted to enrol.

Whilst the program is aimed at maximum flexibility four courses will be considered as core courses. These are CEIC5310 Computing Studies in Process Industries, CEIC5311 Instrumental Analysis in Process Industries, CEIC5312 Safety and Communication in the Process Industries, and CEIC5313 Environmental Technologies in Process Industries.

These core courses could be substituted if a student can demonstrate skills in these areas. The core courses will be offered at periods most convenient to the resource utilisation of the School. 30 credit points can be taken as electives, which may be given as one-week intensive programs.

A 30 credit point project on relevant aspects of process industries, supervised by academic members of staff may be undertaken. 2 staff members will undertake assessment of the project report.

The Head of School or Graduate Studies Coordinator must approve each student program.

The fee for the entire MEngSc program is $16000. Fees for Australian citizens or permanent residents will be initially set at $500 per credit point.

Core courses (15 UOC)
- CEIC5310 Computing Studies in the Process Industries
- CEIC5311 Instrumental Analysis in the Process Industries
- CEIC5312 Safety and Communications in the Process Industries
- CEIC5313 Environmental Technologies

Project (30 units)
- CEIC5320 Process Engineering Project

Elective courses (15UOC)
two to be chosen
- CEIC5330 Process Engineering and the Petroleum Industry
- CEIC5331 Process Engineering: Natural Gas and Lighting
- CEIC5332 Process Engineering in the Food Industry
- CEIC5335 Advanced Computer Methods in the Process Industries
- CEIC5336 Environmental Chemistry in the Process Industries
- CEIC5337 Particle Characterisation in the Process Industries
- CEIC5340 Polymer Synthesis: Fundamentals and Techniques
- CEIC5341 Membrane Technology in the Process Industries
- CEIC5333 Experimental Design in the Process Industries
Course Descriptions

Descriptions of all courses are presented in alphanumeric order within organisational units. For academic advice regarding a particular course consult with the contact for the course as listed. A guide to abbreviations and prefixes is included in the chapter "Handbook Guide", appearing earlier in this book.

Graduate courses will only be offered if class numbers exceed 5 and some graduate courses will only be offered every alternate year. Contact School for further details.

CEIC0010
Mass Transfer and Material Balances
Staff Contact: A/Prof M Brungs
UOC3 HPW3 S1
Prerequisite/s: CHEM1101, CHEM1201, CIVL2505
Note/s: Servicing subject i.e. a subject taught within courses offered by other faculties.


CEIC0030
Environmental Protection in the Process Industries
Staff Contact: Dr PT Crisp
Prerequisite/s: CEIC0010, INDC4120
Note/s: Servicing subject i.e. a subject taught within courses offered by other faculties


CEIC0050
Atmospheric and Process Chemistry
Staff Contact: Dr PT Crisp
UOC3 HPW3 WKS14 S1
Prerequisite/s: CHEM1101, CHEM1201
Note/s: Servicing subject i.e. a subject taught within courses offered by other faculties


CEIC1010
Introduction to the Chemical Industry
Staff Contact: Dr F Lucien
UOC3 HPW3 WKS14 S1

Introduction to basic Chemical Engineering and Industrial Chemistry concepts, design, flow sheets, safety and environmental issues.

The profession, ethics and careers. Laboratory, Pilot Plant and Industry visits. Case studies of the chemical process industry. Introduction to computing and the student computing facilities, including the use of word processing and spreadsheets within the profession.

CEIC1020
Introduction to Chemical Engineering
Staff Contact: A/Prof M Brungs
UOC6 HPW6 WKS14 S2


CEIC1030
Communications and Business Skills
Staff Contact: Dr F Lucien
UOC6 S2

Experience is gained in business practices including: company types, structure and organisation, company financing and operation, personnel management, accounting, company law, industrial relations and trade union practices, marketing. A Business Plan is written and company liquidation is undertaken. Product development and quality management issues are covered. Oral and written communication skills are developed.

CEIC2011
Instrumental Analysis - Theory
Staff Contact: A/Prof M Brungs
UOC3 HPW3 WKS14 S1
Prerequisite/s: PHYS1002, CHEM1101 and CHEM1201, MATH1032 or MATH1231 or MATH1042 or MATH11042 or MATH1123 or MATH1132 or MATH1241, CHEM1101 and CHEM1201, MATH1032 or MATH1231 or MATH1042 or MATH11042 or MATH1123 or MATH1132 or MATH1241, CHEM1101 and CHEM1201


CEIC2012
Instrumental Analysis - Practical
Staff Contact: A/Prof M Brungs
UOC3 HPW3 WKS14 S2
Prerequisite/s: CEIC2011

Development of laboratory skills with a range of analytical instruments which includes: Selective ion electrode, polarography, potentiometric titrations, UV/Visible spectrophotometry, X-Ray Fluorescence and Diffraction, Gas and Ion chromatography.

CEIC2020
Introduction to Numerical Methods
Staff Contact: A/Prof T Pham
UOC3 HPW3 WKS14 S1
Prerequisite/s: MATH1032 or MATH1231 or MATH1042 or MATH11241, CHEM1101 and CHEM1201, MATH1032 or MATH1231 or MATH1042 or MATH11241, CHEM1101 and CHEM1201

Computing for scientific and chemical engineering applications using Pascal. Brief review of basic computer concepts. The Pascal language. Applications in chemical engineering and industrial chemistry such as the solution of heat transfer and chemical reaction problems.
CEIC2110
Material and Energy Balances
Staff Contact: A/Prof M Brungs
UOC3 HPW3 WKS14 S1
Prerequisite/s: CEIC2020
Solution strategies for material and energy balance problems. Material Balances: Component, elemental and differential material balances. Problems involving bypass, recycle, purge and chemical reaction. Energy Balances: Thermodynamic background; first law; general equation for open and closed systems; shaft work and enthalpy; reference states. Application of energy balances: enthalpy data including steam tables and psychometric charts; heat capacity data; phase change; mixing; heat of solution; enthalpy-concentration diagrams; heats of formation, combustion and reaction. Integrated material and energy balance problems.

CEIC2120
Fluid Flow
Staff Contact: Dr R Amal
UOC3 HPW3 WKS14 S1
Prerequisite/s: CEIC1020, PHYS1621 or PHYS1211

CEIC2130
Heat Transfer
Staff Contact: Dr R Shaikholeslami
UOC3 HPW3 WKS14 S2
Prerequisite/s: PHYS1621 or PHYS1211
Introduction to various modes and mechanisms of heat transfer. Physical origins and rate equations. Conductivity. Diffusional heat transfer based on shell balances approach for one-dimensional steady state and transient transfer with heat generation and chemical reactions. Composite walls, contact resistance and extended surfaces. Introduction to heat exchangers; log-mean temperature difference, effectiveness - NTU methods.

CEIC3010
Reaction Engineering
Staff Contact: Prof N Foster
UOC4 HPW3 WKS14 S2
Prerequisite/s: CEIC2110, CHEN2062

CEIC3070
Process Control
Staff Contact: Dr J Bao
UOC4 HPW4 WKS14 S2
Prerequisite/s: CEIC2011, CEIC2020, MATH2030
Concepts of process control, including: dynamic modelling of processes, linearization, Laplace transforms, transfer functions, open loop response of first and higher order systems, approximation by first order plus dead time models, concept of control for process regulation and safety, feedback control, block diagrams, PID controllers and tuning methods, closed loop response, stability analysis, single input-single output control loop design, cascade control, feed forward control, control valve characteristics and sizing, as well as introduction to some advanced control concepts. Process control laboratory experiments.

CEIC3110
Thermodynamics
Staff Contact: Dr V Chen
UOC3 HPW3 WKS14 S1
Prerequisite/s: CEIC2110, CHEN2062

CEIC4070
Automation Science
Staff Contact: Dr J Bao
UOC4 HPW3 WKS14 S1
Prerequisite/s: CEIC3070

CEIC4101
Professional Electives
Staff Contact: A/Prof M Brungs
S1
Prerequisite/s: All Stage 3 courses
To be chosen from offerings in: Bio-processing; Business Management in Chemical Engineering; Environmental Management; Fuels and Energy (graduates may qualify for membership of the Australian Institute of Energy); Minerals Engineering (graduates may qualify for membership of the Australian Institute of Mining and Metallurgy).

CEIC4102
Professional Electives
Staff Contact: A/Prof M Brungs
S2
Prerequisite/s: All Stage 3 courses
To be chosen from offerings in: Bio-processing; Business Management in Chemical Engineering; Environmental Management; Fuels and Energy (graduates may qualify for membership of the Australian Institute of Energy); Minerals Engineering (graduates may qualify for membership of the Australian Institute of Mining and Metallurgy).

CEIC4103
Professional Electives
Staff Contact: A/Prof M Brungs
S2
Prerequisite/s: All Stage 2 courses
To be chosen from offerings in: Bio-processing; Business Management in Chemical Engineering; Environmental Management; Fuels and Energy (graduates may qualify for membership of the Australian Institute of Energy); Minerals Engineering (graduates may qualify for membership of the Australian Institute of Mining and Metallurgy).

CEIC4104
Professional Electives
Staff Contact: A/Prof M Brungs
S2
Prerequisite/s: All Stage 2 courses
To be chosen from offerings in: Bio-processing; Business Management in Chemical Engineering; Environmental Management; Fuels and Energy (graduates may qualify for membership of the Australian Institute of Energy); Minerals Engineering (graduates may qualify for membership of the Australian Institute of Mining and Metallurgy).
CEIC4105
Professional Elective
Staff Contact: A/Prof M Brungs
Prerequisites: All stage 2 courses
To be chosen from offering: Business Management in Chemical Engineering; Advanced Reaction Engineering; Advanced Process control; Advanced Polymers; Minerals Engineering - Practice; Environmental Management.

CEIC4120
Management and Plant Operation
Staff Contact: A/Prof T Davis
S2
A series of lectures designed to introduce the students to appropriate management techniques. Topics will include: business strategies, leadership, total quality management, safety management. Students will be required to operate a computer controlled chemical plant. Sixty days of approved Industrial Training are part of the requirements for the satisfactory completion of this subject. The objectives of the industrial training are (1) to develop an appreciation of the structure and operation of industrial organisations, (2) to understand the role of the engineer and engineering in industry, (3) to appreciate the importance of good communications and interpersonal skills and to develop these skills, and (4) to appreciate the ethical basis of engineering practice in industry. Students are required to submit to the school evidence from their employers of each period of training, confirming the work performed, together with a report (~2000 words) which should summarise the technical work performed, and the extent to which the Industrial training objectives have been fulfilled. The subject also includes SESC3310: This is an objective 5 subject which covers social issues arising from future scientific and technological developments and the role that the professional scientist can play in influencing future directions. The subject is taught by a combination of group activities, case studies, projects and seminars, The subject will cover four major topic areas, which are: professional ethics, environmental related issues, safety and liability and controls of future technology.

CEIC4130
Plant Operation
Staff Contact: A/Prof T Davis
S2
Sixty days of approved Industrial Training are part of the requirements for the satisfactory completion of this subject. The objectives of the industrial training are (1) to develop an appreciation of the structure and operation of industrial organisations, (2) to understand the role of the engineer and engineering in industry, (3) to appreciate the importance of good communications and interpersonal skills and to develop these skills, and (4) to appreciate the ethical basis of engineering practice in industry. Students are required to submit to the school evidence from their employers of each period of training, confirming the work performed, together with a report (~2000 words) which should summarise the technical work performed, and the extent to which the Industrial training objectives have been fulfilled. The subject also includes SESC3310: This is an objective 5 subject which covers social issues arising from future scientific and technological developments and the role that the professional scientist can play in influencing future directions. The subject is taught by a combination of group activities, case studies, projects and seminars, The subject will cover four major topic areas, which are: professional ethics, environmental related issues, safety and liability and controls of future technology.

CEIC5311
Instrumental Analysis in the Process Industries
Staff Contact: A/Prof M Brungs
UOC6 HPW3 S1 or S2
The program will encompass both chemical and physical analysis of materials. The basic principles of laboratory and on-line instrumentation will be examined and this material will be reinforced by appropriate laboratory classes. Selected topics include: analyses of and for water, colour, density and viscosity, spectroscopic, electrochemical and chromatographic techniques. The course will also include aspects of sampling and Laboratory Information Management Systems (LIMS).

CEIC5312
Safety and Communications in the Process Industries
Staff Contact: Prof D Trimm
UOC6 HPW3 S1 or S2

CEIC5313
Environmental Technologies
Staff Contact: Prof A Fane
UOC6 HPW3 S1 or S2
This subject deals with conventional and advanced separation processes for pollution control, efficient treatment and waste minimisation in the Process Industries. Topic areas covered will be selected from: Gravity Separations, Filtration Processes, Sorption Processes, Extraction Processes, Membrane Technology, Biological Processes, Design, Control and Monitoring, Clean Production Technologies.

CEIC5320
Process Engineering Project
Staff Contact: A/Prof R Chaplin
UOC6 HPW3 S1 or S2
An investigation of a problem in any area related to process engineering which involves a significant research or design component. Such an investigation should be related to the research interests and expertise of Staff in the School of Chemical Engineering and Industrial Chemistry. If the student chooses a research project, a course on research methods must also be taken.

CEIC5330
Process Engineering in the Petroleum Industry
Staff Contact: Dr A Adesina
UOC12 HPW6 S1 or S2

CEIC5331
Process Engineering: Natural Gas and Light Hydrocarbons to
Staff Contact: Dr A Adesina
UOC6 HPW3 S1 or S2

CEIC5332
Process Engineering in the Food Industry
Staff Contact: Dr T Pham
UC06 HPW3 S1 or S2
This course covers the application of process engineering techniques in the food industry, with its particular emphasis on product sensory quality and hygiene. The topics considered will include evaporation and drying, separation, refrigeration, thermal processing, prediction of quality and microbiological changes, and computer techniques. The course will include lectures, assignments and one major design project.

CEIC5333
Experimental Design in the Process Industries
Staff Contact: A/Prof R Chaplin
UC06
This course is structured to provide a sound introduction to the fundamentals of experimental design and its impact on productivity and quality in research development and manufacturing processes. Topics covered will include: basic statistical hypothesis testing, quality control, control charts, regression analysis, factorial designs, fractional factorial designs, screening designs, linear and curve-linear models, non-linear models, Taquchi concepts, optimisation, response surface concepts.

CEIC5335
Advanced Computer Methods in the Process Industries
Staff Contact: A/Prof R Chaplin
UC06 HPW3 S1 or S2
Solution of Process Engineering problems, trouble-shooting and Process Design utilising advanced computer applications including flowsheeting, numerical methods, statistical design, CAD and process integration.

CEIC5336
Environmental Chemistry in the Process Industries
Staff Contact: Dr P T Crisp
UC06 HPW3 S1 or S2
Introduction to the chemical processes underlying major problems. The following topics will be covered: soil chemistry, acid rain, land degradation, urban air pollution, ozone depletion, global climatic change, radioactive contamination, alternative energy sources, chemical wastestreams, toxic elements, toxic organics, absorption processes and occupational diseases. The role of the chemical industry in causing and resolving the problems will be examined.

CEIC5337
Particle Characterisation in the Process Industries
Staff Contact: Dr R Amal
UC06 HPW3 S1 or S2
This course will cover theoretical principles and practical aspects of methods of characterising fine particulate materials. Characteristics investigated include: particle size and size distribution, density, porosity, surface area, zeta potential and electrostatic charge, morphology and structure. Techniques covered include: sedimentation, optical techniques, electrozone sensing, image analysis, time of flight analysis, inertial impaction, mercury porosimetry, gas adsorption, helium pycnometry, morphological analysis. Practical examples of industrial applications will be given together with laboratory demonstrations using all the techniques.

CEIC5340
Polymer Synthesis: Fundamentals and Techniques
Staff Contact: A/Prof R Chaplin
UC06 HPW3 S1 or S2

CEIC5341
Membrane Technology in the Process Industries
Staff Contact: Prof A Fane
UC06 HPW3 S1 or S2
Classification of membranes and membrane processes. Driving forces and mass transfer mechanisms. Characterisation for membranes. Control of concentration polarisation and fouling. Aspects of the design of membranes, membrane modules and membrane systems. Operating principles of major membrane processes include microfiltration, ultrafiltration, nanofiltration, reverse osmosis, dialysis, electrodialysis, membrane distillation, pervaporation, gas permeation, liquid membranes. Selected applications and economic aspects of membrane technology in the fields of biotechnology, biosensors (including bioreactors), controlled release, chemical and food processing, water and waste treatment.

CEIC5342
Energy Management in the Process Industries
Staff Contact: A/Prof J F Stubington
UC06 HPW3 S1 or S2
Examination of all aspects of the energy management process engineering plants and the impact on environmental emissions. Topics to be covered include: combustion of solid, liquid and gaseous fuels, energy balances around, furnaces, energy audits, heat return and heat recovery in process plants.

CEIC5350
Industrial Water and Wastewater Engineering
Staff Contact: Prof AG Fane
UC06 HPW3 WK514 S2
Environmental consequences of water pollution. Water quality criteria and regulations related to industrial use and disposal. Water sources and requirements of industry. Theoretical and practical aspects of treatment methods, including screening, sedimentation, oil separation, coagulation and flocculation, filtration, biological treatment, adsorption, ion exchange, membrane processes. Strategies for industry including waste surveys, prevention at source, correction before discharge waste. Economic aspects. Seminars. Factory visits/laboratory.

CHEN2050
Chemical Engineering Practice 1
Staff Contact: A/Prof J F Stubington
UC03 HPW3 WK514 S2
Prerequisite/s: CEIC1020
An introduction to laboratory work in chemical engineering including technical report writing, flow sheet preparation, information retrieval and data processing techniques. Experiments in this subject are designed to demonstrate principles of industrial processes. Industrial operations are also analysed via reports from literature or multimedia, including videos.

CHEN2061
Introduction to Process Chemistry 1
Staff Contact: A/Prof R Chaplin
UC06 HPW6 WK514 S1
Prerequisite/s: CHEM1021 or CHEM1041
Introduction to Process Chemistry 2
Staff Contact: A/Prof R P Chaplin
UOC3 HPW3 WKS14 S2
Prerequisite/s: CHEM2061

An introduction to and survey of the organic and inorganic chemistry of industrially important products.

Mass Transfer
Staff Contact: A/Prof J Stubington
UOC3 HPW3 WKS14 S2

Introduction to various modes and mechanisms mass transfer. Physical origins and rate equations. Diffusivity. Diffusional mass transfer based on shell balance approach for one-dimensional steady state and transient transfer. Analogies between Heat and Mass Transfer Applications.

Systems Modelling and Analysis
Staff Contact: A/Prof A Adesina
UOC3 HPW2 WKS14 S1
Prerequisite/s: CEIC2020, CEIC2110, CEIC2130, MATH2030

Mathematical tools used in the modelling and analysis of chemical, mineral, and environmental processes. Fundamental modelling of chemical, mineral, and environmental systems, based on physical laws, including modelling of lumped systems, discrete systems, multivariable systems, and distributed parameter processes. Application of mathematical analysis tools including: matrix and vector operators, solution of ordinary and partial differential equations, linearization methods, and functional analysis to the solution of problems in the chemical, mineral and environmental engineering fields. Statistical applications including parameter estimation, empirical modelling, data driven models, and design of experiments.

Process Modelling and Optimisation
Staff Contact: A/Prof A Adesina
UOC3 HPW3 WKS14 S2
Prerequisite/s: CEIC2020, MATH2030

Techniques to solve models of chemical and mineral processes, and process optimisation with respect to financial and environmental objectives. The concepts of solution to process models covered include solution of single and multi-variable linear and nonlinear equations, numerical solution of ordinary differential equations, and parameter estimation from process data. The concepts of process optimization covered include single and multi-dimensional nonlinear optimization, linear programming, and dynamic programming. The methods are taught using examples of common applications of the presented concepts in the chemical and mineral processing industries.

Advanced Transport Phenomena
Staff Contact: A/Prof A Adesina
UOC3 HPW3 WKS14 S2
Prerequisite/s: CEIC2120, CEIC2130, CHEN2140, MATH2030

Notes: This subject is an extension of material given in CEIC2120 Fluid Flow, CEIC2130 Heat Transfer and CHEN2140 Mass Transfer.

Review of the analogy between mass, momentum and thermal transport. Derivation of the equations of change for: Isothermal systems - continuity and equation of motion, Non-isothermal systems - forced and free convection. Multicomponent systems.

Particle and Separation Processes
Staff Contact: Prof N Foster
UOC6 HPW6 WKS14 S1
Prerequisite/s: CEIC2110, CEIC2130, CHEN2062, CHEN2140


Plant and Equipment Design
Staff Contact: Dr D Wiley
UOC4 HPW4 WKS14 S2
Prerequisite/s: CEIC2110, CEIC2130, MATH2030


Process Design and Economics
Staff Contact: A/Prof T Pham
S1
Prerequisite/s: CEIC2110, CEIC2130, MATH2030


Process Design and Safety
Staff Contact: A/Prof T Pham
S2
Prerequisite/s: CEIC2110, CEIC2130, MATH2030

CHEN3080
Chemical Engineering Practice 2
Staff Contact: A/Prof J F Stubington
UOC3 HPW3 WKS14 S1
Prerequisite/s: CEIC2110, CEIC2120, CEIC2130, CHEN2050, CHEN2062, CHEN2140
An integrated chemical engineering laboratory incorporating experiments in fluid flow, heat/mass transfer, thermodynamics and kinetics, mineral processing and fuel technology. The objectives of the experiments are to demonstrate, reinforce and extend the principles of chemical engineering which are used in the investigation of chemical engineering problems and to develop an interest in experimentation and efficiency in writing technical reports and presenting technical seminars.

CHEN4031
Environmental Management 1
Staff Contact: Dr R Amal
UOC3 HPW3 WKS14 S1
Prerequisite/s: CHEN3065, CHEN3067
Water pollution design and operation strategies; treatment operations; economic aspects. Air pollution-effluent dispersions: types of gas cleaning units, choice of gas cleaning equipment. Noise pollution and pollution control legislation.

CHEN4081
Design Project
Staff Contact: Dr D Wiley
UOC8 HPW6 WKS14 S1
Prerequisite/s: All Stage 3 courses
This project will cover the engineering of a process plant or part thereof requiring the application of material covered within the undergraduate course. The minimum requirements of this project are as specified by the relevant engineering institutions accreditation standards. The project includes process evaluation and selection process flow sheet development; design of facilities for processing, transport and storage of materials within the plant; plant sizing; equipment selection and costing estimation of utility requirements; plant location and layout; evaluation of the economic liability of the plant; control scheme development; hazard analysis; and preparation of an environmental impact statement and a piping and instrumentation diagram for the plant. All aspects of the design are completed with regard to statutory regulations.

CHEN4091
Research Project Theory
Staff Contact: Dr P T Crisp
UOC3 HPW3 WKS14 S1
Prerequisite/s: All Stage 3 courses
The course requires that the student elect a topic in Chemical Engineering, undertake a literature survey on that topic and produce a report.

CHEN4092
Research Project Practice
Staff Contact: Dr P T Crisp
UOC12 HPW10 WKS14 S2
Prerequisite/s: All Stage 3 courses
The experimental investigation of some aspect of an elected topic area in Chemical Engineering.

CHEN4093
Small Research Project Theory
Staff Contact: Dr P T Crisp
UOC4 HPW4 WKS14 S1
Prerequisite/s: All Year 3 courses
The subject requires that the student elect a topic in Chemical Engineering, undertake a literature survey on that topic and produce a report.

CHEN4094
Small Research Project Practice
Staff Contact: Dr P T Crisp
UOC8 HPW8 WKS14 S2
Prerequisite/s: All Year 3 courses
The experimental investigation of some aspect of an elected topic area in Chemical Engineering.

FUEL0040
Fuel Engineering for Material Science
Staff Contact: A/Prof J F Stubington
UOC3 HPW2 S1
An introduction to combustion technology, combustion calculations, burner design, furnace, kiln and boiler thermal design.

INDC2040
Physical Process Chemistry
Staff Contact: A/Prof R Chaplin
UOC8 HPW6 S1
Prerequisite/s: CHEM1021 or CHEM1041

INDC3051
Process Chemistry and Operations
Staff Contact: Prof M Skylas-Kazacos
S2
Prerequisite/s: CEIC2110, INDC2040

INDC3110
Industrial and Environmental Chemistry
Staff Contact: Dr P T Crisp
S1
Prerequisite/s: CHEM2839, INDC2040

INDC3120
Industrial Chemistry Practice
Staff Contact: A/Prof T Davis
S2
Prerequisite/s: CHEM2839, INDC2040
The production of inorganic industrial chemicals from the standpoint of the application of the basic principles of inorganic and physical chemistry (acid industries, alkali industries, industrial gases electric furnace products, superphosphates, aluminum and glass); a study
of some sections of the organic industrial chemical industry, cellulose, industrial alcohols, formaldehyde, phenol, urea, phenolic and urea resins, acetic acid, polymers based on ethylene and acetylene, elastomers. A small research project designed to illustrate practical applications of the principles of Industrial Chemistry. Regression analysis. Statistical design of experiments. Two level factorial designs. Screening experiments. Optimisation of process variables. Spreadsheet and database utilisation. Basic programming. Industrial applications.

INDC4061
Process Design A
Staff Contact: A/Prof T Tram
UOC4 HPW4 WKS14 S1
Prerequisite/s: All Stage 3 courses
This course will encompass the complete process design of a given (small) chemical plant. In Part A, students will be required to produce a design report which will include plant sizing, process flow sheet, equipment selection and costing.

INDC4062
Process Design B
Staff Contact: A/Prof T Tram
UOC4 HPW4 WKS14 S1
Prerequisite/s: All Stage 3 courses
In Process Design B students will be required to produce an environmental impact statement, and a financial evaluation of the whole process. The report will also discuss the relevant thermodynamic and kinetic aspects of the process.

INDC4091
Research Project Theory
Staff Contact: Prof R Burford
UOC12 HPW11 WKS14 S1
Prerequisite/s: All stage 3 courses
The subject requires that the student elects a topic in Industrial Chemistry, undertake a literature survey on that topic and produce a report.

INDC4092
Research Project Practice
Staff Contact: Prof R Burford
S2
Prerequisite/s: All stage 3 courses
The experimental investigation of some aspect of an elected topic area in Industrial Chemistry.

INDC4093
Small Research Project Theory
Staff Contact: Prof R Burford
S1
Prerequisite/s: All stage 3 courses
The subject requires that the student elects a topic in Industrial Chemistry, undertake a literature survey on that topic and produce a report.

INDC4094
Small Research Project Practice
Staff Contact: Prof R Burford
S2
Prerequisite/s: All stage 3 courses
The subject requires that the student elects a topic in Industrial Chemistry, undertake a literature survey on that topic and produce a report.

POLY3011
Polymer Science – Theory
Staff Contact: Prof R Burford
UOC3 HPW3 WKS14 S1

POLY3012
Polymer Science – Practice
Staff Contact: Prof R Burford
UOC3 HPW3 WKS14 S2
A series of practical laboratory exercises designed to illustrate the kinetics of polymerisation and the mechanical behaviour and properties of polymers.

POLY5000
Polymer Science
Staff Contact: Prof R Burford
UOC12 HPW6 S1
Polymer Processes: Classification of polymers, methods of polymerisation: bulk, solution, emulsion, suspension, high pressure; processes; step growth, chain growth; the chemistry and applications of polymer systems including polyesters, polyamides, phenolic condensation resins, vinyl polymers, synthetic elastomers. Natural polymers. Mechanism and Kinetics: Step growth polymerisation, kinetics, structure effects; chain growth polymerisation. Free radical polymerisation, chemistry and properties of free radicals and initiators; kinetics of propagation and termination reactions; co-polymerisation; monomer radical structure and reactivity. Cationic and anionic polymerisation; stereoregular polymers. Polymer Characterisation: Molecular weight; averages and distributions; thermodynamics of polymer solutions; theta temperature; fractionation methods; measurement of number-average molecular weight and weight-average molecular weight. Polymer Physics: Principles of operation of conventional polymer processing equipment; safety procedures; polymer compound design; stress strain behaviour of polymers in tension, compression, shear and flexure; elementary rheological behaviour of polymers; rubber elasticity; thermal characteristics of polymers.
The School undertake teaching and research in the specialist disciplines of engineering construction and management (civil engineering systems, engineering economics, project planning and management and civil engineering construction), geotechnical engineering (foundation, soil, rock, dam and pavement engineering, geomechanics and environmental geomechanics), structural engineering (structural analysis and design, concrete, steel and composite structures, and concrete and materials technology), transport engineering (planning design and operation of transport systems, land use and transport modelling, statistical analysis, economic evaluations and environmental impact studies), and water engineering (hydraulics, hydrology, groundwater, water resources, water and wastewater treatment, waste management and public health engineering).

The School comprises specialist staff with a broad spectrum of expertise across the disciplines of Civil and Environmental Engineering.

The Centre for Water and Waste Technology and the Munro Centre for Civil and Environmental Engineering are also located within the School. In addition to extensive laboratory facilities on the Kensington campus, the School operates the Heavy Structures Laboratory at Gove Street, Randwick and the Water Research Laboratory at King Street, Manly Vale. The latter complex houses the School's Water Reference Library.

The School is also involved in the UNSW Groundwater Centre which is a joint enterprise with the School of Geology in the Faculty of Science and Technology.

The School offers programs 3620 and 3625 leading to the award of degrees of Bachelor of Engineering in Civil Engineering (BE) and Bachelor of Engineering in Environmental Engineering (BE), at pass or honours level. In the Civil Engineering program students may elect to major in structural engineering, geotechnical engineering, transport engineering, water engineering or engineering construction and management. These programs can be taken on a four-year full-time basis, on a part-time basis or on a combined full-time part-time basis subject to the approval of the Head of School. Intending part-time students are advised that all subjects are offered only in the daytime. Part-time students will normally take two years for each equivalent full-time year. Alternatively, the programs may be taken in a sandwich form in which a student, after completing the first year of the program on a full-time basis, gains industrial experience during one or more periods of employment by taking leave of absence for an entire academic year.

The School also offers a range of combined degree programs which combine the Bachelor of Engineering degrees in Civil or Environmental Engineering with a range of other undergraduate degree programs and postgraduate degrees in engineering and other disciplines. These combined degree programs provide students with the opportunity to broaden their education and to complete two degrees with a significant saving in time. The combined degree programs include:

- Five-year full-time programs 3146 leading to the award of the degrees of Bachelor of Engineering in Civil Engineering and Bachelor of Engineering in Mining Engineering (BE BE) and 3631 leading to the BE BE in Civil and Environmental Engineering.
- Five-year full-time programs 3730 and 3735 leading to the award of the degrees of Bachelor of Engineering in Civil and Environmental Engineering, respectively, and Bachelor of Science. These include the new BE BSc programs majoring in Computer Science.
- Five-year full-time programs 3621 and 3626 leading to the award of the degrees of Bachelor of Engineering in Civil and Environmental Engineering, respectively, and Bachelor of Arts (BE BA).
- Five year full-time programs leading to the award of the degrees of Bachelor of Engineering in Civil or Environmental Engineering and Master of Commerce.
- Four and one half year full-time programs 3622 and 3627 leading to the award of the degrees of Bachelor of Engineering in Civil and Environmental Engineering, respectively, and Master of Engineering Science.
- Six-year full-time courses 4775 and 4777 leading to the award of the degrees of Bachelor of Engineering in Civil and Environmental Engineering, respectively, and Bachelor of Laws (BE LLB).

The School offers the most extensive range of postgraduate coursework in Civil and Environmental Engineering in Australia. There are formal graduate programs leading to the award of the degrees of Master of Engineering Science 8612, Master of Environmental Engineering Science 8615, and also the Graduate Diploma in Engineering 5459. Corresponding programs in external mode delivery are 8617, 8618 and 5454. These programs are available
in specialist areas including engineering construction and management, project management, construction management, environmental engineering, coastal engineering and management, geotechnical engineering, groundwater investigations and management, hydrology and water resources, structural engineering, transport engineering, waste management, water and wastewater treatment, water quality management and water engineering. Within the Master of Engineering Science and Graduate Diploma courses, students may undertake construction management, project management, environmental engineering and waste management by distance learning. Fees are payable for postgraduate coursework but a large number of equity scholarships are available. Details are available from the School Office.

Opportunities are provided for graduate research leading to the award of the degrees of Master of Engineering 2650, Master of Science 2750 and Doctor of Philosophy 1630. The School has a large number of full-time research students and it leads the country in research across the breadth of Civil and Environment engineering.

Undergraduate Study

Program Objectives

The broad objective of the School’s undergraduate programs is to develop well-educated graduates with the basic skills, attributes and knowledge required to practise as professional engineers. The desired skills are those that enable graduates to be problem solvers; critical thinkers; life long learners; good communicators; team players; independent investigators; effective managers; self-motivated; and economically, environmentally and socially aware. It is intended that these attributes are developed in students at the same time that they gain knowledge in a broad range of disciplines. In addition, an objective of the programs is to provide the skills and knowledge in a social context. Integrating subjects in each year of each program (the Engineering Practice subjects) have been introduced to achieve this objective.

Honours

Honours is awarded to students who have achieved above average results and who undertake an Honours Thesis in their Final Year. A weighted average is calculated for each student. A different weighting factor for each year of the program is applied to the marks in each subject by units of credit as follows:

- Year 1 x 1
- General Education x 2
- Year 2 x 2
- Year 3 x 4
- Year 4 x 5

Industrial training is assigned a nominal value of 4 units of credit in Year 4 in the Honours calculation and the Honours thesis subjects (CVEN4000 and CVEN4001) have a weighting of 7.5. For combined degree courses only the marks obtained in the standard Civil or Environmental Engineering subjects are used in the calculation. A weighted average mark in the range of 65-70 will result in a recommendation for Honours 2/2. A weighted average mark in the range of 70-75 will result in a recommendation for Honours 2/1. A weighted average mark of 75 and above will result in a recommendation for Honours 1.

Recognition

Both the BE in Civil Engineering and the BE in Environmental Engineering are fully accredited by the Institution of Engineers, Australia, meeting the examination requirements for admission to graduate and corporate membership of the Institution. Substantial or complete recognition is accorded to the BE programs by overseas engineering institutions.

Industrial Experience

Industrial experience is an integral part of the programs. This can be taken within Australia or overseas. Students must complete at least sixty days of approved industrial experience. Students are strongly recommended to gain as much industrial experience as possible during the session breaks throughout their period of study. Students who have had suitable experience in industry prior to commencement may qualify for exemption from the Year 4 Industrial Training subject.

Computing Requirements

Information regarding recommended computing equipment for the programs offered by the School is available from the School Office.

Program Outlines

3620
Civil Engineering – Full-time Program

Civil Engineering offers opportunities to become involved in projects that enhance the overall quality of life. Civil engineers design, construct, manage, and maintain the infrastructure that supports modern society including buildings, bridges, roads and highways, tunnels, airfields, dams, ports and harbours, railways, new mines, water supply and sewerage schemes, irrigation systems and flood mitigation works. The profession is very broad and affords opportunities for involvement in many specialist activities.

Bachelor of Engineering
BE (Civil)

<table>
<thead>
<tr>
<th>HPW UOC</th>
<th>S1</th>
<th>S2</th>
</tr>
</thead>
<tbody>
<tr>
<td>Year 1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>CHEM1011</td>
<td>Fundamentals of Chem A or</td>
<td>6</td>
</tr>
<tr>
<td>CHEM1031</td>
<td>Higher Chemistry C</td>
<td>2</td>
</tr>
<tr>
<td>CVEN1021</td>
<td>Engineering Practice 1A</td>
<td>0</td>
</tr>
<tr>
<td>CVEN1022</td>
<td>Engineering Practice 1B</td>
<td>3</td>
</tr>
<tr>
<td>CVEN1023</td>
<td>Statics</td>
<td>3</td>
</tr>
<tr>
<td>CVEN1024</td>
<td>Dynamics</td>
<td>3</td>
</tr>
<tr>
<td>CVEN1025</td>
<td>Computing</td>
<td>0</td>
</tr>
<tr>
<td>CVEN1026</td>
<td>Engineering Materials 1</td>
<td>6</td>
</tr>
<tr>
<td>MATH1131</td>
<td>Mathematics 1A or</td>
<td>0</td>
</tr>
<tr>
<td>MATH1141</td>
<td>Higher Mathematics 1A</td>
<td>0</td>
</tr>
<tr>
<td>MATH1231</td>
<td>Mathematics 1B or</td>
<td>0</td>
</tr>
<tr>
<td>MATH1241</td>
<td>Higher Mathematics 1B</td>
<td>0</td>
</tr>
<tr>
<td>PHYS1279</td>
<td>Physics 1CE</td>
<td>0</td>
</tr>
<tr>
<td>Total HPW Session 1</td>
<td>20</td>
<td></td>
</tr>
<tr>
<td>Total HPW Session 2</td>
<td>20</td>
<td></td>
</tr>
<tr>
<td>Total Units of Credit</td>
<td>48</td>
<td></td>
</tr>
</tbody>
</table>
Environmental Engineering – Full-time Program

Environmental engineers are concerned with the environmental impact of engineering activities. They apply their broad knowledge of engineering and environmental processes in identifying environmental problems and in developing effective solutions to them. They also coordinate the activities of specialist groups such as biologists, ecologists and geologists within major projects. The discipline of environmental engineering embraces parts of civil engineering, with emphasis on management, systems design, water, geotechnical and transport engineering, together with aspects of chemical engineering, applied and biological sciences and environmental studies.

Bachelor of Engineering
BE (Environmental)

Year 1
CHEM1011 Fundamentals of Chem A or CHEM1031 Higher Chemistry C 6 0 6
CHEM1021 Engineering Practice 1A 2 0 4
CHEM1022 Engineering Practice 1B 0 4 6
CHEM1023 Statics 3 0 4
CHEM1024 Dynamics 0 3 4
CHEM1025 Computing 3 0 4
CVEN1026 Engineering Materials 1 0 3 4
CVEN1531 Intro to Water & Atmos Chem 0 4 4
MATH1131 Mathematics 1A or MATH1141 Higher Mathematics 1A 6 0 6
MATH1231 Mathematics 1B or MATH1241 Higher Mathematics 1B 0 6 6

Total HPW Session 1 20
Total HPW Session 2 20
Total Units of Credit 48
### Combined Programs

Combined degree programs offered in the School of Civil and Environmental Engineering are listed below.

---

### 3621

**BE BA in Civil Engineering – Full-time Program**

With this combined degree program, students can add their choice of an Arts program to the standard, professionally accredited Civil Engineering program offered by the School of Civil and Environmental Engineering. It provides flexibility in the choice of subjects within the full Arts program and enables students to gain a broad education in Arts and Social Sciences, as well as specialised studies in Civil Engineering.

Because Engineering and Arts programs can have a common content, such as mathematics and physics, two additional sessions of study is required to gain the additional qualification of Bachelor of Arts. In general, this additional study is taken concurrently with the BE program and both can be completed in ten sessions.

**Eligibility**

The course is open to all students who satisfy both the Civil Engineering and Arts entry conditions. Students may enter directly in Year 1 or may apply to transfer from the normal engineering course after completion of at least one year if they have a credit or higher average or the permission of the Head of School. Transfer after the second year may result in students taking more than minimum time to complete the combined course.

**Organisation**

The BE BA course is administered by the School of Civil and Environmental Engineering. The School requires the student to obtain the approval of the Faculty of Arts and Social Sciences for the BA components of their program. The final program and timetable must be approved by the School of Civil and Environmental Engineering.

Student should start discussing their program with representatives of the School and the Faculty of Arts and Social Sciences as early as possible. Students should themselves determine the Arts program that they wish to undertake. The Arts and Social Sciences Handbook describes the options. There are no special rules on what subjects should be included in each year. Students should schedule the Arts and Engineering components to suit their preferences, while meeting the constraints of timetables and prerequisites.

Students will need to refer to the current edition of the Faculty of Arts and Social Sciences Handbook.

**Rules**

1. Students must complete 60 units of credit in the BA program, with no more than 24 units of credit obtained at Level 1 (ie in subjects designed for students in their first year of study). Of these 24 Level 1 units of credit, no more than 12 units of credit may be from any one School or Department.

2. Students must complete a major sequence (42 units of credit) in one of the following areas:

- Chinese Studies
- Education
- English
- Environmental Studies*
- French Studies
- German Studies
- Modern Greek
- History
- Indonesian Studies
- Japanese Studies
- Korean Studies

---

### Year 3

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>HPW</th>
<th>UOC</th>
</tr>
</thead>
<tbody>
<tr>
<td>BIOS3301</td>
<td>Population and Community</td>
<td>S1</td>
<td>3</td>
</tr>
<tr>
<td></td>
<td>Ecology for Env Engineers</td>
<td>S2</td>
<td>3</td>
</tr>
<tr>
<td>CEIC0050</td>
<td>Atm and Process Chem</td>
<td></td>
<td>3</td>
</tr>
<tr>
<td>CVEN3025</td>
<td>Enng Computations 2</td>
<td></td>
<td>3</td>
</tr>
<tr>
<td>CVEN3126</td>
<td>Engineering Management 1</td>
<td></td>
<td>3</td>
</tr>
<tr>
<td>CVEN3224</td>
<td>Geotechnical Engineering 1</td>
<td></td>
<td>6</td>
</tr>
<tr>
<td>CVEN3438</td>
<td>Transport Planning &amp; Envmt</td>
<td></td>
<td>3</td>
</tr>
<tr>
<td>CVEN3525</td>
<td>Water Engineering 2</td>
<td></td>
<td>6</td>
</tr>
<tr>
<td>CVEN3531</td>
<td>Water Chemistry</td>
<td></td>
<td>3</td>
</tr>
<tr>
<td>CVEN3720</td>
<td>Envtl Engg Practice 3A</td>
<td></td>
<td>0</td>
</tr>
<tr>
<td>CVEN3721</td>
<td>Envtl Engg Practice 3B</td>
<td></td>
<td>0</td>
</tr>
<tr>
<td>General Education</td>
<td></td>
<td></td>
<td>2</td>
</tr>
<tr>
<td>Total HPW Session 1</td>
<td></td>
<td></td>
<td>21</td>
</tr>
<tr>
<td>Total HPW Session 2</td>
<td></td>
<td></td>
<td>21</td>
</tr>
<tr>
<td>Total Units of Credit</td>
<td></td>
<td></td>
<td>48</td>
</tr>
</tbody>
</table>

---

### Year 4 – Session 1

Students achieving a weighted average mark exceeding 62 in all subjects in Years 1 to 3 are eligible to undertake an Honours thesis in Year 4 (CVEN4000 in S1 and CVEN4001 in S2).

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>HPW</th>
<th>UOC</th>
</tr>
</thead>
<tbody>
<tr>
<td>CVEN4008</td>
<td>Industrial Training</td>
<td>S1</td>
<td>0</td>
</tr>
<tr>
<td>CVEN4000</td>
<td>Honours Thesis Part A or B</td>
<td>S2</td>
<td>0</td>
</tr>
<tr>
<td>CVEN4721</td>
<td>Env Engineering Practice 4</td>
<td></td>
<td>0</td>
</tr>
<tr>
<td>CVEN4722</td>
<td>Geotechnical Engg 2</td>
<td></td>
<td>4</td>
</tr>
<tr>
<td>CVEN4723</td>
<td>Water Engineering 2</td>
<td></td>
<td>3</td>
</tr>
<tr>
<td>CVEN4724</td>
<td>Trans &amp; Fate of Pollutants</td>
<td></td>
<td>3</td>
</tr>
<tr>
<td>CVEN4725</td>
<td>Env Policy, Law &amp; Economics</td>
<td></td>
<td>3</td>
</tr>
<tr>
<td>CVEN4726</td>
<td>Waste Management</td>
<td></td>
<td>3</td>
</tr>
<tr>
<td>Total HPW Session 1</td>
<td></td>
<td></td>
<td>19</td>
</tr>
<tr>
<td>Total Units of Credit</td>
<td></td>
<td></td>
<td>24</td>
</tr>
</tbody>
</table>

---

### Year 4 – Session 2

All students not undertaking the honours thesis are required to select at least one major plus either a second major or 12 units of credit of electives taken from different discipline areas. Students undertaking the honours thesis are required to undertake one major plus at least 8 units of credit of electives taken from one or more discipline areas. To complete a major, all three 4 unit of credit elective subjects (listed for each discipline below) must be undertaken.

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>HPW</th>
<th>UOC</th>
</tr>
</thead>
<tbody>
<tr>
<td>CVEN4001</td>
<td>Honours Thesis Part B</td>
<td></td>
<td>3</td>
</tr>
<tr>
<td>Geotechnical Engineering Major</td>
<td></td>
<td>4</td>
<td></td>
</tr>
<tr>
<td>CVEN4269</td>
<td>Envtl Geomechanics</td>
<td></td>
<td>0</td>
</tr>
<tr>
<td>plus two of the following three subjects</td>
<td></td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>CVEN4239</td>
<td>Rock Engg &amp; Geomechanics</td>
<td></td>
<td>3</td>
</tr>
<tr>
<td>CVEN4249</td>
<td>Adv Geotechnical Engineering</td>
<td></td>
<td>3</td>
</tr>
<tr>
<td>CVEN4259</td>
<td>Adv Pavement Engineering</td>
<td></td>
<td>3</td>
</tr>
<tr>
<td>Transport Engineering Major</td>
<td></td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>CVEN4439</td>
<td>Transport Operations &amp; Systems Design</td>
<td></td>
<td>3</td>
</tr>
<tr>
<td>CVEN4449</td>
<td>Traffic Mgmt &amp; Control</td>
<td></td>
<td>3</td>
</tr>
<tr>
<td>CVEN4459</td>
<td>Transport &amp; Environment</td>
<td></td>
<td>3</td>
</tr>
<tr>
<td>Water Engineering Major</td>
<td></td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>CVEN4539</td>
<td>Advanced Water Quality &amp; Treatment</td>
<td></td>
<td>3</td>
</tr>
<tr>
<td>CVEN4549</td>
<td>Advanced Catchment &amp; Coastal Processes</td>
<td></td>
<td>3</td>
</tr>
<tr>
<td>CVEN4569</td>
<td>Advanced Environment Systems</td>
<td></td>
<td>3</td>
</tr>
<tr>
<td>Chemical Engineering Major</td>
<td></td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>CEIC3070</td>
<td>Process Control</td>
<td></td>
<td>4</td>
</tr>
<tr>
<td>CEIC3010</td>
<td>Reaction Engineering</td>
<td></td>
<td>3</td>
</tr>
<tr>
<td>CHEN2063</td>
<td>Process Chemistry</td>
<td></td>
<td>3</td>
</tr>
<tr>
<td>Geography Major</td>
<td></td>
<td></td>
<td>3</td>
</tr>
<tr>
<td>Any two of the following three subjects</td>
<td></td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>GEOG3025</td>
<td>Geomorphology</td>
<td></td>
<td>4</td>
</tr>
<tr>
<td>GEOG3751</td>
<td>Environmental Change</td>
<td></td>
<td>4</td>
</tr>
<tr>
<td>GEOG3921</td>
<td>Coastal Resource Mgmt</td>
<td></td>
<td>4</td>
</tr>
<tr>
<td>Total HPW Session 2</td>
<td></td>
<td></td>
<td>18</td>
</tr>
<tr>
<td>Total Units of Credit</td>
<td></td>
<td></td>
<td>24</td>
</tr>
</tbody>
</table>
CIVIL AND ENVIRONMENTAL ENGINEERING  53

Linguistics
Music
Philosophy
Policy Studies
Political Science
Russian Studies
Science & Technology Studies
Sociology
Spanish & Latin American Studies
Theatre, Film and Dance

* Students completing an Environmental Studies major sequence must complete, in addition to the 30 Upper Level units of credit specified, 6 Level 1 units of credit in an approved subject. Students must also complete a minor sequence of 24 units of credit in one of the other areas listed above.

3. Except for subjects completed as part of the Environmental Studies or Japanese major sequences, no more than 12 units of credit may be obtained from subjects in the BA program which are offered by Schools outside the Faculty of Arts and Social Sciences.

4. No subject included for credit in the BE program can be included in the 60 units of credit required at Rule 1 for the BA program.

5. Students must complete the full requirements of Program 3620 BE in Civil Engineering except that they are exempt from the General Studies requirements of the BE program. However, students will not be eligible for graduation for the BE until a minimum of 12 units of credit of the BA program have been successfully completed.

6. Students who complete the requirements for the BA program and the first two years of the BE program may proceed to graduation with the degree of Bachelor of Arts.

7. Students may be awarded Honours in the BA by successful completion of honours year. It should be noted that entry into a particular BA Honours program may require completion of subjects additional to those specified under Rules 1-4.

8. The total units of credit in the program is 5 x 48 = 240.

3626
BE BA in Environmental Engineering – Full-time Program

With this combined degree program, students can add their choice of an Arts program to the standard, professionally accredited Environmental Engineering program offered by the School of Civil and Environmental Engineering. It provides flexibility in the choice of subjects within the full Arts program and enables students to gain a broad education in Arts and Social Sciences, as well as specialised studies in Environmental Engineering.

Because Engineering and Arts programs can have a common content, such as mathematics and physics, two additional sessions of study is required to gain the additional qualification of Bachelor of Arts. In general, this additional study is taken concurrently with the BE program and both can be completed in ten sessions.

Eligibility

The course is open to all students who satisfy both the Environmental Engineering and Arts entry conditions. Students may enter directly in Year 1 or may apply to transfer from the normal engineering course after completion of at least one year if they have a credit or higher average or the permission of the Head of School. Transfer after the second year may result in students taking more than minimum time to complete the combined course.

Organisation

The BE BA course is administered by the School of Civil and Environmental Engineering. The School requires the student to obtain the approval of the Faculty of Arts and Social Sciences for the BA components of their program. The final program and timetable must be approved by the School of Civil and Environmental Engineering.

Students should start discussing their program with representatives of the School and the Faculty of Arts and Social Sciences as early as possible. Students should themselves determine the Arts program that they wish to undertake. The Arts and Social Sciences Handbook describes the options. There are no special rules on what subjects should be included in each year. Students should schedule the Arts and Engineering components to suit their preferences, while meeting the constraints of timetables and prerequisites.

Students will need to refer to the current edition of the Faculty of Arts and Social Sciences Handbook.

Rules

1. Students must complete 60 units of credit in the BA program, with no more than 24 units of credit obtained at Level 1 (ie in subjects designed for students in their first year of study). Of these 24 Level 1 units of credit, no more than 12 units of credit may be from any one School or Department.

2. Students must complete a major sequence (42 units of credit) in one of the following areas:

   - Chinese Studies
   - Education
   - English
   - Environmental Studies *
   - French
   - German Studies
   - Modern Greek
   - History
   - Indonesian Studies
   - Japanese Studies
   - Korean Studies
   - Linguistics
   - Music
   - Philosophy
   - Policy Studies
   - Political Science
   - Russian Studies
   - Science & Technology Studies
   - Sociology
   - Spanish & Latin American Studies
   - Theatre, Film and Dance

   * Students completing an Environmental Studies major sequence must complete, in addition to the 30 Upper Level units of credit specified, 6 Level 1 units of credit in an approved subject. Students must also complete a minor sequence of 24 units of credit in one of the other areas listed in the table above.

3. Except for subjects completed as part of the Environmental Studies or Japanese major sequences, no more than 12 units of credit may be obtained from subjects in the BA program which are offered by Schools outside the Faculty of Arts and Social Sciences.

4. No subject included for credit in the BE program can be included in the 60 units of credit required at Rule 1 for the BA program.

5. Students must complete the full requirements of Program 3625 BE in Environmental Engineering except that they are exempt from the General Studies requirements of the BE program. However, students will not be eligible for graduation for the BE until a minimum of 12 units of credit of the BA program have been successfully completed.

6. Students who complete the requirements for the BA program and the first two years of the BE program may proceed to graduation with the degree of Bachelor of Arts.

7. Students may be awarded Honours in the BA by successful completion of honours year. It should be noted that entry into a particular BA Honours program may require completion of subjects additional to those specified under Rules 1-4.

8. The total units of credit in the program is 5 x 48 = 240.
3730

BE BSc in Civil Engineering – Full-time Program

Students may seek to undertake a five-year full-time combined program leading to the award of the degrees of Bachelor of Engineering in Civil Engineering and Bachelor of Science (BE BSc). The program is administered by the School of Civil and Environmental Engineering.

With the combined degree program, students can add their choice of a Science, Mathematics or Computer Science program to the standard, professionally accredited Civil Engineering program offered by the School of Civil and Environmental Engineering. The School of Civil and Environmental Engineering is the academic unit responsible for the program. The School will consult with the Board of Studies in Science and Mathematics in approving the BSc component of the course.

Students must satisfy admission requirements for both the BE in Civil Engineering and BSc programs or may transfer from the BE in Civil Engineering course after completion of at least one year, if they have a credit or higher average or the permission of the Head, School of Civil and Environmental Engineering.

Subject credits can accrue simultaneously for both component degrees where there is an overlap of subjects from the Civil Engineering program and Science and Mathematics program.

Rules

1. The program is a five year full-time combined program leading to the award of the two degrees of Bachelor of Engineering and Bachelor of Science (BE BSc).

2. The five years of the program include at least 106 units of credit in the Science program (3970) and a minimum of 240 units of credit in total.

3. The 106 Science program units of credit must include a minimum of 36 and a maximum of 48 level 1 units of credit and all subjects prescribed in a specific program as outlined in the Science Handbook must be completed. A Major sequence (42 units of credit of level 2 and 3 subjects with at least 18 units of credit of level 3 subjects) in a science discipline is also a requirement of the Science program.

4. Students must satisfy the normal prerequisites for entry to the Board of Studies in Science and Mathematics and to individual subjects therein. Also, students must satisfy the normal prerequisites for entry to Civil Engineering and to individual subjects therein.

5. Students desiring to enrol in the BSc degree course at Honours level are not able to complete the program in five years and must obtain approval from the School of Civil and Environmental Engineering and the Board of Studies in Science and Mathematics for their programs. With the approval of the relevant school and of the Head of the School of Civil and Environmental Engineering, a student may follow a standard Honours program in the Science course which can be completed by an additional year of study.

6. The degrees of Bachelors of Engineering and Bachelor of Science are not awarded until the completion of the full five year program.

7. Students contemplating enrolling in this course should consult fully with the Board of Studies in Science and Mathematics and with the School of Civil and Environmental Engineering before enrolment.

8. There will be a testamur for each degree in the combined program.

9. Students must complete the full requirements of the BE in Civil Engineering (code 3620) except that:
   a) CVEN3021 and CVEN3022 are exempted;
   b) the General Studies subjects are exempted; and
   c) a final year engineering major (12 units of credit) is exempted.

10. Group A and Group B subjects listed in Rule 12 below will count towards satisfying requirements of both rules 2 and 9 above. The subjects in Group B may not satisfy requirements for progression within science programs.

11. Students may apply for exemption from the requirements of Rule 9 for the subjects listed in Rule 12 below in Group B on the basis of subjects/requirements in parentheses.

12. Exemptions will be granted for the subjects in Group C below with respect to Rule 9 on the basis of the requirements within parentheses.

   Group A
   MATH1131 or MATH1141, MATH1231 or MATH1241, CHEM1011 or CHEM1021, PHYS1279

   Group B
   PHYS1279 (PHYS1121), CHEM1011 (CHEM1021), MATH2019 (at least 12 units of credit of non-statistics level II mathematics), CVEN2025 (at least 3 units of credit of level II Statistics).

   Group C
   CVEN3025 (at least 3 units of credit of level III applied mathematics).

13. Students wishing to major in Physics must consult with the School of Physics and the School of Civil & Environmental Engineering in regards to choice of subjects.

14. A typical structure of a combined Engineering /Science course is set out below. Subject to timetable restrictions, the full range of Science programs is available to Civil Engineering students.

   Year 1
   All the year 1 subjects in the Civil Engineering program.

   Year 2
   The year 2 subjects in the Civil Engineering program, except that 12 units of credit of Science subjects are substituted for CVEN2021, CVEN2022 and General Education.

   Year 3
   Science subjects to total at least 36 units of credit and CVEN2021, CVEN2022, CVEN3025, CVEN3126

   Year 4
   Science subjects to total at least 24 units of credit and CVEN3224, CVEN3322, CVEN3438, CVEN3448, CVEN3525

   Year 5
   Science subjects to total at least 12 units of credit in S2 in lieu of one civil engineering major (12 units of credit). Otherwise standard Year 4 program in Civil Engineering.

   The degrees of Bachelor of Engineering and Bachelor of Science may be conferred as a Pass degree or as an Honours degree. There are two classes of Honours, Class 1 and Class 2 in two divisions. The award and grade of honours in the BE are made in recognition of superior performance throughout the course with a greater weighting on subjects in the later years. The BSc can be awarded honours on the successful completion of an honours year. It should be noted that entry into a particular Honours program may require completion of additional subjects.

15. The total units of credit in the program is 5 x 48 = 240
## Combined Program BE(Civil) BSc(Computer Science)

Notwithstanding the above rules, the following 5 year program has been approved leading to the two degrees of Bachelor of Engineering in Civil Engineering and Bachelor of Science in Computer Science.

<table>
<thead>
<tr>
<th>Year 1</th>
<th>HPW</th>
<th>UOC</th>
</tr>
</thead>
<tbody>
<tr>
<td>CHEM1011 Fundamentals of Chem A or</td>
<td>S1</td>
<td>S2</td>
</tr>
<tr>
<td>CHEM1031 Higher Chemistry C</td>
<td>6</td>
<td>0</td>
</tr>
<tr>
<td>COMP1011 Computing 1A</td>
<td>0</td>
<td>6</td>
</tr>
<tr>
<td>CVEN1021 Engineering Practice 1A</td>
<td>2</td>
<td>0</td>
</tr>
<tr>
<td>CVEN1023 Statics</td>
<td>3</td>
<td>0</td>
</tr>
<tr>
<td>CVEN1024 Dynamics</td>
<td>0</td>
<td>3</td>
</tr>
<tr>
<td>CVEN1025 Computing</td>
<td>3</td>
<td>0</td>
</tr>
<tr>
<td>CVEN1026 Engineering Materials 1</td>
<td>0</td>
<td>3</td>
</tr>
<tr>
<td>MATH1131 Mathematics 1A or</td>
<td>6</td>
<td>0</td>
</tr>
<tr>
<td>MATH1141 Higher Mathematics 1A</td>
<td>6</td>
<td>0</td>
</tr>
<tr>
<td>MATH1231 Mathematics 1B or</td>
<td>0</td>
<td>6</td>
</tr>
<tr>
<td>MATH1241 Higher Mathematics 1B</td>
<td>0</td>
<td>6</td>
</tr>
<tr>
<td>PHYS1721 Physics 1CE</td>
<td>0</td>
<td>4</td>
</tr>
</tbody>
</table>

Total HPW Session 1  **20**

Total HPW Session 2  **22**

Total Units of Credit  **48**

<table>
<thead>
<tr>
<th>Year 2</th>
<th>HPW</th>
<th>UOC</th>
</tr>
</thead>
<tbody>
<tr>
<td>COMP1021 Computing 1B</td>
<td>6</td>
<td>0</td>
</tr>
<tr>
<td>COMP2011 Data Organisation</td>
<td>0</td>
<td>6</td>
</tr>
<tr>
<td>CVEN2021 Engineering Practice 2A</td>
<td>2</td>
<td>0</td>
</tr>
<tr>
<td>CVEN2022 Civil Engineering Practice 2B</td>
<td>0</td>
<td>2</td>
</tr>
<tr>
<td>CVEN2025 Engineering Computations 1</td>
<td>3</td>
<td>0</td>
</tr>
<tr>
<td>CVEN2026 Mechanics of Solids</td>
<td>3</td>
<td>0</td>
</tr>
<tr>
<td>CVEN2322 Structural Engineering 1</td>
<td>0</td>
<td>6</td>
</tr>
<tr>
<td>CVEN2026 Engineering Materials 2</td>
<td>3</td>
<td>0</td>
</tr>
<tr>
<td>CVEN2525 Water Engineering 1</td>
<td>0</td>
<td>3</td>
</tr>
<tr>
<td>MATH1081 Discrete Mathematics</td>
<td>6</td>
<td>0</td>
</tr>
<tr>
<td>MATH2019 Engg. Mathematics. 2CE</td>
<td>0</td>
<td>5</td>
</tr>
</tbody>
</table>

Total HPW Session 1  **23**

Total HPW Session 2  **22**

Total Units of Credit  **48**

<table>
<thead>
<tr>
<th>Year 3</th>
<th>HPW</th>
<th>UOC</th>
</tr>
</thead>
<tbody>
<tr>
<td>COMP2021 Digital System Structures</td>
<td>5</td>
<td>0</td>
</tr>
<tr>
<td>COMP2041 Software Construction: Techniques and Tools</td>
<td>0</td>
<td>5</td>
</tr>
<tr>
<td>CVEN2125 Systems Engineering</td>
<td>0</td>
<td>2</td>
</tr>
<tr>
<td>CVEN2126 Engineering Construction</td>
<td>3</td>
<td>0</td>
</tr>
<tr>
<td>CVEN3025 Engg Computations 2</td>
<td>3</td>
<td>0</td>
</tr>
<tr>
<td>CVEN3126 Management Engineering 1</td>
<td>0</td>
<td>3</td>
</tr>
<tr>
<td>CVEN3322 Structural Engineering 2</td>
<td>0</td>
<td>6</td>
</tr>
<tr>
<td>GMAT0442 Surveying for Civil Engineers</td>
<td>3</td>
<td>0</td>
</tr>
<tr>
<td>GMAT0491 Survey Camp (0)</td>
<td>0</td>
<td>3</td>
</tr>
</tbody>
</table>

One Level 3 Computing Elective  **5**

One Level 3 Computing Elective  **5**

Total HPW Session 1  **19**

Total HPW Session 2  **21**

Total Units of Credit  **48**

<table>
<thead>
<tr>
<th>Year 4</th>
<th>HPW</th>
<th>UOC</th>
</tr>
</thead>
<tbody>
<tr>
<td>CVEN3021 Civil Engg Practice 3A</td>
<td>4</td>
<td>0</td>
</tr>
<tr>
<td>CVEN3022 Civil Engg Practice 3B</td>
<td>0</td>
<td>4</td>
</tr>
<tr>
<td>CVEN3224 Geotechnical Engineering 1</td>
<td>0</td>
<td>6</td>
</tr>
<tr>
<td>CVEN3438 Transport Planning &amp; Enwmt</td>
<td>3</td>
<td>0</td>
</tr>
<tr>
<td>CVEN3548 Transport Engineering</td>
<td>3</td>
<td>0</td>
</tr>
<tr>
<td>CVEN3552 Water Engineering 2</td>
<td>6</td>
<td>0</td>
</tr>
</tbody>
</table>

One Level 3 Computing Elective  **5**

Two Level 3 Computing Electives  **10**

Total HPW Session 1  **21**

Total HPW Session 2  **20**

Total Units of Credit  **48**

### Year 5 – Session 1

Students achieving a weighted average mark exceeding 62 in all civil engineering subjects in Years 1 to 4 are eligible to undertake an Honours thesis in Year 5 (CVEN4000 in S1 and CVEN4001 in S2). Honours students should select a thesis topic that involves both Civil Engineering and Computing components.

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Title</th>
<th>HPW</th>
<th>UOC</th>
</tr>
</thead>
<tbody>
<tr>
<td>CVEN4000 Industrial Training</td>
<td></td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>CVEN4001 Honours Thesis Part B</td>
<td></td>
<td>0</td>
<td>3</td>
</tr>
<tr>
<td>CVEN4139 Adv Constr. &amp; Project Mgmt</td>
<td></td>
<td>0</td>
<td>3</td>
</tr>
<tr>
<td>CVEN4149 Professional Level Project Mgmt. Tools &amp; Skills</td>
<td>0</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>CVEN4159 Adv Constr. Tech. &amp; Engg</td>
<td></td>
<td>0</td>
<td>3</td>
</tr>
</tbody>
</table>

### Computing Major

One Level 4 Computing Elective  **5**

One Level 4 Computing Elective  **5**

### Geotechnical Engineering Major

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Title</th>
<th>HPW</th>
<th>UOC</th>
</tr>
</thead>
<tbody>
<tr>
<td>CVEN4239 Rock Engg &amp; Geomechanics</td>
<td></td>
<td>0</td>
<td>3</td>
</tr>
<tr>
<td>CVEN4249 Adv Geotechnical Engg</td>
<td></td>
<td>0</td>
<td>3</td>
</tr>
<tr>
<td>CVEN4259 Adv Pavement Engg</td>
<td></td>
<td>0</td>
<td>3</td>
</tr>
</tbody>
</table>

### Structural Engineering Major

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Title</th>
<th>HPW</th>
<th>UOC</th>
</tr>
</thead>
<tbody>
<tr>
<td>CVEN4339 Design of Bridges</td>
<td></td>
<td>0</td>
<td>3</td>
</tr>
<tr>
<td>CVEN4349 Special Topics in Concrete, Steel &amp; Composite Structures</td>
<td>0</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>CVEN4359 Struct Anal &amp; Finite Elements</td>
<td></td>
<td>0</td>
<td>3</td>
</tr>
</tbody>
</table>

### Transport Engineering Major

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Title</th>
<th>HPW</th>
<th>UOC</th>
</tr>
</thead>
<tbody>
<tr>
<td>CVEN4449 Transport Operations &amp; Systems Design</td>
<td></td>
<td>0</td>
<td>3</td>
</tr>
<tr>
<td>CVEN4449 Traffic Mgmt &amp; Control</td>
<td></td>
<td>0</td>
<td>3</td>
</tr>
<tr>
<td>CVEN4459 Transport &amp; Environment</td>
<td></td>
<td>0</td>
<td>3</td>
</tr>
</tbody>
</table>

### Water Engineering Major

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Title</th>
<th>HPW</th>
<th>UOC</th>
</tr>
</thead>
<tbody>
<tr>
<td>CVEN4539 Advanced Water Quality &amp; Treatment</td>
<td></td>
<td>0</td>
<td>3</td>
</tr>
<tr>
<td>CVEN4549 Advanced Catchment &amp; Coastal Processes</td>
<td></td>
<td>0</td>
<td>3</td>
</tr>
<tr>
<td>CVEN4559 Adv Water Engineering</td>
<td></td>
<td>0</td>
<td>3</td>
</tr>
</tbody>
</table>

Total HPW Session 2  **18 or 19**

Total Units of Credit  **24**

### 3735

**BE BSc in Environmental Engineering – Full-time Program**

Students may seek to undertake a five-year full-time combined program leading to the award of the degree of Bachelor of Engineering in Environmental Engineering and Bachelor of Science (BE BSc). The program is administered by the School of Civil and Environmental Engineering.
With the combined degree program, students can add their choice of a Science and Mathematics program to the standard, professionally accredited Environmental Engineering program offered by the School of Civil and Environmental Engineering.

The School of Civil and Environmental Engineering is the academic unit responsible for the program. The School will consult with the Board of Studies of Science and Mathematics in approving the BSc component of the course.

Students must satisfy admission requirements for both the BE in Environmental Engineering and BSc programs or may transfer from the BE in Environmental Engineering program after completion of at least one year if they have a credit or higher average or the permission of the Head, School of Civil and Environmental Engineering.

Subject credits can accrue simultaneously for both component degrees where there is an overlap of subjects from the Environmental Engineering program and Science and Mathematics programs.

Rules

1. The program is a five year full-time combined program leading to the award of the two degrees of Bachelor of Engineering and Bachelor of Science (BE BSc).
2. The five years of the program include at least 108 units of credit in the Science program (3970) and a minimum of 240 units of credit in total.
3. The 108 Science program units of credit must include a minimum of 36 and a maximum of 48 level 1 units of credit and all subjects prescribed in a specific program as outlined in the Science Handbook must be completed.
4. Students must satisfy the normal prerequisites for entry to the Board of Studies in Science and Mathematics and to individual subjects therein. Also, students must satisfy the normal prerequisites for entry to Environmental Engineering and to individual subjects therein.
5. Students desiring to enrol in the BSc degree course at Honours level are not able to complete the program in five years and must obtain approval from the School of Civil and Environmental Engineering and the Board of Studies in Science and Mathematics for their programs. With the approval of the relevant school and of the Head of the School of Civil and Environmental Engineering, a student may follow a standard Honours program in the Science course which can be completed by an additional year of study.
6. The degrees of Bachelors of Engineering and Bachelor of Science are not awarded until the completion of the full five year program.
7. Students contemplating enrolling in this course should consult fully with the Board of Studies in Science and Mathematics and with the School of Civil and Environmental Engineering before enrolment.
8. There will be a testamur for each degree in the combined program.
9. Students must complete the full requirements of the BE in Environmental Engineering (code 3625) except that:
   a) CVEN3720 and CVEN3721 are exempted;
   b) General education subjects are exempted;
   c) a final year engineering major (12 units of credit) is exempted; and
   d) final year engineering electives are to be selected from the Geotechnical, Transport, Water and Chemical Engineering majors.

10. Group A and Group B subjects below will count towards satisfying requirements of both rules 2 and 9 above. The subjects in Group B may not satisfy requirements for progression within science programs.
11. Students may apply for exemption from the requirements of Rule 9 for the subjects listed in Rule 12 below Group B on the basis of subjects/requirements in parentheses.
12. Exemptions will be granted for the subjects in Group C below with respect to Rule 9 on the basis of the requirements within parentheses.

Group A
CHEM1011, CHEM1021, MATH1131 or MATH1141, MATH1231 or MATH1241, BIOS1101

Group B
CVEN1531 (CHEM1021), MATH2019 (at least 12 units of credit of non statistics level II mathematics), MATH2025 (at least 3 units of credit of level II Statistics), GEOG1711 (GEOG1721), BIOS3301 (BIOS3111).

Group C
CVEN3025 (at least 3 units of credit of level III applied mathematics).
13. Students wishing to major in Physics must consult with the School of Physics and the School of Civil & Environmental Engineering in regards to choice of subjects.
14. A typical structure of a combined Engineering/Science course is set out below. Subject to timetable restrictions, the full range of Science programs is available to Environmental Engineering students.

Year 1
All the year 1 subjects in the Environmental Engineering course

Year 2
The year 2 subjects in the Environmental Engineering program, except that 12 units of credit of Science subjects are substituted for CVEN2021, CVEN2022 and General Education.

Year 3
Science subjects to total at least 36 units of credit and CVEN2021, CVEN2022, CVEN3025, CVEN3126

Year 4
Science subjects to total at least 24 units of credit and BIOS3301, CEIC0050, CVEN3224, CVEN3438, CVEN3525, CVEN3531

Year 5
Science subjects to total at least 12 units of credit in S2 in lieu of one environmental engineering major (12 units of credit). Otherwise Standard Year 4 program in Environmental Engineering.

The degrees of Bachelor of Engineering and Bachelor of Science may be conferred as a Pass degree or as an Honours degree. There are two classes of Honours, Class 1 and Class 2 in two divisions. The award and grade of honours in the BE are made in recognition of superior performance throughout the course with a greater weighting on subjects in the later years. The BSc can be awarded honours on the successful completion of an honours year. It should be noted that entry into a particular Honours program may require completion of additional subjects.

15. The total units of credit in the program is 5 x 48 = 240.
<table>
<thead>
<tr>
<th>Year 1</th>
<th>HPW</th>
<th>UOC</th>
</tr>
</thead>
<tbody>
<tr>
<td>CHEM1011 Fundamentals of Chem A or CHEM1031 Higher Chemistry C</td>
<td>6</td>
<td>0</td>
</tr>
<tr>
<td>COMP1011 Computing 1A</td>
<td>0</td>
<td>6</td>
</tr>
<tr>
<td>CVEN1021 Engineering Practice 1A</td>
<td>2</td>
<td>0</td>
</tr>
<tr>
<td>CVEN1023 Statics</td>
<td>3</td>
<td>0</td>
</tr>
<tr>
<td>CVEN1024 Dynamics</td>
<td>0</td>
<td>3</td>
</tr>
<tr>
<td>CVEN1025 Computing</td>
<td>3</td>
<td>0</td>
</tr>
<tr>
<td>CVEN1026 Engineering Materials 1</td>
<td>0</td>
<td>3</td>
</tr>
<tr>
<td>CVEN1531 Intro to Water &amp; Atmos Chem</td>
<td>0</td>
<td>4</td>
</tr>
<tr>
<td>MATH1131 Mathematics 1A or MATH1141 Higher Mathematics 1A</td>
<td>6</td>
<td>0</td>
</tr>
<tr>
<td>MATH1231 Mathematics 1B or MATH1241 Higher Mathematics 1B</td>
<td>0</td>
<td>6</td>
</tr>
<tr>
<td>Total HPW Session 1</td>
<td>20</td>
<td></td>
</tr>
<tr>
<td>Total HPW Session 2</td>
<td>22</td>
<td></td>
</tr>
<tr>
<td>Total Units of Credit</td>
<td>48</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Year 2</th>
<th>HPW</th>
<th>UOC</th>
</tr>
</thead>
<tbody>
<tr>
<td>BIOS1101 Evolutionary &amp; Funct Biology</td>
<td>0</td>
<td>6</td>
</tr>
<tr>
<td>CEIC0010 Mass Trans &amp; Matls Balance</td>
<td>3</td>
<td>0</td>
</tr>
<tr>
<td>COMP1021 Computing 1B</td>
<td>6</td>
<td>0</td>
</tr>
<tr>
<td>COMP2011 Data Organisation</td>
<td>0</td>
<td>6</td>
</tr>
<tr>
<td>CVEN2021 Engineering Practice 2A</td>
<td>2</td>
<td>0</td>
</tr>
<tr>
<td>CVEN2025 Engg Computations 1</td>
<td>3</td>
<td>0</td>
</tr>
<tr>
<td>CVEN2023 Mechanics of Solids</td>
<td>3</td>
<td>0</td>
</tr>
<tr>
<td>CVEN2525 Water Engineering 1</td>
<td>0</td>
<td>3</td>
</tr>
<tr>
<td>CVEN2722 Envr. Engrg Practice 2B</td>
<td>0</td>
<td>2</td>
</tr>
<tr>
<td>MATH1081 Discrete Mathematics</td>
<td>6</td>
<td>0</td>
</tr>
<tr>
<td>MATH2019 Engg. Mathematics. 2CE</td>
<td>0</td>
<td>5</td>
</tr>
<tr>
<td>Total HPW Session 1</td>
<td>23</td>
<td></td>
</tr>
<tr>
<td>Total HPW Session 2</td>
<td>22</td>
<td></td>
</tr>
<tr>
<td>Total Units of Credit</td>
<td>48</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Year 3</th>
<th>HPW</th>
<th>UOC</th>
</tr>
</thead>
<tbody>
<tr>
<td>BIOS3301 Population and Community Ecology for Env Engineers</td>
<td>0</td>
<td>3</td>
</tr>
<tr>
<td>COMP2021 Digital System Structures</td>
<td>5</td>
<td>0</td>
</tr>
<tr>
<td>COMP2041 Software Construction: Techniques and Tools</td>
<td>0</td>
<td>5</td>
</tr>
<tr>
<td>CVEN2125 Systems Engineering</td>
<td>0</td>
<td>2</td>
</tr>
<tr>
<td>CVEN3025 Engg Computations 2</td>
<td>3</td>
<td>0</td>
</tr>
<tr>
<td>CVEN3126 Engineering Management 1</td>
<td>0</td>
<td>3</td>
</tr>
<tr>
<td>CVEN3531 Water Chemistry</td>
<td>0</td>
<td>3</td>
</tr>
<tr>
<td>GEOG1711 Planet Earth: Envmt in Crisis</td>
<td>3</td>
<td>0</td>
</tr>
<tr>
<td>GMAT0753 Intro. to Spatial Info Systems</td>
<td>2</td>
<td>0</td>
</tr>
<tr>
<td>INDC1401 Chem of the Indus. Environmt.</td>
<td>3</td>
<td>0</td>
</tr>
<tr>
<td>One Level 3 Computing Elective</td>
<td>5</td>
<td>0</td>
</tr>
<tr>
<td>One Level 3 Computing Elective</td>
<td>5</td>
<td>0</td>
</tr>
<tr>
<td>Total HPW Session 1</td>
<td>21</td>
<td></td>
</tr>
<tr>
<td>Total HPW Session 2</td>
<td>21</td>
<td></td>
</tr>
<tr>
<td>Total Units of Credit</td>
<td>48</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Year 4</th>
<th>HPW</th>
<th>UOC</th>
</tr>
</thead>
<tbody>
<tr>
<td>CEIC0050 Atm and Process Chem</td>
<td>3</td>
<td>0</td>
</tr>
<tr>
<td>CVEN3720 Envr Engg Practice 3A</td>
<td>4</td>
<td>0</td>
</tr>
<tr>
<td>CVEN3721 Envr Engg Practice 3B</td>
<td>0</td>
<td>4</td>
</tr>
<tr>
<td>CVEN3224 Geotechnical Engineering 1</td>
<td>0</td>
<td>6</td>
</tr>
<tr>
<td>CVEN3438 Transport Planning &amp; Envmt Water Engineering 2</td>
<td>3</td>
<td>0</td>
</tr>
<tr>
<td>CVEN3525 Water Engineering 2</td>
<td>6</td>
<td>0</td>
</tr>
<tr>
<td>One Level 3 Computing Elective</td>
<td>5</td>
<td>0</td>
</tr>
<tr>
<td>One Level 3 Computing Elective</td>
<td>0</td>
<td>10</td>
</tr>
<tr>
<td>Two Level 3 Computing Electives</td>
<td>12</td>
<td></td>
</tr>
</tbody>
</table>

Notwithstanding the above rules, the following 5 year program has been approved leading to the two degrees of Bachelor of Engineering in Civil Engineering and Bachelor of Science in Computer Science.

**Combined Program BE(Environmental) BSc(Computer Science)**

**Total HPW Session 1** 21
**Total HPW Session 2** 20
**Total Units of Credit** 48

**Year 5 – Session 1**

Students achieving a weighted average mark exceeding 62 in all environmental engineering subjects in Years 1 to 4 are eligible to undertake an honours thesis in Year 5 (CVEN4000 in S1 and CVEN4001 in S2). Honours students should select a thesis topic that involves both Environmental Engineering and Computing components.

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Credit Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>CVEN4008</td>
<td>Industrial Training</td>
<td>0</td>
</tr>
<tr>
<td>CVEN4000</td>
<td>Honours Thesis Part A or</td>
<td>0</td>
</tr>
<tr>
<td>CVEN4721</td>
<td>Env Engineering Practice 4</td>
<td>4</td>
</tr>
<tr>
<td>CVEN4224</td>
<td>Geotechnical Engg 2</td>
<td>3</td>
</tr>
<tr>
<td>CVEN4525</td>
<td>Water Engineering 3</td>
<td>3</td>
</tr>
<tr>
<td>CVEN4533</td>
<td>Trans &amp; Fate of Pollutants</td>
<td>3</td>
</tr>
<tr>
<td>CVEN4722</td>
<td>Env Policy, Law &amp; Economics</td>
<td>3</td>
</tr>
<tr>
<td>CVEN4723</td>
<td>Waste Management</td>
<td>3</td>
</tr>
</tbody>
</table>

**Total HPW Session 1** 19
**Total Units of Credit** 24

**Year 5 – Session 2**

All students not undertaking the honours thesis are required to select at least one major plus either a second major or 12 units of credit of electives taken from different discipline areas. Students undertaking the honours thesis are required to undertake one major plus at least 8 units of credit of electives taken from one or more discipline areas. To complete a major, all three 4 unit of credit elective subjects (listed for each discipline below) must be undertaken.

**Geotechnical Engineering Major**

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Credit Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>CVEN4269</td>
<td>Envirt Geomcnes</td>
<td>0</td>
</tr>
<tr>
<td>plus two of the following three subjects</td>
<td></td>
<td></td>
</tr>
<tr>
<td>CVEN4239</td>
<td>Rock Engg &amp; Geometrics</td>
<td>0</td>
</tr>
<tr>
<td>CVEN4249</td>
<td>Adv Geotechnical Engineering</td>
<td>0</td>
</tr>
<tr>
<td>CVEN4269</td>
<td>Adv Pavement Engineering</td>
<td>0</td>
</tr>
</tbody>
</table>

**Transport Engineering Major**

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Credit Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>CVEN4439</td>
<td>Transport Operations &amp; Systems Design</td>
<td>0</td>
</tr>
<tr>
<td>CVEN4449</td>
<td>Traffic Mgmt &amp; Control</td>
<td>0</td>
</tr>
<tr>
<td>CVEN4459</td>
<td>Transport &amp; Environment</td>
<td>0</td>
</tr>
</tbody>
</table>

**Water Engineering Major**

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Credit Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>CVEN4539</td>
<td>Advanced Water Quality &amp; Treatment</td>
<td>0</td>
</tr>
<tr>
<td>CVEN4549</td>
<td>Advanced Catchment &amp; Coastal Processes</td>
<td>0</td>
</tr>
<tr>
<td>CVEN4569</td>
<td>Adv Environmental Systems</td>
<td>0</td>
</tr>
</tbody>
</table>

**Chemical Engineering Major**

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Credit Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>CEIC3070</td>
<td>Process Control</td>
<td>0</td>
</tr>
<tr>
<td>CEIC3010</td>
<td>Reaction Engineering</td>
<td>0</td>
</tr>
<tr>
<td>CHEN2063</td>
<td>Process Chemistry</td>
<td>0</td>
</tr>
</tbody>
</table>

**Geography Major**

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Credit Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>GEOG3025</td>
<td>Geomorphology</td>
<td>0</td>
</tr>
<tr>
<td>GEOG3761</td>
<td>Environmental Change</td>
<td>0</td>
</tr>
<tr>
<td>GEOG3921</td>
<td>Coastal Resource Mgmt</td>
<td>0</td>
</tr>
</tbody>
</table>

**Total HPW Session 2** 17 to 20
**Total Units of Credit** 24
### BE in Civil Engineering
### BE in Environmental Engineering

The program provides students with professional qualifications in areas of great importance to the community. The program is attractive to students who have in mind a career involving environmental issues and infrastructure development. The program is administered by the School of Civil and Environmental Engineering.

#### Rules
1. Students must satisfy the normal course and subject prerequisites for Environmental Engineering and Civil Engineering.
2. Course Outline

### Year 1 - Standard Year 1 of Program 3620

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>UOC</th>
</tr>
</thead>
<tbody>
<tr>
<td>CHEM1012</td>
<td>Fundamentals of Chem B</td>
<td>6</td>
</tr>
<tr>
<td>CVEN2025</td>
<td>Engg Computations 1</td>
<td>3</td>
</tr>
<tr>
<td>CVEN2126</td>
<td>Engineering Construction</td>
<td>3</td>
</tr>
<tr>
<td>CVEN2023</td>
<td>Mechanics of Solids</td>
<td>3</td>
</tr>
<tr>
<td>CVEN2525</td>
<td>Water Engineering 1</td>
<td>3</td>
</tr>
<tr>
<td>CVEN2322</td>
<td>Structural Engineering 1</td>
<td>3</td>
</tr>
<tr>
<td>CVEN3226</td>
<td>Engineering Materials 2</td>
<td>3</td>
</tr>
<tr>
<td>GMAT0442</td>
<td>Surveying for Civil Engineers</td>
<td>3</td>
</tr>
<tr>
<td>GMAT0491</td>
<td>Surveying Camp</td>
<td>3</td>
</tr>
<tr>
<td>GEOG1711</td>
<td>Planet Earth: Env in Crisis</td>
<td>3</td>
</tr>
<tr>
<td>MATH2019</td>
<td>Engg Mathematics 2CE</td>
<td>6</td>
</tr>
</tbody>
</table>

**Total Credit Points:** 48

### Year 2

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>UOC</th>
</tr>
</thead>
<tbody>
<tr>
<td>CVEN2021</td>
<td>Engineering Practice 2A</td>
<td>3</td>
</tr>
<tr>
<td>CVEN2022</td>
<td>Civil Engg Practice 2B or</td>
<td></td>
</tr>
<tr>
<td>CVEN2722</td>
<td>Env.Engg Practice 2B</td>
<td>3</td>
</tr>
<tr>
<td>CVEN2125</td>
<td>Systems Engineering</td>
<td>3</td>
</tr>
<tr>
<td>CVEN3126</td>
<td>Engineering Management 1</td>
<td>3</td>
</tr>
<tr>
<td>CVEN3322</td>
<td>Structural Engineering 2</td>
<td>6</td>
</tr>
<tr>
<td>CVEN3438</td>
<td>Transport Planning &amp; Envirmt</td>
<td>3</td>
</tr>
<tr>
<td>CVEN3448</td>
<td>Transport Engineering</td>
<td>3</td>
</tr>
<tr>
<td>CVEN3525</td>
<td>Water Engineering 2</td>
<td></td>
</tr>
<tr>
<td>GMAT0753</td>
<td>Intro to Spatial Information Systems</td>
<td>3</td>
</tr>
<tr>
<td>INDC4120</td>
<td>Chem of the Indust Envirmt</td>
<td>3</td>
</tr>
</tbody>
</table>

**Total Credit Points:** 48

### Year 3

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>UOC</th>
</tr>
</thead>
<tbody>
<tr>
<td>BIOS1101</td>
<td>Evolutionary and Functional Biology</td>
<td>6</td>
</tr>
<tr>
<td>CEIC0010*</td>
<td>Mass Tran &amp; Matt Balance</td>
<td>3</td>
</tr>
<tr>
<td>CVEN2021</td>
<td>Engineering Practice 2A</td>
<td>3</td>
</tr>
<tr>
<td>CVEN2022</td>
<td>Civil Engg Practice 2B or</td>
<td></td>
</tr>
<tr>
<td>CVEN2722</td>
<td>Env.Engg Practice 2B</td>
<td>3</td>
</tr>
<tr>
<td>CVEN2125</td>
<td>Systems Engineering</td>
<td>3</td>
</tr>
<tr>
<td>CVEN3126</td>
<td>Engineering Management 1</td>
<td>3</td>
</tr>
<tr>
<td>CVEN3322</td>
<td>Structural Engineering 2</td>
<td>6</td>
</tr>
<tr>
<td>CVEN3438</td>
<td>Transport Planning &amp; Envirmt</td>
<td>3</td>
</tr>
<tr>
<td>CVEN3448</td>
<td>Transport Engineering</td>
<td>3</td>
</tr>
<tr>
<td>CVEN3525</td>
<td>Water Engineering 2</td>
<td></td>
</tr>
<tr>
<td>GMAT0753</td>
<td>Intro to Spatial Information Systems</td>
<td>3</td>
</tr>
<tr>
<td>INDC4120</td>
<td>Chem of the Indust Envirmt</td>
<td>3</td>
</tr>
</tbody>
</table>

**Total Credit Points:** 48

### Year 4

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>UOC</th>
</tr>
</thead>
<tbody>
<tr>
<td>BIOS3301</td>
<td>Population &amp; Community</td>
<td>3</td>
</tr>
<tr>
<td>CVEN3021</td>
<td>Civil Engg Practice 3A or</td>
<td></td>
</tr>
<tr>
<td>CVEN3720</td>
<td>Env Engg Practice 3A or</td>
<td>6</td>
</tr>
<tr>
<td>CVEN3022</td>
<td>Civil Engg Practice 3B or</td>
<td></td>
</tr>
<tr>
<td>CVEN3721</td>
<td>Env Engg Practice 3B or</td>
<td>6</td>
</tr>
<tr>
<td>CVEN3025</td>
<td>Engineering Computations 2</td>
<td>3</td>
</tr>
<tr>
<td>CVEN3224</td>
<td>Geotechnical Engineering 1</td>
<td>6</td>
</tr>
<tr>
<td>CVEN3531</td>
<td>Water Chemistry</td>
<td>3</td>
</tr>
<tr>
<td>CVEN4322</td>
<td>Structural Engineering 3</td>
<td>6</td>
</tr>
<tr>
<td>CVEN4722</td>
<td>Env Policy, Law &amp; Economics</td>
<td>3</td>
</tr>
<tr>
<td>CEIC0050</td>
<td>Atmos &amp; Process Chem</td>
<td>3</td>
</tr>
</tbody>
</table>

**Total Credit Points:** 48

### Year 5 - Session 1

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>UOC</th>
</tr>
</thead>
<tbody>
<tr>
<td>CVEN4008</td>
<td>Industrial Training</td>
<td></td>
</tr>
<tr>
<td>CVEN4000</td>
<td>Honours Thesis Part A or</td>
<td></td>
</tr>
<tr>
<td>CVEN4021</td>
<td>Civil Engg Practice 4 or</td>
<td>6</td>
</tr>
<tr>
<td>CVEN4721</td>
<td>Environ Eng Practice 4</td>
<td></td>
</tr>
<tr>
<td>CVEN4126</td>
<td>Engg Management 2 or</td>
<td>4</td>
</tr>
<tr>
<td>CVEN4723</td>
<td>Waste Management</td>
<td>4</td>
</tr>
<tr>
<td>CVEN4224</td>
<td>Geotechnical Engineering 2</td>
<td>4</td>
</tr>
<tr>
<td>CVEN4525</td>
<td>Water Engineering 3</td>
<td>4</td>
</tr>
<tr>
<td>CVEN4533</td>
<td>Trans &amp; Fate of Pollutants</td>
<td>3</td>
</tr>
<tr>
<td>UOC</td>
<td>3 Unit of Credit Open Elective</td>
<td>3</td>
</tr>
</tbody>
</table>

**Total credit points:** 24

### Year 5 - Session 2

All students not undertaking an honours thesis are required to select at least one major plus either a second major or 12 units of credit of electives. Students undertaking the honours thesis are required to undertake one major plus at least 8 units of credit of electives. A maximum of three electives (including those undertaken as a part of a major) can be taken from any one major discipline.

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>UOC</th>
</tr>
</thead>
<tbody>
<tr>
<td>CVEN4000</td>
<td>Honours Thesis Part B</td>
<td>4</td>
</tr>
<tr>
<td>CVEN4138</td>
<td>Advanced Construction and Project Management</td>
<td>4</td>
</tr>
<tr>
<td>CVEN4149</td>
<td>Professional Level Project Management Tools &amp; Skills</td>
<td>4</td>
</tr>
<tr>
<td>CVEN4159</td>
<td>Advanced Construction Technology &amp; Engineering</td>
<td>4</td>
</tr>
<tr>
<td>CVEN4239</td>
<td>Rock Engg &amp; Geomechanics</td>
<td>4</td>
</tr>
<tr>
<td>CVEN4249</td>
<td>Adv Geotechnical Engineering</td>
<td>4</td>
</tr>
<tr>
<td>CVEN4259</td>
<td>Adv Pavement Engineering</td>
<td>4</td>
</tr>
<tr>
<td>CVEN4269</td>
<td>Envrntl Geomechanics</td>
<td>4</td>
</tr>
<tr>
<td>CVEN4339</td>
<td>Design of Bridges</td>
<td>4</td>
</tr>
<tr>
<td>CVEN4349</td>
<td>Special topics in Concrete, Steel &amp; Composite Struct</td>
<td>4</td>
</tr>
<tr>
<td>CVEN4359</td>
<td>Struct Anal &amp; Finite Elements</td>
<td>4</td>
</tr>
<tr>
<td>CVEN4439</td>
<td>Transport Operations &amp; Systems Design</td>
<td>4</td>
</tr>
<tr>
<td>CVEN4449</td>
<td>Traffic Mgmt &amp; Control</td>
<td>4</td>
</tr>
<tr>
<td>CVEN4459</td>
<td>Transport &amp; Environment</td>
<td>4</td>
</tr>
<tr>
<td>CVEN4539</td>
<td>Adv Water Qual &amp; Treatment</td>
<td>4</td>
</tr>
<tr>
<td>CVEN4549</td>
<td>Advanced Catchment &amp; Coastal Processes</td>
<td>4</td>
</tr>
<tr>
<td>CVEN4559</td>
<td>Adv Water Engineering</td>
<td>4</td>
</tr>
<tr>
<td>CVEN4569</td>
<td>Adv Environmental Systems</td>
<td>4</td>
</tr>
</tbody>
</table>

**Total Credit points:** 24

Note each major strand is divided into at least three units each of 4 units of credit. A major consists of undertaking 12 units of credit in a given strand. Students may also take elective components of 4 units each offered from different strands.

3. The degrees of Bachelor of Engineering may be conferred as Pass or Honours degrees. There are two classes of Honours, Class 1, and Class 2, in two divisions. The award and grade of Honours are made in recognition of superior performance throughout the course with a greater weighting on subjects in the later years. The course can lead to the award of the University Medal in either Civil or Environmental Engineering.

4. There will be a testamur for each degree in the combined course.

5. Students must satisfy admission requirements for both the BE in Civil and Environmental Engineering for direct admission or may transfer from either the Civil or the Environmental BE program after completion of the first year with a weighted average mark of 65 or greater or the permission of the Head of School of Civil and Environmental Engineering.

6. The total units of credit in the program is $5 \times 48 = 240$. 

---

UOC: University of Technology Credit Points

---

Students may transfer from either the Civil or the Environmental BE program after completion of the first year with a weighted average mark of 65 or greater or with the permission of the Head of School of Civil and Environmental Engineering.
3146
BE in Civil Engineering BE in Mining Engineering – Full-time Program

Students enrol in the Bachelor of Engineering in Civil Engineering Program 3620, which is administered by the School of Civil and Environmental Engineering. The first three years of the combined degree program are therefore identical to program 3620. After completing 6 Sessions of this program, students may apply to enter the Bachelor of Engineering in Mining Engineering 3146, which is administered by the School of Mining Engineering, and aim to complete the mining requirements in four additional sessions.

Students considering this option should discuss the above arrangements with the relevant Program Authorities.

4775
BE LLB in Civil Engineering and Law – Full-time Program

This program provides students with professional qualifications in areas of very great importance to the community. The program is attractive to students who have in mind a career involving construction or general engineering and the law. Most large developments raise a formidable range of legal issues, and there is a need for highly qualified personnel who are able to understand both the engineering and the legal dimensions of development, both in Australia and overseas.

This program is administered by the Faculty of Law and candidates are admitted through the Faculty of Law.

Rules
1. The program is a six year full-time combined program leading to the award of the two degrees of Bachelor of Engineering and Bachelor of Laws (BE LLB).
2. Students must satisfy the normal prerequisites for entry to the Faculty of Engineering and the Faculty of Law and to individual subjects in these faculties. Students must study engineering subjects in a sequence approved by the Faculty of Engineering. There are no general Faculty prerequisites to courses offered by the Faculty of Law but students must study law subjects in a sequence approved by the Faculty of Law.
3. The total units of credit required in law courses is 144 (92 from compulsory courses and 52 from elective courses).
4. The courses listed below are required to complete the program.

Year 1
- CVEN1021 Engineering Practice 1A
- CVEN1022 Computing
- CVEN1023 Statics
- CVEN1024 Dynamics
- CVEN1026 Engineering Materials 1
- MATH131 Mathematics 1A or
- MATH141 Higher Mathematics 1A
- MATH1231 Mathematics 1B
- MATH1241 Higher Mathematics 1B
- PHYS1279 Physics 1CE
- 12 units of Credit from Law

Total credit points 48

Year 2
- CHEM1011 Fundamentals of Chem A or
- CHEM1033 Higher Chemistry C
- CVEN2025 Engineering Computations 1
- CVEN2125 Systems Engineering
- CVEN2126 Engineering Construction
- CVEN2223 Mechanics of Solids
- CVEN2322 Structural Engineering 1
- CVEN2226 Engineering Materials 2
- CVEN2525 Water Engineering 1
- MATH2019 Eng Mathematics 2 CE

12 units of Credit from Law

Total credit points 48

Year 3
- CVEN2021 Engineering Practice 2A
- CVEN2022 Civil Engg Practice 2B
- CVEN3025 Eng Computations 2
- CVEN3126 Engineering Management 1
- CVEN3224 Geotechnical Engineering 1
- CVEN3322 Structural Engineering 2
- CVEN3438 Transport Planning & Envir
- CVEN3448 Transport Engineering
- CVEN3525 Water Engineering 2

12 units of Credit from Law

Total credit points 48

Year 4- Session 1
- CVEN4008 Industrial Training
- CVEN4000 Honours Thesis Part A or
- CVEN4021 Civil Engineering Practice 4
- CVEN4126 Engineering Management 2
- CVEN4224 Geotechnical Engineering 2
- CVEN4322 Structural Engineering 3
- CVEN4525 Water Engineering 3

Total credit points 24

Year 4- Session 2
- All students not undertaking an honours thesis are required to select at least one major or 12 units of credit of engineering electives.
- Students undertaking the honours thesis are required to undertake at least 8 units of credit of engineering electives.

Year 5
- CVEN4001 Honours Thesis Part B
- CVEN4139 Advanced Construction and Project Management
- CVEN4149 Professional Level Project Management Tools & Skills
- CVEN4159 Advanced Construction Technology and Engineering
- CVEN4239 Environmental Geomechanics
- CVEN4249 Adv Geotechnical Engg
- CVEN4259 Adv Pavement Engg
- CVEN4359 Design of Bridges
- CVEN4349 Special topics in Concrete, Steel & Composite Struct
- CVEN4359 Struct Anal & Finite Elements
- CVEN4439 Transport Operations and Systems Design
- CVEN4449 Traffic Managmt & Control
- CVEN4459 Transport & Environment
- CVEN4539 Advanced Water Quality and Treatment
- CVEN4549 Advanced Catchment and Coastal Processes
- CVEN4559 Advanced Water Engineering

Year 6
- 48 units of Credits from Law

Year 7
- 48 units of Credits from Law

5. The degree of Bachelor of Engineering may be conferred as a Pass degree or as an Honours degree. There are two classes of Honours, Class I, Class II in two divisions. The award and grade of Honours are made in recognition of superior performance throughout the program with a greater weighting on courses in the later years.

6. The total units of credit in the program is 6 x 48 = 288.

7. There will be a testamur for each degree in the combined program with both degrees being conferred at the completion of the full six year program.
BE LLB in Environmental Engineering and Law –
Full-time Program

This program provides students with professional qualifications in areas of very great importance to the community. The program is attractive to students who have in mind a career involving environmental issues, engineering and the law. Most large developments raise a formidable range of legal issues, and there is a need for highly qualified personnel who are able to understand both the engineering and the legal dimensions of development, both in Australia and overseas.

This program is administered by the Faculty of Law and candidates are admitted through the Faculty of Law.

Rules

1. The program is a six year full-time combined program leading to the award of the two degrees of Bachelor of Engineering and Bachelor of Laws (BE LLB).

2. Students must satisfy the normal prerequisites for entry to the Faculty of Engineering and to the Faculty of Law and to individual subjects in those faculties. Students must study engineering subjects in a sequence approved by the Faculty of Engineering. There are no general Faculty prerequisites to courses offered by the Faculty of Law but students must study law subjects in a sequence approved by the Faculty of Law.

3. The total units of credit required in law courses is 144 (92 from compulsory courses and 52 from elective courses).

4. The courses listed below are required to complete the program.

### Year 1

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>UOC</th>
</tr>
</thead>
<tbody>
<tr>
<td>CHEM1011</td>
<td>Fundamentals of Chem A or</td>
<td>6</td>
</tr>
<tr>
<td>CHEM1031</td>
<td>Higher Chemistry C</td>
<td>6</td>
</tr>
<tr>
<td>CVEN1021</td>
<td>Engineering Practice 1A</td>
<td>4</td>
</tr>
<tr>
<td>CVEN1023</td>
<td>Statics</td>
<td>4</td>
</tr>
<tr>
<td>CVEN1024</td>
<td>Dynamics</td>
<td>4</td>
</tr>
<tr>
<td>CVEN1025</td>
<td>Computing</td>
<td>4</td>
</tr>
<tr>
<td>CVEN1026</td>
<td>Engineering Materials 1</td>
<td>4</td>
</tr>
<tr>
<td>CVEN1531</td>
<td>Introduction to Water and Atmospheric Chemistry</td>
<td>4</td>
</tr>
<tr>
<td>MATH1131</td>
<td>Mathematics 1A</td>
<td>6</td>
</tr>
<tr>
<td>MATH1141</td>
<td>Higher Mathematics 1A</td>
<td>12</td>
</tr>
<tr>
<td></td>
<td>Total credit points</td>
<td>48</td>
</tr>
</tbody>
</table>

### Year 2

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>UOC</th>
</tr>
</thead>
<tbody>
<tr>
<td>BIOS1101</td>
<td>Evolutionary and Functional Biology</td>
<td>6</td>
</tr>
<tr>
<td>CEIC0010</td>
<td>Mass Transfer and Materials Balance</td>
<td>3</td>
</tr>
<tr>
<td>CVEN2023</td>
<td>Engineering Computations 1</td>
<td>3</td>
</tr>
<tr>
<td>CVEN2125</td>
<td>Systems Engineering</td>
<td>3</td>
</tr>
<tr>
<td>CVEN2023</td>
<td>Mechanics of Solids</td>
<td>3</td>
</tr>
<tr>
<td>CVEN2525</td>
<td>Water Engineering 1</td>
<td>3</td>
</tr>
<tr>
<td>INDCCI120</td>
<td>Chemistry of the Industrial Environment</td>
<td>3</td>
</tr>
<tr>
<td>MATH1231</td>
<td>Mathematics 1B</td>
<td>6</td>
</tr>
<tr>
<td>MATH1241</td>
<td>Higher Mathematics 1B</td>
<td>18</td>
</tr>
<tr>
<td></td>
<td>Total credit points</td>
<td>48</td>
</tr>
</tbody>
</table>

### Year 3

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>UOC</th>
</tr>
</thead>
<tbody>
<tr>
<td>BIOS3301</td>
<td>Population and Community Ecology for Env Engineers</td>
<td>3</td>
</tr>
<tr>
<td>CEIC0050</td>
<td>Atmospheric and Process Chemistry</td>
<td>3</td>
</tr>
<tr>
<td>CVEN2021</td>
<td>Engineering Practice 2A</td>
<td>3</td>
</tr>
<tr>
<td>CVEN2722</td>
<td>Env Engineering Practice 2B</td>
<td>3</td>
</tr>
<tr>
<td>CVEN3025</td>
<td>Engineering Computations 2</td>
<td>3</td>
</tr>
<tr>
<td>CVEN3126</td>
<td>Engineering Management 1</td>
<td>3</td>
</tr>
<tr>
<td>CVEN3224</td>
<td>Geotechnical Engineering 1</td>
<td>5</td>
</tr>
<tr>
<td>CVEN3438</td>
<td>Trans Planning &amp; Environment</td>
<td>3</td>
</tr>
<tr>
<td>CVEN3525</td>
<td>Water Engineering 2</td>
<td>6</td>
</tr>
<tr>
<td>CVEN3531</td>
<td>Water Chemistry</td>
<td>3</td>
</tr>
<tr>
<td>MATH2019</td>
<td>Engg Mathematics 2 CE</td>
<td>6</td>
</tr>
<tr>
<td></td>
<td>Total units of Credit from Law</td>
<td>6</td>
</tr>
</tbody>
</table>

### Total credit points 48

#### Year 4 – Session 1

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>UOC</th>
</tr>
</thead>
<tbody>
<tr>
<td>CVEN4008</td>
<td>Industrial Training</td>
<td>0</td>
</tr>
<tr>
<td>CVEN4000</td>
<td>Honours Thesis Part A or</td>
<td>6</td>
</tr>
<tr>
<td>CVEN4721</td>
<td>Environ Engr Practice 4</td>
<td>4</td>
</tr>
<tr>
<td>CVEN4224</td>
<td>Geotechnical Engr 2</td>
<td>4</td>
</tr>
<tr>
<td>CVEN4525</td>
<td>Water Engineering 3</td>
<td>4</td>
</tr>
<tr>
<td>CVEN4533</td>
<td>Trans &amp; Fate of Pollutants</td>
<td>3</td>
</tr>
<tr>
<td>CVEN4722</td>
<td>Environ Policy, Law &amp; Econ</td>
<td>3</td>
</tr>
<tr>
<td>CVEN4723</td>
<td>Waste Management</td>
<td>4</td>
</tr>
<tr>
<td></td>
<td>Total credit points</td>
<td>24</td>
</tr>
</tbody>
</table>

#### Year 4 – Session 2

All students not undertaking an honours thesis are required to select at least one major or 12 units of credit of engineering electives. Students undertaking the honours thesis are required to undertake at least 8 units of credit of engineering electives.

### Total credit points 48

#### Year 5

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>UOC</th>
</tr>
</thead>
<tbody>
<tr>
<td>CVEN4439</td>
<td>Transport Operations and Systems Design</td>
<td>4</td>
</tr>
<tr>
<td>CVEN4449</td>
<td>Traffic Managmt &amp; Control</td>
<td>4</td>
</tr>
<tr>
<td>CVEN4459</td>
<td>Transport &amp; Environment</td>
<td>4</td>
</tr>
<tr>
<td>CVEN4539</td>
<td>Adv Water Quality &amp; Treat</td>
<td>4</td>
</tr>
<tr>
<td>CVEN4549</td>
<td>Advanced Catchment &amp; Coastal Processes</td>
<td>4</td>
</tr>
<tr>
<td>CVEN4569</td>
<td>Adv Environmental Systems</td>
<td>4</td>
</tr>
<tr>
<td>CEIC3070</td>
<td>Process Control</td>
<td>4</td>
</tr>
<tr>
<td>CEIC3100</td>
<td>Reaction Engineering</td>
<td>4</td>
</tr>
<tr>
<td>CEIC4100</td>
<td>Chemical Eng Electives for Environmental Engineers</td>
<td>4</td>
</tr>
<tr>
<td></td>
<td>Total credit points</td>
<td>48</td>
</tr>
</tbody>
</table>

#### Year 6

48 units of Credits from Law

### Total credit points 48

#### Year 6

5. The degree of Bachelor of Engineering may be conferred as a Pass degree or as an Honours degree. There are two classes of Honours, Class I, Class II in two divisions. The award and grade of Honours are made in recognition of superior performance throughout the program with a greater weighting on courses in the later years.

6. The total units of credit in the program is 6 x 48 = 288.

7. There will be a testamur for each degree in the combined program with both degrees being conferred at the completion of the full six year program.

---

BE/MCom Bachelor of Engineering/Master of Commerce

The Bachelor of Engineering/Master of Commerce concurrent programs allow students to complete BE and MCom degrees. These courses provide professional qualifications in engineering and business/commerce. They are suited to high ability students who have technological flair and a desire to work with, and manage teams of professionals, projects and business.
Program of Study

Students undertake the first three years of their BE program. In Year 4 they undertake 3 core Master of Commerce (MCom) subjects one in S1 (instead of Engineering Practice) and two in S2 (instead of 12 units of credit of engineering electives). These three commerce subjects together with a further exemption based on the high level of mathematics and statistics in their BE degrees, lead to advanced standing of 4 MCom subjects.

To complete the remaining 8 MCom subjects, students can choose either full-time or part-time study. Students undertaking this program do not undertake an Honours Thesis in Year 4 of the engineering degree.

Eligibility and Application

A minimum of a 65% average in the first 3 years of the BE program is required. Students should apply at the end of Year 3 to undertake the MCom courses in Year 4. Normal HECs/fees apply for the 4 years of the undergraduate degree including the MCom subjects in Year 4. However, course fees apply to the 8 remaining MCom courses.

3622

BEMEngSc in Civil Engineering – Full-time Program

Students may undertake a 4½ year full-time combined program leading to the awards of Bachelor of Engineering in Civil Engineering and Master of Engineering Science in any of the existing sub-disciplines of Civil Engineering, including Engineering Construction and Management; Project Management; Technology Management; Geotechnical Engineering; Structural Engineering; Transport Engineering; Coastal Engineering and Management; Groundwater Studies; Hydrology and Water Resources; Waste Management; Water Quality Management; and Water and Wastewater Treatment.

This course will provide full professional accreditation and provide students with the in-depth specialist training to facilitate employment in discipline specific consulting practices and other specialist areas of the profession. The program is suited to high achieving students. Students enrolled in the program are expected to achieve a course average mark of 65+ or higher in the first 3 years of study to be eligible to proceed to year 4 of the program. Students with an average less than 65% will transfer to program 3620 to complete the BE in Civil Engineering. Students enrolled in the BE in Civil Engineering (3620) who have achieved an average in excess of 65% in the first three years of their studies may be permitted to transfer to this combined degree program.

Program of Study

Students undertake the first three years (6 semesters) of the BE in Civil Engineering program. Provided a 65% or better average is achieved in these first three years, students undertake the 4th year of the Civil Engineering degree, substituting 12 units of credit of graduate coursework in their eighth full-time semester for one 12 credit unit undergraduate major (or 12 units of credit of undergraduate electives). In the summer semester, at the end of the fourth year, students undertake a 12 credit unit graduate project/thesis. The 12 units of credit of graduate coursework completed in the eighth semester is counted towards both degrees and the 12 credit project/thesis is considered in the evaluation of honours in the undergraduate program and weighted similarly to the honours thesis in the BE program.

Rules:

1. The minimum duration of the program is 4½ years (including a summer semester at the end of the 4th year) leading to the award of the two degrees Bachelor of Engineering in Civil Engineering and Master of Engineering Science (BE MEngSc).
2. Students must study all subjects in the sequence approved by the Faculty of Engineering and are not permitted to enrol in any graduate subject until the first seven semesters of the program are successfully completed.
3. A minimum average of 65% in the first 3 years of the BE program is required.
Postgraduate Study

Opportunities are provided for graduate research leading to the award of the degree of Master of Engineering 2650, Master of Science 2750 and Doctor of Philosophy 1630. There are formal graduate programs leading to the award of the degree of Master of Engineering Science 8612, Master of Environmental Engineering Science 8615, and also the Graduate Diploma in Engineering 5459. These programs are available in a wide range of areas.

Students may also undertake in external mode the Master of Engineering Science 8617, the Master of Environmental Engineering Science 8618 and Graduate Diploma 5454 courses, and specialise in engineering construction and management or aspects of water engineering. Fees are payable for post-graduate coursework programs.

The School also offers a certificate qualification on completion of 24 units of credit.

Course Work Programs

Master of Engineering Science and Master of Environmental Engineering Science candidates are required to complete a program totalling 48 units of credit which may include a 12 unit of credit project. Subjects are presented in a range of delivery modes including 3 hours per week over a 14 week session (6 cu), 3 hours per week over a 7 week period (3 cu), and as 3 day short courses (3 cu). Subject to approval, candidates may undertake some subjects from other schools in the faculty, in other faculties or at other universities.

Students may enrol in a particular program or specialisation. Usually a student completes the core requirements in the specialisation, and then a choice of elective subjects and/or a project. Elective subjects must be approved by the course coordinator.

Graduate Diploma candidates are required to complete a program of study totalling 36 credit points of coursework and may choose from a range of subjects in the discipline of their choice, perhaps including all the core subjects of one of the specialisations. All subjects offered in the Masters program can also be taken in the Graduate Diploma program subject to approval by the course coordinator. In some cases up to 12 units of credit may be derived from approved undergraduate subjects.

It should be noted that some candidates who have partially completed the requirements for Graduate Diploma may be considered for upgrading to the relevant Masters program with advanced standing. Further enquiries should be made with the School Office.

8612
Master of Engineering Science
MEngSc

Internal Mode Delivery

Subjects are offered in a range of delivery modes and units of credit. Note that not all subjects are offered each year and the School Office should be consulted for details of which subjects are offered in any particular year.

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
</tr>
</thead>
<tbody>
<tr>
<td>8612.1000</td>
<td>Engineering Construction and Management</td>
</tr>
<tr>
<td>8612.1100</td>
<td>Project Management</td>
</tr>
<tr>
<td>8612.1200</td>
<td>Construction Management</td>
</tr>
<tr>
<td>8613.1300</td>
<td>Engineering/Technology Management</td>
</tr>
</tbody>
</table>

Subjects are selected from the following list. All subjects are 6 units of credit.

Management
- CVEN9702: Project Planning and Control
- CVEN9703: Quality and Quality Systems
- CVEN9706: Human Resources Management
- CVEN9707: Contracts Management
- CVEN9708: Asset Management
- CVEN9710: Management of Risk
- CVEN9711: Management of Professional Services
- CVEN9714: Resource Management
- CVEN9717: Marketing in Technology and Engineering
- CVEN9718: Strategic Management in Engineering
- CVEN9720: Problem Solving and Decision Making
- CVEN9726: Legal Studies and Professional Practice
- CVEN9730: International Project Management
- CVEN9731: Project Management Framework

Construction
- CVEN9723: Design of Construction Operations
- CVEN9724: Construction Engineering and Technology
- CVEN9727: Construction Estimating and Tendering

8612.2000  Geotechnical Engineering

Specialist areas include geotechnical engineering and pavement engineering. Subjects are selected from the following list. Subjects are 6 units of credit unless noted otherwise.

- CVEN9775: Numerical Methods in Geotechnical Engineering (3uoc)
- CVEN9776: Engineering for Underground Structures (3uoc)
- CVEN9779: Soil Dynamics and Earthquake Engineering (3uoc)
- CVEN9783: Pavement Materials
- CVEN9784: Pavement Analysis and Design
- CVEN9785: Pavement Evaluation and Management (3uoc)
- CVEN9786: Industrial, Airport and Heavy Duty Pavements (3uoc)
- CVEN9788: Geotechnical Site Investigations
- CVEN9790: Soil and Rock Slope Instability and Stabilisation
- CVEN9792: Foundation Engineering
- CVEN9793: Geomechanics
- CVEN9794: Geotechnical Engineering of Dams
- CVEN9795: Design of Dams for Earthquake (3uoc)
- CVEN9798: Fundamentals of Geomechanics (3uoc)
- CVEN9799: Geotechnics of Waste Disposal and Site Remediation
- CVEN7807: Groundwater Hydrology (3uoc)
- CVEN7808: Investigation of Groundwater Resources (3uoc)
- CVEN7809: Geophysical Techniques in Groundwater Studies (3uoc)

8612.3000  Structural Engineering

Subjects are selected from the following list. All subjects are 6 units of credit.

- CVEN9772: Numerical Methods in Civil Engineering
- CVEN9802: Structural Stability
- CVEN9804: Vibration of Structures
- CVEN9806: Prestressed Concrete Design
- CVEN9809: Reinforced Concrete Design
- CVEN9814: Analysis of Plates and Shells
- CVEN9818: Bridge Engineering
- CVEN9820: Computational Structural Mechanics
- CVEN9822: Steel Structures
- CVEN9824: Advanced Materials Technology
- CVEN9825: Continuum Mechanics
- CVEN9827: Composite Steel - Concrete Structures
8612.4000 Transport Engineering

The courses in this 30 units of credit core may be offered over a standard 14 week semester or may be taken in short course mode. The remaining 12 units of credit may be from a 12 units of credit project, or any combination of other subjects available within the School. Elective subjects from other faculties can be taken with the approval of the course coordinator. The core subjects are:

CVEN9403 Theory of Land Use Transport Interaction
CVEN9405 Urban Transport Planning Practice
CVEN9407 Transport Systems Design (Non-Urban)
CVEN9408 Transport Systems Design (Urban)
CVEN9410 Highway Engineering Practice
CVEN9414 Transport Systems Part 1
CVEN9415 Transport Systems Part 2
CVEN9418 Transport and Social Impact Assessment
CVEN9420 Special Topic in Transport Engineering
CVEN9421 Fundamentals of Traffic Engineering
CVEN9422 Traffic Management and Control
CVEN9423 Transport Environmental Analysis, Assessment and Control
SAFE9544 Traffic Safety
CVEN9783 Pavement Materials
CVEN9784 Pavement Analysis and Design
CVEN9785 Pavement Evaluation and Management (3uoc)
CVEN9786 Industrial, Airport and Heavy Duty Pavements (3uoc)

8612.5000 Water Engineering

Additional Elective Subjects
GEOL9055 Hydrogeochemical Modelling (3uoc)
CVEN7817 Water in Mining Engineering (3uoc)
CVEN7829 Decision Support Systems (3uoc)
CVEN7822 Water Resources Modelling 2 (3uoc)

8612.5300 Groundwater Studies

All subjects in this 36 units of credit core are 3 units of credit subjects offered in 3-day short course mode. GEOL subjects are offered in co-operation with the School of Geology. The program is organised by the UNSW Groundwater Centre. The remaining 12 units of credit may be from a 12 units of credit project, or any combination of other subjects available within the School. Elective subjects from other faculties may be taken with the approval of the course coordinator. The core subjects are:

CVEN7807 Groundwater Hydrology
CVEN7808 Investigation of Groundwater Resources
CVEN7809 Geophysical Techniques in Groundwater Studies
CVEN7819 Hydrological Processes
CVEN7823 Applied Groundwater Modelling
CVEN7825 Aquatic Chemistry for Engineering
CVEN7830 Physical Aspects of Contaminated Groundwater
CVEN7831 Chemical and Biological Aspects of Contaminated Groundwater
GEOL9111 Groundwater Environments
GEOL9112 Investigation and Management of Salinity
GEOL9053 Hydrochemistry
GEOL9054 Analysis and Interpretation of Hydrochemical Data

8612.5400 Coastal Engineering and Management

All subjects in this 36 units of credit core are 3 units of credit subjects offered in 3-day short course mode. The remaining 12 units of credit may be from a 12 units of credit project, or any combination of 3 or 6 units of credit subjects available within the School. Elective subjects from other faculties can be taken with the approval of the course coordinator. The core subjects are:

CVEN7819 Hydrological Processes
CVEN7820 Coastal Dynamics
CVEN7803 Coastal & Beach Processes
CVEN7804 Coastal Structures
CVEN7805 Coastal Zone Management
CVEN7807 Groundwater Hydrology
CVEN7812 Natural and Artificial Wetlands
CVEN7813 Estuarine Processes
CVEN7806 Catchment and Water Quality Management
CVEN7824 Risk Analysis in Engineering
CVEN7801 Design of Stormwater Structures
CVEN7811 Sediment Transport in Alluvial River Systems

8612.5500 Hydrology and Water Resources

All subjects in this 36 units of credit core are 3 units of credit subjects offered in 3-day short course mode. The remaining 12 units of credit may be from a 12 units of credit project, or any combination of subjects available within the School. Elective subjects from other faculties can be taken with the approval of the course coordinator. The core subjects are:

CVEN7819 Hydrological Processes
CVEN7820 Rainfall and Runoff Processes
CVEN7800 Urban Hydrology and Stormwater
CVEN7807 Groundwater Hydrology
CVEN7821 Water Resources Modelling I
CVEN7806 Catchment and Water Quality Management
CVEN7815 Introduction to Catchment Models
CVEN7816 Catchment Surface Models
CVEN7814 Flood Estimation
CVEN7824 Risk Analysis in Water Engineering
GEOL9112 Investigation and Management of Salinity
CVEN7812 Natural and Artificial Wetlands

8612.5600 Water Quality Management

All subjects in this 36 units of credit core are 3 units of credit subjects offered in 3-day short course mode. The remaining 12 units of credit may be from a 12 units of credit project, or any combination of subjects available within the School. Elective subjects from other faculties can be taken with the approval of the course coordinator. The core subjects are:
Additional Subjects

CVEN8711 Management and Professional Services
CVEN8710 Management of Risk
CVEN8708 Asset Management
CVEN8707 Contracts Management
CVEN8714 Resource Management
CVEN8717 Marketing in Technology and Engineering
CVEN8715 Strategic Management in Engineering
CVEN8720 Problem Solving and Decision Making
CVEN8726 Legal Studies and Professional Practice
CVEN8730 International Project Management
CVEN8731 Project Management Framework

Elective Subjects

CVEN8714 Resource Management
CVEN8715 Strategic Management in Engineering
CVEN8720 Problem Solving and Decision Making
CVEN8726 Legal Studies and Professional Practice
CVEN8730 International Project Management
CVEN8731 Project Management Framework

Details of each specialisation's core requirements are given below:

8617.5100 Waste Management
CVEN8851 Unit Operations in Water and Waste Management
CVEN8852 Solid Waste Management
CVEN8881 Hazardous Waste Management
CVEN8884 Environmental Engineering Science 1
CVEN8885 Environmental Engineering Science 2

8617.5200 Water and Wastewater Treatment
CVEN8851 Unit Operations in Water and Waste Management
CVEN8855 Water and Wastewater Analysis and Quality Requirements
CVEN8856 Water Treatment
CVEN8857 Wastewater Treatment
CVEN8884 Environmental Engineering Science 1

8617.5300 Groundwater Studies
CVEN8860 Investigation of Groundwater Resources
CVEN8861 Environmental and Engineering Geophysics
CVEN8875 Hydrological Processes
CVEN8884 Environmental Engineering Science 1
CVEN8891 Groundwater Contamination and Remediation

Additional Subjects

CVEN8414 Transport Systems - Part 1
CVEN8415 Transport Systems - Part 2
CVEN8421 Fundamentals of Traffic Engineering
Graduate Diplomas in Civil and Environmental Engineering

Graduate Diploma students undertake 36 units of credit of coursework. Candidates may choose from a range of subjects in the special area of their choice. All subjects offered in the Masters programs can also be taken in the Graduate Diploma programs subject to the approval of the course coordinator. There are also opportunities to select subjects from other professional areas in which candidates may be interested. In some cases 12 units of credit may be derived from approved undergraduate subjects and the programs may contain subjects from other schools of the Faculty, other faculties of the University and other universities to the approval of the course coordinator.

It should be noted that some candidates who have partially or fully completed the requirement but not taken out the diploma may considered for upgrading to the MEngSc program with advanced standing.

External GradDip programs are offered on a fee paying basis.

Certificate in Civil and Environmental Engineering

The School of Civil and Environmental Engineering offers a Certificate qualification which will be awarded on the successful completion of postgraduate subjects totalling 24 units of credit. There is a wide range of subjects available in a range of delivery modes including internal, external and short course modes.

The Certificate program will suit those wishing to pursue a specialised range of subjects or those who have limited qualifications together with relevant professional experience. Enquiries and applications should be directed to the School.

Students may continue with their postgraduate studies by subsequently enrolling in a Graduate Diploma or Master of Engineering Science degree program and may be granted advanced standing.
Course Descriptions

Descriptions of all courses are presented in alphanumeric order within organisational units. For academic advice regarding a particular course consult with the contact for the course as listed. A guide to abbreviations and prefixes is included in the chapter Handbook Guide, appearing earlier in this book.

CVEN0616
Structures
Staff Contact: A/Prof F Tin-Loi
UOC3 HPW2 WKS14 S1
Note/s: This is a servicing subject for courses offered by other schools and faculties.


CVEN0636
Properties of Materials
Staff Contact: Dr N Gowripalan
UOC3 HPW3 WKS14 S1
Note/s: This is a servicing subject for courses offered by other schools and faculties.


CVEN0646
Water and Wastewater Engineering
Staff Contact: A/Prof RJ Cox
UOC3 HPW3 WKS14 S1
Note/s: This is a servicing subject for courses offered by other schools and faculties.

Basic concepts of hydraulics: Fluid properties, hydrostatics, motion of fluids, conduct flow and open channel flow. Scope and applications of hydrology: Hydrologic measurements, rainfall analysis, storm rainfall-runoff relations, flood estimation, surface and groundwater sources, transmission and distribution. Urban drainage design: Relationship between urban development and each of water supply, wastewater and stormwater drainage. Subdivision layouts.

CVEN0656
Soil and Pavement Engineering
Staff Contact: A/Prof B Shackel
UOC3 HPW3 S2
Note/s: This is a servicing subject for courses offered by other schools and faculties.

Basic properties of soils and soil mechanics; Classification of soils; soil forming processes; seepage of water through soils; shear strengths, bearing capacity, settlement of foundations, stability of slopes and embankments, earth pressures and simple design of retaining walls; Concepts related to land use and transport systems; Pavement design based on engineering classification; site investigation for pavements, sampling and in-situ testing of subgrades, design practice of urban and rural roads, intersections and interchanges; base and sub-base materials; subgrade improvement.

CVEN1021
Civil Engineering Practice 1A
Staff Contact: Dr SJ Foster
UOC4 HPW2 WKS14 S1
Assumed Knowledge: 2 unit HSC English

Introduction to the structure, nature and scope of civil and environmental engineering. Topics include: history of engineering; engineering today; organisation of the profession; the engineer in society; environmental, social and legal considerations; civil and environmental engineering failures and engineering responsibilities; communication methods and skills; oral presentations; report writing, presentation and expectations; case studies of major projects.

CVEN1022
Engineering Practice 1B
Staff Contact: Dr SJ Foster
UOC6 HPW4 WKS14 S2
Assumed Knowledge: CVEN1021

Concepts of engineering projects; initiation, feasibility, environmental impact; problem definition; decision making. This subject seeks to develop students skills in critical thinking, communication, teamwork and research.

CVEN1023
Statics
Staff Contact: Prof RI Gilbert
UOC4 HPW3 WKS14 S1S2

An introductory subject in engineering mechanics dealing with conditions of equilibrium of structures and fluids. Topics include: two dimensional concurrent and non-concurrent force systems; resultant of forces; equilibrium of forces; distributed forces; centre of gravity; centroids; internal actions; analysis of beams (shear force and bending moment diagrams); analysis of frames (determinacy, internal hinges); analysis of trusses (methods of joints and sections); cables; fluid statics; analysis of cables; introduction to three dimensional statics.

CVEN1024
Dynamics
Staff Contact: Dr RE Lawther
UOC4 HPW3 WKS14 S2
Assumed Knowledge: CVEN1023

An introductory subject dealing with mechanics of bodies and of fluids in motion. Topics include laws governing continuity, energy and momentum; dynamics of particles; planar motion of rigid bodies and of fluids; ideal fluid flow; simple spring mass systems responding to forces of simple form; applications to civil and environmental engineering problems.

CVEN1025
Computing
Staff Contact: Dr GE Swarbrick
UOC4 HPW3 WKS14 S1
Assumed Knowledge: Basic computer literacy including the use of PC operating systems, word processors & text editors.

A subject designed to introduce students to engineering computing, including computer programming; programming using spreadsheets; computer graphics and computer aided drafting (CAD).

CVEN1026
Engineering Materials 1
Staff Contact: Dr N Gowripalan
UOC4 HPW3 WKS14 S2
Assumed Knowledge: CHEM1011

An introduction to the properties and behaviour of civil engineering materials including concrete, steel, other metals, polymers and ceramics. Topics include: (i) Concrete Technology : Cements, aggregates, admixtures, workability, strength and durability; (ii) Metals Technology: Types of materials, mechanical properties of metals, response of metals to loading, creep and fatigue; (iii) Polymers: Classification of polymers, structure of polymers, creep and relaxation, deterioration of mechanisms and durability; (iv) Ceramics: Types of ceramic materials, mechanical and insulation properties and durability.
CVEN1531
Introduction to Water and Atmospheric Chemistry
Staff Contact: Prof TD Waite
UOC4 HPW4 WKS14 S2
Assumed Knowledge: CHEM1011

CVEN2021
Engineering Practice 2A
Staff Contact: A/Prof I Cordery
UOC4 HPW2 WKS14 S1
Prerequisite/s: Completed 36UC from Year 1
Assumed Knowledge: CVEN1021, CVEN1022
Part 1 of a 2nd year integrating subject introducing students to the multi-disciplinary nature of real world engineering problems and the relationship of engineering to the wider socio-economic environment. Case studies in formulation, modelling and resolution of engineering problems. A holistic approach to addressing complex engineering problems, engineering methodology, community participation and public involvement, sustainability, equity and distributional effects. Other topics include introduction to EIS, risk-quantification, management.

CVEN2022
Civil Engineering Practice 2B
Staff Contact: A/Prof I Cordery
UOC4 HPW2 WKS14 S2
Prerequisite/s: Completed 36UC from Year 1
Assumed Knowledge: CVEN2021
Part 2 of a 2nd year integrating subject for Civil Engineering students. The subject introduces students to the multi-disciplinary nature of real world engineering problems and the relationship of engineering to the wider socio-economic environment. Case studies in formulation, modelling and resolution of engineering problems including geotechnical, transportation, environmental, water, structural, construction and related issues. A holistic approach to addressing complex engineering problems, engineering methodology, community participation and public involvement, sustainability, equity and distributional effects.

CVEN2023
Mechanics of Solids
Staff Contact: Dr MM Attard
UOC3 HPW3 WKS14 S1
Prerequisite/s: CVEN1023
Assumed Knowledge: MATH1231
An introduction to the strengths of materials: properties of sections; concepts of stress and strain; stress-strain relationships; bars under axial force, bending moment, shear force, torsion; deflections due to bending and shear; combined stresses; stresses and strains at a point; principal stresses and strains.

CVEN2025
Engineering Computations 1
Staff Contact: Dr A Sharma
UOC3 HPW3 WKS14 S1
Assumed Knowledge: MATH1231, CVEN1025
Graphical data analysis; curve fitting and interpolation; simple and multi-linear regression; random variables and their properties; normal and binomial distributions. Functions of random variables and their simulation using computers; one and two sample interference methods. Risk-quantification; ecological risk assessment. Applied data analysis.

CVEN2026
Engineering Materials 2
Staff Contact: Dr N Gowripalan
UOC3 HPW3 WKS14 S1
Assumed Knowledge: CVEN1026
The subject builds on the concepts of CVEN1026 with topics in concrete technology, metals technology and fibre reinforced polymer composites. Concrete Technology: Mix design, quality control, long term effects (creep and shrinkage); high performance concrete and fibre reinforced concrete. Metals Technology: Volume change; corrosion; various types of steel including stainless steel. Fibre Reinforced Polymer Composites: Matrix materials, types of fibres, density of composites, absorption characteristics, durability and long term mechanical properties.

CVEN2125
Systems Engineering
Staff Contact: Mr S Davis
UOC3 HPW2 WKS14 S2
Assumed Knowledge: CVEN2021
The formulation and solution of engineering problems and their interfaces with other issues. Decision making. An holistic approach to addressing complicated engineering problems. Basic systems concepts applied to Civil and Environmental Engineering. Classification and representation of systems. Modelling of systems. Systems analysis techniques such as simulation. Inverse systems approaches such as optimisation, planning, design, decision theory, and identification. Allowance for variability and uncertainty. Case studies.

CVEN2126
Engineering Construction
Staff Contact: Mr G Nawar
UOC3 HPW3 WKS14 S1
Assumed Knowledge: CVEN1022
An introduction to the design and planning of construction operations, the selection of plant and equipment and researching issues associated with construction. Topics selected from: earthmoving; temporary works including scaffold, formwork, dewatering systems; specialist techniques including drilling, compressed air systems, explosives and blasting, ground anchors, grouting methods and work physiology; aggregate production including quarrying, dredging, recycled materials; building construction including foundations, piles, cranes, steel construction, concrete construction and masonry construction; plus a selection of particular construction activities including dam construction, coffer dams and caissons, tunneling, pipelines and road, railway and bridge construction.

CVEN2322
Structural Engineering 1
Staff Contact: A/Prof F Tin-Loi
UOC6 HPW6 WKS14 S2
Prerequisite/s: CVEN1023
Assumed Knowledge: CVEN2023
The subject consists of an analysis strand and a design strand. Analysis Strand: The principles and requirements of structural analysis of indeterminate trusses and frames. Topics include structural idealisation; determinacy; principle of virtual work, the force method (flexibility analysis); reciprocal theorems; force and displacement transformations. Design Strand: Topics include concepts of limit states design (design objectives; strength, serviceability and durability limit states); loads on structures (dead, live, wind and earthquake loads); Structural Steel: design of tension and stocky compression members; design of laterally supported steel beams; simple connections; Timber Engineering: materials; design of simple elements; domestic construction.

CVEN2525
Water Engineering 1
Staff Contact: A/Professor JE Ball
UOC3 HPW3 WKS14 S2
Prerequisite/s: CVEN1023
Assumed Knowledge: CVEN2023
Extension of pressure, continuity, energy and momentum concepts introduced in Dynamics (Bernoulli's equation, momentum flux and force balances); turbulent and laminar flow; energy losses and pipe systems; boundary layers, skin friction and form drag; pump behaviour and selection; physical models.
**CVEN2722**  
**Environmental Engineering Practice 2B**  
Staff Contact: A/Prof J Ongerth  
UOC4  HPW2  WK514  S2  
Prerequisite/s: 36UC from Year 1  
Assumed Knowledge: CVEN2021  

This subject follows Engineering Practice 2A and develops the students' understanding of environmental engineering and its place in society. It integrates the various parts of the environmental engineering degree program and seeks to further develop student skills in critical thinking, communication, teamwork and research. Topics covered in formal lectures include: dealing with complexity; sources of information on natural and social systems; perception skills in critical thinking, communication, teamwork and research; in society, it integrates the various parts of the environmental sub-disciplines of civil engineering. Multi-disciplinary projects are undertaken and involve the identification of major issues and the development of solutions for open-ended problems including considerations of the environment, economic and social impact of the proposed solutions. This subject is focal in Year 3 of the undergraduate civil engineering program, reinforcing the material covered in the subjects being undertaken concurrently.

**CVEN3021**  
**Civil Engineering Practice 3A**  
Staff Contact: Dr MM Attard  
UOC6  HPW4  WK514  S1  
Prerequisite/s: Completed 36UC from Year 2  
Assumed Knowledge: CVEN2021, CVEN2022  

A project based subject integrating the material learnt in the various sub-disciplines of civil engineering. Multi-disciplinary projects are undertaken and involve the identification of major issues and the development of solutions for open-ended problems including considerations of the environment, economic and social impact of the proposed solutions. This subject is focal in Year 3 of the undergraduate civil engineering program, reinforcing the material covered in the subjects being undertaken concurrently.

**CVEN3022**  
**Civil Engineering Practice 3B**  
Staff Contact: Dr MM Attard  
UOC6  HPW4  WK514  S2  
Prerequisite/s: Completed 36UC from Year 2  
Assumed Knowledge: CVEN3021  

CVEN3022 continues on from CVEN3021. A project based subject integrating the material learnt in the various sub-disciplines of civil engineering. This subject is focal in Year 3 of the undergraduate civil engineering program, reinforcing the material covered in the subjects being undertaken concurrently.

**CVEN3025**  
**Engineering Computations 2**  
Staff Contact: Dr RE Lawther  
UOC3  HPW3  WK514  S1  
Assumed Knowledge: MATH2019, CVEN2025  

Topics include: Numerical solution of linear and non-linear equations; numerical integration, finite differences; differential equations, boundary value problems, initial value problems; eigenvalue problems; partial differential equations (civil and environmental engineering applications); an introduction to finite element analysis.

**CVEN3126**  
**Engineering Management 1**  
Staff Contact: Prof D Carmichael  
UOC3  HPW3  WK514  S2  
Assumed Knowledge: CVEN2125  

Basic techniques used in the management of projects and engineering works; purpose and principles of management; management of people, management of equipment and materials; planning and control, management of quality and risk; the management of humans and organisations; management information systems.

**CVEN3224**  
**Geotechnical Engineering 1**  
Staff Contact: Dr N Khalili  
UOC6  HPW6  WK514  S2  
Prerequisite/s: CVEN1023  
Assumed Knowledge: CVEN2023, CVEN2025  

An introductory subject to fundamental and applied soil mechanics and geological engineering. Topics include: Fundamental Soil Mechanics: Description of soil, clay mineralogy, plasticity and particle size distribution; basic relationships of phases; soil classification and material specification; hydraulic properties of soils and flow of water through soil; principle of effective stress; consolidation theory, stress distributions and settlement; compaction and basic stabilisation; Mohr's circle, failure criteria, stress paths and strength of soils; soil testing; slope stability, Geological Engineering; the earth and its formation, rock classification, formation; properties of sedimentary, metamorphic and igneous rocks; sediments, including alluvial, colluvial, wind deposited, chemical; rock defects and their engineering significance; rock weathering classification and its effect on properties.

**CVEN3322**  
**Structural Engineering 2**  
Staff Contact: Prof MA Bradford  
UOC6  HPW6  WK514  S2  
Prerequisite/s: CVEN1023  
Assumed Knowledge: CVEN2023, CVEN2322  

A subject consisting of structural design and structural analysis strands. Design strand: Reinforced concrete elements; revision of limit states; material types and properties; durability requirements; behaviour of cross-sections in bending; service and ultimate loads; ultimate strength analysis and design of cross-sections in both flexure (singly and doubly reinforced, ductility) and in shear; serviceability analysis and design of beams (cracked section analysis, deflection and crack control); bond anchorage and curtailment (simple and continuous beams and one-way slabs). Analysis strand: Applications of the stiffness method of analysis; moment distribution applied to continuous beams and non-sway frames; plastic analysis; slender- ness effects in frames; elastic stability analysis; Euler buckling.

**CVEN3438**  
**Transport Planning and Environment**  
Staff Contact: Dr U Van debona  
UOC3  HPW3  WK514  S1  
Assumed Knowledge: CVEN2015  

There are two components of this subject. The first deals with environmental acoustics and commences by considering the basic technology. From there both the analytical techniques and procedures involved in noise impact assessment and control are covered. The second component is concerned with analysis of traffic and transport systems. In particular it focuses on the interactions among transportation, land use and the environment. This is expected to develop integrated planning skills in Land-use transport and the environment. Topics include: definitions and concepts related to land use and transport systems; equation of state; traffic generation; trip distribution; traffic assignment and mode choice; computer modelling of transport systems; assessment of environmental and community impacts.

**CVEN3448**  
**Transport Engineering**  
Staff Contact: Dr P Hidas  
UOC3  HPW3  WK514  S1  

This subject develops skills related to highway design and pavement evaluation. Topics include: introduction to road design including elements, history, terminology and driver influence; route location process; design practice of urban and rural roads, intersections and interchanges; computer aided design; road traffic loadings; sub-grade evaluation; base and sub-base materials; surfacings; pavement design including flexible pavements.

**CVEN3525**  
**Water Engineering 2**  
Staff Contact: Dr Rl Acworth  
UOC6  HPW6  WK514  S1  
Assumed Knowledge: CVEN2525  This subject builds on the concepts introduced in Water Engineering 1. Topics include open channel flow; sediment transport; groundwater flow and pump testing of aquifers; hydrological cycle, global circulation and precipitation processes; runoff generation, design rainfall and flood estimation.
Basic thermodynamic and kinetic concepts are extended in this course to enable analysis of complex aqueous systems typical of surface water, ground water and marine environments. The principles of acid-base behaviour, solid dissolution and precipitation, complexation, oxidation and reduction and interactions at solid surfaces are presented such that problems pertaining to natural system behaviour, water quality degradation and water and wastewater treatment can be coherently addressed. A problem solving approach is emphasised.

The thesis may describe directed laboratory, investigatory, design, field or research work on an approved subject and will be completed under the guidance of a member of the academic staff. This subject integrating the material learnt in the various sub-disciplines of environmental engineering, Multi-disciplinary projects are undertaken and involve the identification of major issues and the development of solutions for open-ended problems including considerations of the environment, economic and social impact of the proposed solutions. This subject is focal in Year 3 of the undergraduate environmental engineering program reinforcing the material covered in the subjects being undertaken concurrently.

Continues on from CVEN3720. A project based subject integrating the material learnt in the various sub-disciplines of environmental engineering. This subject is focal in Year 3 of the undergraduate environmental engineering program reinforcing the material covered in the subjects being undertaken concurrently.

Honours Thesis - Part A
Staff Contact: Dr Rl Acworth

Prerequisite/s: Completed 36UOC from Year 2
Assumed Knowledge: CVEN3216, CVEN3222

A weighted average at the completion of Year 3 as set by the School. Completion of ALL note/s: Only students having a weighted average as set by the School (currently > 60%) in all subjects in Years 1, 2 and 3 will be permitted to undertake the honours thesis. The thesis may describe directed laboratory, investigatory, design, field or research work on unapproved subject and will be completed under the guidance of a member of the academic staff. This subject must be satisfactorily completed by all students wishing to obtain an honours degree.

Honours Thesis - Part B
Staff Contact: Dr B Cathers

Prerequisite/s: CVEN4000

Part B of the honours thesis. Subject description as for CVEN4000.

Industrial Training
Staff Contact: Mr G Nawar

Students are required to complete a minimum of 60 working days of approved industrial training before the fourth week of S1 in Year 4, and to present a seminar during session 1 of Year 4 outlining their industrial training experiences.
CVEN4249
Advanced Geotechnical Engineering
Staff Contact: Prof R Fell
UOC4 HPW3 S2
Prerequisite/s: CVEN3224, CVEN4224
The influence of geology on geotechnical behaviour of soil and rock; site investigation techniques - test pitting, drilling and water pressure testing; in-situ testing methods - SPT, CPT, vane shear, site investigation examples; laboratory shear strength testing and selection of design parameters; peak and residual strengths; triaxial and direct shear test; site investigations for landslides and slope stabilisation techniques; use of slope stability analysis programs; an introduction to clay mineralogy and its influence on soil behaviour, including reactive soils; identification and treatment of dispersive soils; investigations for contaminated sites.

CVEN4259
Advanced Pavement Engineering
Staff Contact: A/Prof B Shackel
UOC4 HPW3 WKS14 S2
Prerequisite/s: CVEN3224, CVEN4224
Site investigation for pavements, sampling and in-situ testing of sub-grades, prediction of moisture equilibrium; derivation of design parameters; sub-grade improvement, use of geofabrics, working platforms; stabilisation using lime and cement; mechanisms of stabilisation, stabilisation techniques for base, sub-base and sub-grade; traffic loading for roads, airfields and industrial pavements; stress analysis in flexible and rigid pavements; analytical procedures, computer solutions, approximate methods; background and use of the CIRCLY computer program; concepts of mechanistic analysis and design; mechanistic design of flexible and rigid pavements; characterising asphaltic and unbound pavement materials; design and construction of segmental pavements for roads, airports and industrial hardstands; environmental paving.

CVEN4259
Environmental Geomechanics
Staff Contact: Dr G Swarbrick
UOC4 HPW3 WKS14 S2
Prerequisite/s: CVEN3224, CVEN4224
Geotechnical design of landfills; contaminant migration in soils; remediation of contaminated sites. Mine waste management, including tailings disposal and acid mine drainage.

CVEN4322
Structural Engineering 3
Staff Contact: Dr B Uy
UOC6 HPW6 WKS14 S1
Prerequisite/s: CVEN2322
Assumed Knowledge: CVEN3224
Assumed Knowledge: CVEN3322. The design of reinforced concrete and prestressed concrete, composite and steel structures. Reinforced Concrete: Design of beam-columns (including slenderness effects); slab systems including edge-supported slabs, flat slabs and flat plates; punching shear; retaining walls and footings. Prestressed Concrete: Basic concepts and materials; design of beams and one-way slabs for strength and serviceability; design of anchorage zones and transfer strength; Composite Structures: floor systems; slabs and girders. Steel Structures: steel beams including consideration of local buckling; lateral buckling and web buckling; behaviour and design of steel columns and beam-columns.

CVEN4339
Design of Bridges
Staff Contact: A/Prof F Tin Loi
UOC4 HPW3 WKS14 S2
Prerequisite/s: CVEN2322, CVEN3322, CVEN4322
Fundamentals of bridge engineering (site selection; bridge type selection; standard superstructures and substructures; bridge hydraulics; bridge form); bridge codes; load distribution in bridges; preliminary design considerations for simply supported beam-and-slab and box girder bridges, continuous beam-and-slab bridges, cable-stayed bridges.

CVEN4349
Special Topics in Concrete, Steel and Composite Structures
Staff Contact: Prof RI Gilbert
UOC4 HPW3 WKS14 S2
Prerequisite/s: CVEN3222, CVEN3322, CVEN4322
Topics will be selected from the following. Concrete Structures: The art of detailing; design for torsion; yield line design; strut and tie modelling; time effects; design of continuous prestressed concrete beams. Steel Structures: Plastic analysis and design of steel structures. Composite Steel-Concrete Structures: concrete-filled steel tubes; connections, beam-slab systems; longitudinal shear and slip; Repair of Damaged Concrete Members:Externally bonded steel plated structures; the use of carbon fibre and advanced materials technology in the repair of concrete structures.

CVEN4359
Structural Analysis and Finite Elements
Staff Contact: Dr RE Lawther
UOC4 HPW3 WKS14 S2
Prerequisite/s: CVEN3322, CVEN3322, CVEN4322
Application of finite elements to structural problems. Topics will be selected from 2D membrane elements and their application to shear walls and panels subject to in-plane loading; plate elements and their application to floor slabs and panels subject to out-of-plane loading; buckling analysis using finite elements; output checking.

CVEN4439
Transport Operations and Systems Design
Staff Contact: Dr U Vandebona
UOC4 HPW3 WKS14 S2
Prerequisite/s: CVEN3438
This subject covers advanced topics on transport operations and design. Topics include: application of mathematical approaches to the operational characteristics of different modes of transport, congestion analysis, graphical and simulation techniques, network theory and queuing theory applications to ports, airports and railways. Case studies related to ferry services, bus operations and freight transport are also covered.

CVEN4449
Traffic Management and Control
Staff Contact: Dr P Hidas
UOC4 HPW3 WKS14 S2
Prerequisite/s: CVEN3438
An advanced course covering traffic management and control. Topics include traffic studies and capacity, integrated urban traffic management, arterial road traffic management measures and devices, traffic signal timing calculations, history, basic concepts, current signal setting practice, and intersection analysis with the SIDRA software package.

CVEN4459
Transport and Environment
Staff Contact: Dr U Vandebona
UOC4 HPW3 WKS14 S2
Prerequisite/s: CVEN3438
This subject covers advanced topics on transport planning in the context of integration of land-use, transport and environmental consideration. Topics include the land use/transport/environment, trip generation, trip distribution, modal split, route choice modelling, traffic assignment, economic evaluation of transport and environmental impacts of transport.

CVEN4525
Water Engineering 3
Staff Contact: Dr B Cathers
UOC4 HPW3 WKS14 S1
Assumed Knowledge: CVEN3525
Topics include water quality parameters; unit operations in treatment of water and wastewater; potable water distribution systems; environmental impacts of transport.
An introduction to environmental policies at a range of institutional levels, including sustainable development principles; implementation of environmental policies by Regulatory action at international, national, State and local levels; introduction to a range of environmental economic analytical tools, and implementation of environmental policies by market mechanisms.

CVEN4723
Waste Management
Staff Contact: Mr S Moore
UOC4 HPW3 WKS14 S1
Assumed Knowledge: CVEN3224
An introduction to waste management, from generation to treatment and disposal; including waste characterisation, waste minimisation, waste treatment and landfill design. Wastes generated in urban economies are the focus of the subject, but mining and contaminated sites may also be included.

---

Postgraduate Short Course Mode Subjects

CVEN7800
Urban Hydrology and Stormwater
Staff Contact: A/Prof J E Ball
UOC3 HPW21 WKS1
Corequisite/s: CVEN7819
Note/s: Excluded CVEN9832
An introduction to human impacts on the hydrological cycle with an emphasis on the additional factors that need consideration in urban environments, an introduction to impacts of urban development on stormwater quantity and quality, management of urban stormwater quantity and quality, an introduction to impacts of urban developments on groundwater, case studies.

CVEN7801
Design of Stormwater Structures
Staff Contact: A/Prof J E Ball
UOC3 HPW21 WKS1
Note/s: Excluded CVEN9832
Design of stormwater quantity and quality management structures such as detention basins, retention basins, infiltration basins, artificial wetlands, gross pollutant traps, sedimentation basins, and pollution booms.

CVEN7802
Coastal Dynamics
Staff Contact: A/Prof R Cox
UOC3 HPW21 WKS1
Note/s: Excluded CVEN9835

CVEN7803
Coastal and Beach Processes
Staff Contact: A/Prof R Cox
UOC3 HPW21 WKS1
Note/s: Excluded CVEN9835
Coastal and beach processes including tides, storms, currents and elevated water levels, morphology, sediment transport mechanisms, beach erosion and nourishment, prediction and modelling of shoreline change.

CVEN7804
Coastal Structures
Staff Contact: A/Prof R Cox
UOC3 HPW21 WKS1
Note/s: Excluded CVEN9835
Wave forces on coastal and ocean structures with application to practical engineering design of harbours, breakwaters, seawalls, piers, decks, marinas, pipelines and outfalls.
CVEN7805 Coastal Zone Management
Staff Contact: A/Prof R Cox
UOC3 HP21 WKS1
Note/s: Excluded CVEN9836

CVEN7806 Catchment and Water Quality Management
Staff Contact: Prof T D Waite
UOC3 HP21 WKS1
Note/s: Excluded CVEN9858
Fundamental concepts, total catchment management, issues in non-urban catchment inclusive of non-point-source contamination and erosion, water quality management in catchments, rivers, lakes, reservoirs, estuaries and the coastal zone.

CVEN7807 Groundwater Hydrology
Staff Contact: Dr R I Acworth
UOC3 HP21 WKS1
Corequisite/s: CVEN7819
Note/s: Excluded CVEN9860

CVEN7808 Investigation of Groundwater Resources
Staff Contact: Dr R I Acworth
UOC3 HP21 WKS1
Corequisite/s: CVEN7807
Note/s: Excluded CVEN9860
Groundwater investigation methods. Drilling methods; well design and completion for water production and contamination investigation. Contract specification and supervision. Solutions to the radial flow equation; pumping test interpretation; programme of field work and data analysis.

CVEN7809 Geophysical Techniques In Groundwater Studies
Staff Contact: Dr R I Acworth
UOC3 HP21 WKS1
Note/s: Excluded CVEN9861

CVEN7810 Electrical Methods In Groundwater Investigation
Staff Contact: Dr R I Acworth
UOC3 HP21 WKS1
Note/s: Excluded CVEN9861

CVEN7811 Sediment Transport In Alluvial River Systems
Staff Contact: Dr B Cathers
UOC3 HP21 WKS1
Note/s: Excluded CVEN9862
Catchment and river morphological processes including river response to changed conditions and river engineering and management. Sediment transport estimation for cohesive and non-cohesive materials including computer modelling application packages.

CVEN7812 Natural and Artificial Wetlands
Staff Contact: Dr B Cathers
UOC3 HP21 WKS1
Corequisite/s: CVEN7819
Note/s: Excluded CVEN9863

CVEN7813 Estuarine Processes
Staff Contact: Dr B Cathers
UOC3 HP21 WKS1
Note/s: Excluded CVEN9863
The objective of this subject is to extend the student’s knowledge of physical and biochemical processes which occur in estuaries and how to measure, model and predict those processes. Topics include estuarine classification and density structure. Tides and water level response of estuaries. Tidal flushing of estuaries and inlets. Mixing processes and random walk and box models. Two layer models. Difference models for hydrodynamics and algal dynamics. Biochemical processes in estuaries.

CVEN7814 Flood Estimation
Staff Contact: A/Prof I Cordery
UOC3 HP21 WKS1
Note/s: Excluded CVEN9866
Introduction and background to flood estimation; frequency analysis of hydrological data; flood frequency analysis; design rainfall data; regional flood methods; rational methods; estimation of extremes.

CVEN7815 Introduction to Catchment Models
Staff Contact: A/Prof J E Ball
UOC3 HP21 WKS1
Corequisite/s: CVEN7820
Note/s: Excluded CVEN9867
An introduction to the concepts and reductionist approach involved in the modelling of catchment processes influencing the quantity and quality of surface runoff from a catchment. Also introduced are the different forms of models, how these models are combined to provide catchment modelling system, and implementation of catchment modelling systems. The information and data required for operation of these modelling systems and sources of this information are also discussed. Finally, the calibration, validation, and reliability of catchment modelling systems is presented.

CVEN7816 Catchment Surface Models
Staff Contact: A/Prof J E Ball
UOC3 HP21 WKS1
Corequisite/s: CVEN7814, CVEN7815
Note/s: Excluded CVEN9867
An introduction to processes influencing the generation of surface runoff and the transportation of pollutant constituents with the surface runoff. The surface runoff models considered include UH methods, time-area methods, linear and non-linear reservoir models and,
kinematic wave methods. Water quality models considered include UAL, Simple methods, and process based models. Selection of appropriate models is discussed also.

CVEN7817
Water In Mining Engineering
Staff Contact: Dr R I Acworth
U0C3 HPW21 WKS1
Prerequisite/s: CVEN7807
Note/s: Excluded CVEN9871

Hydrological cycle and sources of mine water; mine dewatering strategies; groundwater flow into mines; consolidation and drainage of fine-grained material during dewatering; monitoring the effects of mining on regional groundwater resources.

CVEN7818
Channel and River Models
Staff Contact: A/Prof J E Ball
U0C3 HPW21 WKS1
Corequisite/s: CVEN7815
Note/s: Excluded CVEN9871

Selection of models for routing flows along the channels and rivers in a catchment drainage network. Also included is a detailed discussion of the theory of these models. Models considered include Muskingum with both variable and constant parameters, kinematic wave models, non-inertial and diffusion models, and dynamic wave models. These models will be discussed with reference to single channel situations and network situations. Also included is a discussion of water quality models for motion of pollutant constituents in channels and rivers. These models will include plug-flow methods, and advection-diffusion models in both coupled and uncoupled situation.

CVEN7819
Hydrological Processes
Staff Contact: A/Prof T I Cordery
U0C3 HPW21 WKS1
Note/s: Excluded CVEN9875

Hydrological cycle; atmospheric circulation; weather systems and oceanic circulation; moisture in the atmosphere; measurement of meteorological parameters; calculation of potential evaporation and evapotranspiration.

CVEN7820
Rainfall and Runoff Processes
Staff Contact: A/Prof T I Cordery
U0C3 HPW21 WKS1
Corequisite/s: CVEN7819
Note/s: Excluded CVEN9875

Precipitation processes; interception and infiltration; storm runoff processes; loss models; hydrograph analysis.

CVEN7821
Water Resources Modelling 1
Staff Contact: Dr A Sharma
U0C3 HPW21 WKS1
Prerequisite/s: CVEN7819
Corequisite/s: CVEN7824
Note/s: Excluded CVEN9876

Water resources data - sources, errors and corrections; introduction to storage yield relationships for reservoir design; extension of hydrological records; introduction to time series analysis.

CVEN7822
Water Resources Modelling 2
Staff Contact: Dr A Sharma
U0C3 HPW21 WKS1
Corequisite/s: CVEN7821
Note/s: Excluded CVEN9876

Time series analysis; stochastic models; stochastic reservoir analysis; optimisation in water Resources.

CVEN7823
Applied Groundwater Modelling
Staff Contact: Dr R I Acworth
U0C3 HPW21 WKS1
Prerequisite/s: CVEN7807
Note/s: Excluded CVEN9880

Equations and numerical methods; conceptual model and grid design; boundaries; sources and sinks of ground water; model execution and calibration; profile models; particle tracking.

CVEN7824
Risk Analysis in Water Engineering
Staff Contact: Dr A Sharma
U0C3 HPW21 WKS1
Note/s: Excluded CVEN9880

Introduction to the theory of probability; joint, marginal and conditional probability; commonly used probability distributions; expectations and estimation of model parameters; hypothesis testing and confidence limits; uses in water and coastal engineering - applications to flood design, monte carlo simulation, bootstrap, and hydrological, human and environmental risk assessment.

CVEN7825
Aquatic Chemistry for Engineering
Staff Contact: Prof T D Waite
U0C3 HPW21 WKS1
Note/s: Excluded CVEN9884

Introduction to principles of the chemistry of natural waters and polluted systems covering basic processes of acidity and alkalinity, mineral precipitation, complexation, oxidation/reduction and surface and colloid chemistry. Tools developed enabling solution of realistic water chemistry problems including introduction to use of chemical speciation computer codes.

CVEN7826
Microbiology for Engineering
Staff Contact: A/Prof N Ashbolt
U0C3 HPW21 WKS1
Corequisite/s: CVEN7825
Note/s: Excluded CVEN9884

The objective of this unit is to familiarise the student with the fundamentals of water and wastewater chemistry along with the microbiology that drives most of these reactions in various environments. A structured approach is used to introduce concepts governing chemical equilibria, reaction rates, pH, alkalinity, oxidation-reduction and complexation, and integrates this knowledge with an understanding of microbial growth, metabolic diversity and persistence of disease-causing microorganisms.

CVEN7827
Contaminant Transport In the Environment
Staff Contact: Dr B Cathers
U0C3 HPW21 WKS1
Prerequisite/s: CVEN7825
Note/s: Excluded CVEN9885


CVEN7828
Transformation and Fate of Contaminants In the Environment
Staff Contact: Prof T D Waite
U0C3 HPW21 WKS1
Prerequisite/s: CVEN7825
Corequisite/s: CVEN7827
Note/s: Excluded CVEN9885

Major variables and general principles of the transformation and fate of pollutants. Air chemistry: interaction and degradation of gaseous pollutants in the atmosphere. Aquatic chemistry: transformation and fate of particles, organic contaminants, nutrients and metals released to coastal waters.
CVEN7829
Decision Support Systems in Water Engineering
Staff Contact: A/Prof J E Ball
UOC3 HPW21 WKS1
Note/s: Excluded CVEN9890

Principles of decision support systems and their application in decision making in water resources, expert systems, GIS concepts, an introduction to hydroinformatic concepts, and error analysis.

CVEN7830
Physical Aspects of Contaminated Groundwater
Staff Contact: Dr R I Acworth
UOC3 HPW21 WKS1
Note/s: Excluded CVEN9891

Sources of groundwater contamination; diffusion and dispersion; tracer tests; review of organic chemistry; contamination by light non-aqueous phase liquids (LNAPL) and dense non-aqueous phase liquids (DNAPL); gas chromatographic analysis techniques; case studies of LNAPL and DNAPL contaminant investigation.

CVEN7831
Chemical and Biological Aspects of Contaminated Groundwater
Staff Contact: Prof T D Waite
UOC3 HPW21 WKS1
Note/s: Excluded CVEN9891

The source and sink mechanisms for inorganic and organic groundwater contaminants are described along with an insight into the mechanisms of critical chemical and microbiological transformations. The nature of groundwater microbes in natural and artificially contaminated systems are explained against a background focused on chemical and microbiological remediation of groundwater contaminants. Case examples are worked through for a range of contaminated sites.

External Mode Subjects

CVEN8701
Engineering Economics and Financial Management
Staff Contact: Prof D G Carmichael
UOC6

Project initiation and development, feasibility studies, planning; economics, review of practical decision making problems and relevant techniques, benefit/cost analysis, methods of economic appraisal; consideration of inflation and taxation in investment decisions; depreciation; management decision processes, decision theory, utility; life-cycle costing, value management; models and techniques to assist the manager, forecasting; optimisation; applications; multiple objective planning; project delivery systems; financial planning, accounting.

CVEN8702
Project Planning and Control
Staff Contact: Prof D G Carmichael
UOC6

The planning process; time estimating; the link between planning and control; control systems; the critical path method, networks, resource levelling, resource constrained scheduling, network compression, overlapping relationships, applied cpm, cost influences, project control, legal considerations, simulation in networks, stochastic networks, project management, applications.

CVEN8703
Quality and Quality Systems
Staff Contact: Prof D G Carmichael
UOC6

Quality management principles, practice and responsibilities; applications; quality systems documentation, manuals, implementation and procedures; quality assurance; quality control; relevant codes on quality; total quality management, quality circles and related approaches; quality requirements in contracts; continuous improvement.

CVEN8706
Human Resources Management
Staff Contact: Mr J B O Brien
UOC6

The development of skills for the management of people and their workplaces; industrial relations, health and safety issues, the recognition of people as the basic unit of engineering productivity and engineering organisations; negotiating theory and practices; the structure and function of organisations, management of group action; work delegation across organisational boundaries; interpersonal skills, conflict management; learning curves; motivation.

CVEN8707
Contracts Management
Staff Contact: Prof D G Carmichael
UOC6

Elements of contract law and a contract; contracts; contract documents including specifications; procurement methods (contract or project delivery strategies); tendering; time incontracts; variations; payments; rights and obligations, planning and programming; risk management and insurance; dispute resolution and dispute avoidance; claims.

CVEN8708
Asset Management
Staff Contact: Prof D G Carmichael
UOC6


CVEN8710
Management of Risk
Staff Contact: Mr G Nawar
UOC6

Introduction to the concept of risk and decision making under conditions of uncertainty; projectobjectives and planning, risk/factors affecting project performance; risk identification in engineering processes; human error, natural hazards and unforeseen risks; risk evaluation and quantification methods; relevant statistical techniques; risk avoidance and minimisation; financial risk, portfolio theory; risk sharing and financing; ambient and acceptable risk levels; insurances.

CVEN8711
Management of Professional Services
Staff Contact: Prof D G Carmichael
UOC6

The Management of the delivery of professional engineering and technology services which are predominantly knowledge-based, such as designs, reports and investigations. The client relationship. Planning and control of work, staff and resources. Marketing including the promoting and pricing of services. Contracts for the provision of services. The design process and organisation and team management. Financial management of the engineering/technology firm.
CVEN8714
Resource Management
Staff Contact: Prof DG Carmichael
UOC6

The management of non human (inert) resources such as equipment, plant, materials infrastructure and assets, including maintenance management, asset management, fleet management and related topics; resource acquisition, maintenance and repair policies; procurement, inventory, supply management and control; optimisation, applications; resource planning; resource disposal.

CVEN8717
Marketing In Technology and Engineering
Staff Contact: Prof DG Carmichael
UOC6

The interface of technology and engineering with marketing. Marketing of professional consultant services; promoting; advertising; pricing of services. Client management; briefs. Marketing for contractors; competition, competitive bidding; tendering and proposals. Winning and securing work and commissions. Entrepreneurship. Marketing research; environment; products; distribution; strategies.

CVEN8718
Strategic Management in Engineering
Staff Contact: Prof DG Carmichael
UOC6

Strategic management for engineering and technology based organisations. Strategic versus operational planning; approaches to developing strategies. Influence of environment, resources (people, materials, plant/equipment), opportunities, competition. Strategic change, implementation, control. Influence of organisation size and type.

CVEN8720
Problem Solving and Decision Making
Staff Contact: Prof D G Carmichael
UOC6


CVEN8723
Design of Construction Operations
Staff Contact: Mr S R Davis
UOC6

Design theory as applied to construction processes; application to selected areas of the construction industry, building construction; queuing and simulation models; work study (method study and work measurement) procedures; productivity; job planning, layout planning, capacity planning; planning and design of production systems (construction oriented); reliability, availability, applications.

CVEN8724
Construction Engineering and Technology
Staff Contact: Mr JB O Brien
UOC6

Structure of the construction industry; construction engineering theory; construction processes; methods engineering, automation and mechanisation concepts; modelling, design and analysis; problem solving; task analysis; adaptive systems and control concepts; experimental studies of construction processes. Construction technologies; construction robotics, applications of expert and knowledge based systems. Case studies.

CVEN8726
Legal Studies and Professional Practice
Staff Contact: Prof DG Carmichael
UOC6

Nature and sources of law, court procedures, interpretation of documents, evidence, technical opinions, expert witness; company law; duties of an engineer; tort, professional liability; trade practices and consumer legislation; ethics.

CVEN8727
Construction Estimating and Tendering
Staff Contact: Prof DG Carmichael
UOC6

Estimating procedures, estimating cost of labour plant and materials, indirect costs and overheads, profit; preparation of cost estimates for engineering projects; the conversion of an estimate into a tender; bidding strategies and models; the tendering process; marketing.

CVEN8730
International Project Management
Staff Contact: Prof D G Carmichael
UOC6


CVEN8731
Project Management Framework
Staff Contact: Mr JB O Brien
UOC6

An overview of project management; the nature of technical and non-technical projects; the project life cycle; the project team, organisational and behavioural aspects; the project manager; the organisation and management of project resources; project success evaluation techniques; project delivery; management information and decision support systems; case studies in project management; management theory and processes; relationship to general management; functions of project management.

CVEN8799
Geotechnics of Waste Disposal and Site Remediation
Staff Contact: Dr G E Swarbrick
UOC6

Soil and contaminant chemistry, soil-contaminant interaction, movement of water and contaminants through the saturated and vadose zones, advection and dispersion of contaminants, gas flow and diffusion, contaminated site investigation management, risk assessment, soil and groundwater remediation, landfill leachate and gas management, and mine waste disposal and management, dredged waste disposal and management, field trip to inspect an landfill and/or a mining project.

CVEN8851
Unit Operations In Water and Waste Management
Staff Contact: Mr P J Bliss
UOC6

Theory and principles of physical, chemical and hydraulic unit processes which are common to both water and wastewater treatment; energy dissipation and modelling; mixing; sedimentation; flotation; filtration; aeration; coagulation and flocculation; gas transfer; disinfection; heat transfer; combustion; sludge characterisation, thickening and dewatering; and activated carbon.

CVEN8855
Water and Wastewater Analysis and Quality Requirements
Staff Contact: Prof T D Waite
UOC6

The effects of impurities in water and wastewater on its suitability for various beneficial uses, and methods used for detecting impurities. Analytical methods used in water and wastewater treatment for monitoring and process.
CVEN8856
Water Treatment
Staff Contact: Prof T D Waite
UOC6
Integrated design of facilities for the treatment of various types of raw water to meet specified water quality, with emphasis on water for municipal supply, including: chemical selection, dosing and mixing; coagulation - flocculation - clarification - filtration and disinfection technology. Processes for water softening, iron and manganese removal and demineralisation, including precipitation - oxidation, ion exchange - reverse osmosis. Taste and odour control. Disposal of water treatment residuals.

CVEN8857
Wastewater Treatment
Staff Contact: Mr P J Bliss
UOC6
Principles and applications of aerobic and anaerobic biological processes for treatment of wastewaters and sludges. Design of integrated systems of biological, physical, chemical and sludge treatment processes to satisfy effluent quality objectives. Effluent disposal and reuse. Stabilisation, processing, disposal and utilisation of treatment residuals.

CVEN8860
Investigation of Groundwater Resources
Staff Contact: Dr R I Acworth
UOC6

CVEN8861
Environmental and Engineering Geophysics
Staff Contact: Dr R I Acworth
UOC6

CVEN8872
Solid Waste Management
Staff Contact: Mr S J Moore
UOC6
Characterisation of municipal solid waste; collection; transfer stations; waste minimisation and recycling; waste treatment, including size reduction, composting, incineration, emerging technologies; landfill disposal, including preparation of landfill management plans and operational aspects; introduction to planning of waste management systems.

CVEN8875
Hydrological Processes
Staff Contact: A/Prof I Cordery
UOC6
Introduction to hydrological cycle and energy balance; meteorology; precipitation processes and analysis; interception and infiltration; evaporation; storm runoff processes; hydrograph analysis; loss models.

CVEN8881
Hazardous Waste Management
Staff Contact: Mr S J Moore
UOC6
Waste audits and characterisation of hazardous wastes in regions and industries; control of generation and transport of hazardous waste, manifest systems; waste minimisation; on-site treatment methods; integrated off-site treatment facilities; management of residues from treatment facilities; introduction to planning of regional hazardous waste management systems. Characteristics of individual waste types (dioxins, PCBs, pesticides, heavy metal, etc.) and waste management in individual industries (steel, pulp and paper, petrochemical, food processing, etc.).

CVEN8884
Environmental Engineering Science 1
Staff Contact: Prof T D Waite
UOC6
Application of chemical principles to aqueous systems; pH and alkalinity, solubility and precipitation, complexation, redox and surface chemistry. Chemical equilibrium modelling. Introduction to chemical reaction kinetics. Introduction to Microbiology; Structure and metabolism of cells and micro-organisms; monitoring methods for pathogens and indicator organisms; impact of water and wastewater treatment on disease transmission.

CVEN8885
Environmental Engineering Science 2
Staff Contact: Prof T D Waite
UOC6

CVEN8888
Environmental Management
Staff Contact: Mr S J Moore
UOC6
Introduction to economics of markets; sustainable development; pollution control; benefit-cost analysis; costing the environment. Regulatory procedures and requirements for new project development, and for the operation of facilities; including EIA and pollution control regulations with an emphasis on NSW.

CVEN8891
Groundwater Contamination and Remediation
Staff Contact: Dr R I Acworth
UOC6
Description of types of groundwater contaminants, sources of groundwater contamination, review of transport equations, mass transport in saturated media, advection and dispersion, biological and chemical transformation of groundwater contaminants, multilayer flow, migration of nonaqueous liquids. Groundwater sampling and analysis, monitoring well design and installation, soilwater and soil-gas monitoring. Treatment and prevention of groundwater contamination. Site investigation methods at contaminated sites. Size remediation; source control, pump and treat, soil vapour extraction, bioremediation.
Types of urban transport facilities. Distributors, streets, bicycle landscape. Design of intersection and parking areas. and change terminals, noise control. Minimum geometric form; water, signposting, fencing and posts.

Staff Contact: CVEN9408

Optical guidance, design models, landscape, provision for surface-differences between road, railway and airport carriageway layout.

Process of location of road, railway and airport facilities. Data collection, alternative routes, public discussion, methods, techniques, aids, plans and diagrams produced. Geometric form; differences between road, railway and airport carriageway layout. Optical guidance, design models, landscape, provision for surface-water, signposting, fencing and posts.

Types of urban transport facilities. Distributors, streets, bicycle routes, walk-oriented areas, bus lanes and rapid transit lanes, stops and change terminals, noise control. Minimum geometric form; speed range controls, provision for surface water on urban roads, landscape. Design of intersection and parking areas.


This syllabus changes to allow presentation of a special topic of current interest particularly by visitors with recognised expertise in the topic.


Unsignalised intersections; operating characteristics, capacity and level of service: multi-lane and two-way-two-lane roads, urban roads, HCM-software calculations. Economic analysis of transport investments.
road traffic management. Local Area Traffic Management, Traffic Calming. Travel Demand Management.

CVEN9423
Transport Environmental Analysis, Assessment and Control
Staff Contact: Dr V Vandebona
UOC6 HPW3 WKS14 S2

CVEN9701
Engineering Economics and Financial Management
Staff Contact: Prof D G Carmichael
UOC6 HPW3 WKS14 S1
Project initiation and development, feasibility studies, planning; economics, review of practical decision making problems and relevant techniques, benefit/cost analysis, methods of economic appraisal; consideration of inflation and taxation in investment decisions; depreciation; management decision processes, decision utility; life-cycle costing, value management; models and techniques to assist the manager, forecasting; optimisation; applications; multiple objective planning; project delivery systems; financial planning, accounting.

CVEN9702
Project Planning and Control
Staff Contact: Prof D G Carmichael
UOC6 HPW3 WKS14 SS
The planning process; time estimating; the link between planning and control; control systems; the critical path method, networks, resource levelling, resource constrained scheduling, network compression, overlapping relationships, applied cpm, cost influences, project control, legal considerations, simulation in networks, stochastic networks, project management, applications.

CVEN9703
Quality and Quality Systems
Staff Contact: Professor D G Carmichael
UOC6 HPW3 WKS14 S2
Quality management principles, practice and responsibilities; applications; quality systems documentation, manuals, implementation and procedures; quality assurance; quality control; relevant codes on quality; total quality management, quality circles and related approaches; quality requirements in contracts; continuous improvement.

CVEN9706
Human Resources Management
Staff Contact: Mr J B O'Brien
UOC6 HPW3 WKS14 SS
The development of skills for the management of people and their workplaces; industrial relations, health and safety issues, the recognition of people as the basic unit of engineering productivity; the structure and function of organisations, management of group action; work delegation across organisational boundaries; interpersonal skills, conflict management; learning curves; motivation.

CVEN9707
Contracts Management
Staff Contact: Prof D G Carmichael
UOC6 HPW3 WKS14 S1
Elements of contract law and a contract; contracts; contract documents including specifications; procurement methods (contract or project delivery strategies); tendering; time in contracts; variations; payments; rights and obligations; planning and programming; risk management and insurance; dispute resolution and dispute avoidance; claims.

CVEN9708
Asset Management
Staff Contact: Prof D G Carmichael
UOC6 HPW3 WKS14 SS

CVEN9710
Management of Risk
Staff Contact: Mr G Nawar
UOC6 HPW3 WKS14 SS
Introduction to the concept of risk and decision making under conditions of uncertainty; project objectives and planning, risk factors affecting project performance; risk identification in engineering processes; human error, natural hazards and unforeseen risks; risk evaluation and quantification methods; relevant statistical techniques; risk avoidance and minimisation; financial risk, portfolio theory, risk sharing and financing; ambient and acceptable risk levels; insurances.

CVEN9711
Management of Professional Services
Staff Contact: Prof D G Carmichael
UOC6 HPW3 WKS14 SS
The management of the delivery of professional engineering and technology services which are predominantly knowledge-based, such as designs, reports and investigations. The client relationship. Planning and control of work, staff and resources. Marketing including the promoting and pricing of services. Contracts for the provision of services. The design process and organisation and team management. Financial management of the engineering/technology firm.

CVEN9714
Resource Management
Staff Contact: Prof D G Carmichael
UOC6 HPW3 WKS14 SS
The management of non human (inert) resources such as equipment, plant, materials infrastructure and assets, including maintenance management, asset management, fleet management and related topics; resource acquisition, maintenance and repair policies; procurement, inventory, supply management and control; optimisation applications; resource planning; resource disposal.

CVEN9717
Marketing in Technology and Engineering
Staff Contact: Prof D G Carmichael
UOC6 HPW3 WKS14 S2
The interface of technology and engineering with marketing. Marketing of professional consultant services; promotion; advertising; pricing of services. Client management; briefs. Marketing for contract services; competition, competitive bidding; tendering and proposals Winning and securing work and commissions. Entrepreneurship. Marketing research; environment; products; distribution; strategies.

CVEN9718
Strategic Management for Engineering
Staff Contact: Prof D G Carmichael
UOC6 HPW3 WKS14 S1
Strategic management for engineering and technology based organisations. Strategic versus operational planning; approaches to developing strategies. Influence of environment, resources (people, materials, plant/equipment), opportunities, competition. Strategic change, implementation, control. Influence of organisation size and shape.
CVEN9720
Problem Solving and Decision Making
Staff Contact: Mr J B O'Brien
UOC6 HPW3 WKS14 S2

CVEN9723
Design of Construction Operations
Staff Contact: Mr S R Davis
UOC6 HPW3 WKS14 S2
Design theory as applied to construction processes; application to selected areas of the construction industry; building construction; queuing and simulation models; study work (method study and work measurement) procedures; productivity; job planning, layout planning, capacity planning; planning and design of production systems (construction oriented); reliability, availability, applications.

CVEN9724
Construction Engineering and Technology
Staff Contact: Mr J B O Brien
UOC6 HPW3 WKS14 SS
Structure of the construction industry; construction engineering theory, construction processes: methods engineering, automation and mechanisation concepts; modelling, designand analysis; problem solving; task analysis; adaptive systems and control concepts; experimental studies of construction processes. Construction technologies; construction robotics, applications of expert and knowledge based systems. Case studies.

CVEN9726
Legal Studies and Professional Practice
Staff Contact: Prof D G Carmichael
UOC6 HPW3 WKS14 SS
Nature and sources of law, court procedures, interpretation of documents, evidence, technical opinions, expert witness; company law; duties of an engineer; tort, professional liability; trade practices and consumer legislation; ethics.

CVEN9727
Construction Estimating and Tendering
Staff Contact: Prof D G Carmichael
UOC6 HPW3 WKS14 SS
Estimating procedures, estimating cost of labour plant and materials, indirect costs and overheads, profit; preparation of cost estimates for engineering projects; the conversion of an estimate into a tender; bidding strategies and models; the tendering process; marketing.

CVEN9730
International Project Management
Staff Contact: Prof D G Carmichael
UOC6 HPW3 WKS14 S2

CVEN9731
Project Management Framework
Staff Contact: Mr J B O'Brien
UOC6 HPW3 WKS14 S1
An overview of project management; the nature of technical and non-technical projects; the project life cycle; the project team, organisational and behavioural aspects; the project manager; the organisation and management of project resources; project success evaluation techniques; project delivery; management information and decision support systems; case studies in project management; management theory and processes; relationship to general management; functions of project management.

CVEN9770
Introduction to Numerical Methods in Civil Engineering
Staff Contact: Prof S Valliappan
UOC3 HPW3 WKS57 S1

CVEN9772
Numerical Methods in Civil Engineering
Staff Contact: Prof S Valliappan
UOC6 HPW3 WKS14 SS

CVEN9775
Numerical Methods in Geotechnical Engineering
Staff Contact: Prof S Valliappan
UOC3 HPW3 WKS57 SS
Introduction to computer programs based on finite element, boundary element and finite difference methods. Theory and application of FEM, BEM, FDM to foundations, slopes, embankments, dams, tunnels, seepage and consolidation.

CVEN9776
Rock Engineering for Underground Structures
Staff Contact: Prof R Fell
UOC3 HPW3 WKS57 S1
A lecture and problem based course on the investigation, design and construction of tunnels and other underground structures, rock and rock mass strength and deformability; in-situ stresses; stresses about underground openings by elastic and numerical methods; classification systems for prediction of support requirements, including NATM; design of support elements including bolts, dowels, mesh and anchors. Measurement of in-situ stresses; instrumentation and monitoring; squeezing and swelling ground. Tunnel excavation methods and their applicability, including drill and blast, heading and bench, tunnel boring machine, road.

CVEN9779
Soil Dynamics and Earthquake Engineering
Staff Contact: Dr N Khalili
UOC3 HPW3 WKS57 SS
Elements of soil dynamics, foundation design for dynamic loads, basic concepts of earthquake engineering, seismic analysis of dams and foundations, soil liquefaction.

CVEN9783
Pavement Materials
Staff Contact: A/Prof B Shackel
UOC6 HPW3 WKS14 S1
Types of pavement, selection on basis of cost and performance. Sub-grade conditions, working platforms. Role of environmental factors including temperature and moisture. Soil moisture equilibria and rock. Geotechnical mapping and logging. Introduction to terrain evaluation, field instrumentation for pore pressure and displacement. Environmental investigations - sampling of groundwater and contaminated soil, sample storage, testing.

Assessment of the stability, design and stabilisation of soil and rock slopes in civil and mining engineering. Influence of geology and hydrogeology; site investigations, laboratory testing and field instrumentation; analysis of stability using limit equilibrium and numerical methods; gathering of geological data and stereographic presentation and analysis; design of slopes in soil and rock, sub-grade conditions; working platforms. Role of environmental factors including temperature and moisture. Soil moisture equilibria and drainage requirements. Prediction and characterisation of traffic loadings. Stress distribution in flexible and rigid pavements. Computer-based and approximate methods of analysis. Principles of mechanistic design. Comparative evaluation of design criteria and design procedures for flexible and rigid pavements for roads. Concrete block paving.


Functions of airport, industrial and heavy-duty pavements. Airport and port pavements, container facilities, bulk cargo areas, factories and warehouses floors and hardstand operation requirements. Economic considerations. Types of industrial pavement. Advantages and disadvantages of flexible, rigid and segmental pavements. Types of load, aircraft and industrial vehicles, container stacking, bulk cargo, load equivalency concepts, port area wheel loads, standard design aircraft and vehicles, formulation and application of loading spectra. Subgrade improvement and characterisation. Selection of pavement materials. Pavement design procedures.

Soil and contaminant chemistry, soil-contaminant interaction, movement of water and contaminants through the saturated and vadose zones, advection and dispersion of contaminants, gas flow and diffusion, contaminated site investigation management, risk assessment, soil and groundwater remediation, landfill leachate and gas management, and mine waste disposal and management, dredged waste disposal and management, field trip to inspect an landfill and/or a mining project.
VCEN9802
Structural Stability
Staff Contact: Dr R E Lawther
UOC6 HPW3 WKS14 SS
Euler strut; uniform and non-uniform cross sections. Eccentric loading; stress reversals beyond the elastic limit. Struts continuous over several supports. Stability of frames.

VCEN9804
Vibration of Structures
Staff Contact: AProf F Tin-Loi
UOC6 HPW3 WKS14 S2
Review of basic aspects. Analysis of lumped mass systems with various degrees of freedom. Vibration in beams and other continuous structures.

VCEN9806
Prestressed Concrete Design
Staff Contact: Dr MM Attard
UOC6 HPW3 WKS14 S2

VCEN9809
Reinforced Concrete Design
Staff Contact: Dr S J Foster
UOC6 HPW3 WKS14 S1
Design of reinforced concrete structures. Topics covered will be chosen from: design of beam-columns, non-symmetric sections, flexure-shear-torsion, serviceability and detailing. Special provisions for the use of high strength concretes, strut and tie modelling and collapse load methods for the design of reinforced concrete slabs.

VCEN9814
Analysis of Plates and Shells
Staff Contact: Prof M A Bradford
UOC6 HPW3 WKS14 SS

VCEN9818
Bridge Engineering
Staff Contact: AProf F Tin Loi
UOC6 HPW3 WKS14 S1
Introduction to bridge engineering; site selection, type selection, bridge hydraulics, design philosophies. Transverse load distribution. Simple supported and continuous slabs on beam bridges. Box girder bridges. Cable-stayed.

VCEN9820
Computational Structural Mechanics
Staff Contact: Dr R E Lawther
UOC6 HPW3 WKS14 S1

VCEN9822
Steel Structures
Staff Contact: AProf M A Bradford
UOC6 HPW3 WKS14 S2

VCEN9824
Advanced Materials Technology
Staff Contact: Dr N Gowripalan
UOC6 HPW3 WKS14 S2
Concrete: high performance concrete; new methods of workability measurement; methods of placing-pumping, spraying; mix design methods; special concrete mixes. Fibre Reinforced Plastics (FRP): advanced polymer composites for structures; polymer matrix materials; fibres used properties of polymers; properties of fibres; structural applications; durability of FRP.

VCEN9825
Continuum Mechanics
Staff Contact: Dr M M Attard
UOC6 HPW3 WKS14 S1

VCEN9832
Urban Hydrology and Storm Water
Staff Contact: AProf J E Ball
UOC6 HPW3 WKS14 S1
Notes: Excluded CVEN7804, CVEN7805
Hydrological cycle in the urban environment; anthropogenic impacts on the natural cycle; management of stormwater quantity and quality; information systems for management of stormwater; design of water quality control devices such as gross pollutant traps, booms, wet detention basins; design of water quantity control devices such as detention basins, on-site detention; evaluation of system performance through application of numerical models; case studies; groundwater in urban environments.

VCEN9833
Design of Hydraulic Structures
Staff Contact: AProf R J Cox
UOC6 HPW3 WKS14 SS
Theory of flow in open channels. Application of theory to design of hydraulic structures including spillways, energy dissipators, channel transitions, culverts and side discharge weirs. Environmental control structures also to be considered include sediment and gross pollutant traps, trash racks, pollution booms, reservoir destratification, outfall manifold/diffusers, and fish ladders.

VCEN9835
Coastal Dynamics
Staff Contact: AProf R J Cox
UOC6 HPW3 WKS14 SS
Notes: Excluded CVEN7802, CVEN7803
Theory of periodic waves as applied to tides and wind generated waves in water of varying depths. Measurement, analysis and prediction of waves and tides. Wave growth, refraction, diffraction, shoaling and breaking.

VCEN9836
Coastal Engineering
Staff Contact: AProf R J Cox
UOC6 HPW3 WKS14 SS
Notes: Excluded CVEN7804, CVEN7805
Wave forces on coastal and ocean structures with application to practical engineering design of breakwaters, seawalls, piers, decks, marinas and ocean outfalls. Coastal processes, beach morphology, prediction of shoreline change and coastal zone management. Dredging for navigation, reclamation and beach nourishment.
CFEN9851
Unit Operations in Water and Waste Management
Staff Contact: Mr P J Bliss
UOC6 HPW3 WKS14 S1

Theory and principles of physical, chemical and hydraulic unit processes which are common to both water and wastewater treatment; energy dissipation and modelling; mixing; sedimentation; flotation; filtration; aeration; coagulation and flocculation; gas transfer; disinfection; heat transfer; combustion; sludge characterisation, thickening and dewatering; and activated carbon.

CFEN9852
Water and Wastewater Network Design
Staff Contact: Mr P J Bliss
UOC6 HPW3 WKS14 SS

Estimation of design population, water demands and variations in flows for municipal water supply. Water supply system components and their design capacities. Hydraulics and design of water distribution systems. Separate sanitary sewer systems - estimation of dry weather flows and their variation; infiltration/inflow estimation and control. Hydraulics and design of sanitary sewers for capacity, self-cleansing and sulphide slime control. Design of wastewater pumping installations. Stormwater and combined sewer design.

CFEN9855
Water and Wastewater Analysis and Quality Requirements
Staff Contact: Prof T D Waite
UOC6 HPW3 WKS14 S1

The effects of impurities in water and wastewater on its suitability for various beneficial uses, and methods used for detecting impurities. Analytical methods used in water and wastewater treatment for monitoring and process.

CFEN9856
Water Treatment
Staff Contact: Prof TD Waite
UOC6 HPW3 WKS14 S2

Integrated design of facilities for the treatment of various types of raw water to meet specified water quality, with emphasis on water for municipal supply, including: chemical selection, dosing and mixing; coagulation - flocculation - clarification - filtration and disinfection technology. Processes for water softening, iron and manganese removal and demineralisation, including precipitation, oxidation, iron exchange and reverse osmosis. Taste and odour control. Disposal of water treatment residuals.

CFEN9857
Wastewater Treatment
Staff Contact: Mr P J Bliss
UOC6 HPW3 WKS14 S2

Principles and applications of aerobic and anaerobic biological processes or treatment of wastewaters and sludges. Design of integrated systems of biological, physical, chemical and sludge treatment processes to satisfy effluent quality objectives. Effluent disposal and reuse. Stabilisation, processing, disposal and utilisation of treatment residuals.

CFEN9858
Catchment and Water Quality Management
Staff Contact: Prof T D Waite
UOC6 HPW3 WKS14 S2

Excluded: CFEN7808 Fundamental concepts; water policy; total catchment management; rural catchment issues, including salinity, erosion; water quality management in rivers, reservoirs, estuaries and the coastal zone; water quality management within the urban environment including reuse issues.

CFEN9859
Investigation of Groundwater Resources
Staff Contact: Dr R I Acworth
UOC6 HPW3 WKS14 S1

Note/s: Excluded CFEN7807, CFEN7808

Physical properties of groundwater. Darcy flow; porosity, hydraulic conductivity and intrinsic permeability - field and laboratory tests.


CFEN9861
Environmental and Engineering Geophysics
Staff Contact: Dr R I Acworth
UOC6 HPW3 WKS14 S2


CFEN9862
Fluvial Hydraulics
Staff Contact: A/Prof R J Cox
UOC6 HPW3 WKS14 S2

Note/s: Excluded CFEN7811

Unsteady and varied flow in non-uniform channels, secondary currents, sediment transport, channel morphology, scour and shoaling, river control works, modelling of fluvial processes.

CFEN9863
Estuaries and Wetlands
Staff Contact: Dr B Cathers
UOC6 HPW3 WKS14 S1

Note/s: Excluded CFEN7812, CFEN7813


CFEN9866
Flood Estimation
Staff Contact: A/Prof I Cordery
UOC6 HPW3 WKS14 S2

Note/s: Excluded CFEN7814

Introduction to flood estimation; frequency analysis of hydrological data; flood frequency analysis; design rainfall data; hydrograph analysis; loss models; regional flood methods; rational methods; time-area methods; UH methods; extreme floods.

CFEN9867
Catchment and River Modelling
Staff Contact: A/Prof I Cordery
UOC6 HPW3 WKS14 S2

Note/s: Excluded CFEN7815, CFEN7816

Introduction to modelling; introduction to flood routing, nonlinear catchment models; kinematicwave models; application and calibration of models. Water quality models.

CFEN9871
Water Supply and Sanitation in Developing Regions
Staff Contact: Prof T D Waite
UOC6 HPW3 WKS14 S2

Note/s: Excluded CFEN7817, CFEN7818

Selection of appropriate technology for water supply and wastewater treatment and disposal to account for developing regions and/or remote locations; design basis for systems and the operating requirements; health issues; stormwater and wastewater reuse.
CIVIL AND ENVIRONMENTAL ENGINEERING

CVEN9872
Solid Waste Management
Staff Contact: Mr S J Moore
UOC6 HPW3 WKS14 S1

Characterisation of municipal solid waste; collection; transfer stations; waste minimisation and recycling; waste treatment, including size reduction, composting, incineration, emerging technologies; landfill disposal, including preparation of landfill management plans and operational aspects; introduction to planning of waste management systems.

CVEN9875
Hydrological Processes
Staff Contact: A/Prof I Cordery
UOC6 HPW3 WKS14 S1

Note/s: Excluded CVEN7819, CVEN7820

Introduction to hydrological cycle and energy balance; meteorology; precipitation processes and analysis, interception and infiltration, storm runoff processes, evapo-transpiration.

CVEN9876
Water Resources Modelling
Staff Contact: Dr A Sharma
UOC6 HPW3 WKS14 S2

Note/s: Excluded CVEN7819, CVEN7820, CVEN7821, CVEN7822

Water resources data - sources, errors, corrections; introduction to storage-yield relationships for reservoir design; extension of records; stochastic models; stochastic models; use of information systems with water resources data; yield estimations for ungauged catchments; principles of optimal design and operation of water.

CVEN9880
Groundwater Modelling
Staff Contact: Dr R I Acworth
UOC6 HPW3 WKS14 S3

Note/s: Excluded CVEN7823, CVEN7824

Groundwater modelling of porous media, for porous media for resource management and groundwater contamination studies. Finite difference and finite element methods. Modelling of density dependent fluids and multiphase fluids. Software packages and applications to borefield management and groundwater contamination studies. Workstation and PC based packages will be demonstrated and used.

CVEN9881
Hazardous Waste Management
Staff Contact: Mr S J Moore
UOC6 HPW3 WKS14 S3

Note/s: Excluded CVEN7825, CVEN7826

Waste audits and characterisation of hazardous wastes in regions and industries; control of generation and transport of hazardous waste, manifest systems; waste minimisation; on-site treatment methods; integrated off-site treatment facilities; management of residues from treatment facilities; introduction to planning of regional hazardous waste management systems. Characteristics of individual waste types (dioxins, PCBs, pesticides, heavy metal, etc.) and waste management in individual industries (steel, pulp and paper, petrochemical, food processing, etc.).

CVEN9884
Environmental Engineering Science 1
Staff Contact: Prof T D Waite
UOC6 HPW3 WKS14 S1

Note/s: Excluded CVEN7825, CVEN7826

Application of chemicals principles to aqueous systems; pH and alkalinity, solubility and precipitation, complexation, redox and surface chemistry; chemical equilibrium modelling; introduction to chemical reaction kinetics. Introduction to microbiology; structure and metabolism of cells and micro-organisms; monitoring methods for pathogens and indicator organisms; impact of water and wastewater treatment on disease transmission.

CVEN9885
Environmental Engineering Science 2
Staff Contact: Prof T D Waite
UOC6 HPW3 WKS14 S2

Note/s: Excluded CVEN7827, CVEN7828


CVEN9888
Environmental Management
Staff Contact: Mr S J Moore
UOC6 HPW3 WKS14 S1

Spectrum of modern environmentalism and sustainable development; environmental impact statement techniques and EIA procedures; environmental management systems; tools for the analysis and management of environmental impacts of engineering projects, including environmental risk assessment, environmental waste audits, Life Cycle Assessment and other materials accounting techniques.

CVEN9889
Environmental Economics and Law
Staff Contact: Mr S J Moore
UOC6 HPW3 WKS14 S2

Note/s: Excluded CVEN7829

Introduction to economics of markets; sustainable development; pollution control; benefit-cost analysis; costing the environment. Regulatory procedures and requirements for new project development, and for the operation of facilities; including EIA and pollution control regulations with an emphasis on NSW.

CVEN9890
Spatial Decision Support Systems in Water Resources
Staff Contact: A/Prof J E Ball
UOC6 HPW3 WKS14 S2

Note/s: Excluded CVEN7830

Principles of spatial decision support systems as used in hydrology, water resources and catchment management. Expert systems methods for decision modelling. Use of geographic information systems in surface and subsurface data analysis, model integration and presentation. Development and use of databases for water resources applications. Review of techniques for spatial data collection including remote sensing and global positioning systems.

CVEN9891
Groundwater Contamination and Remediation
Staff Contact: Dr R I Acworth
UOC6 HPW3 WKS14 S1

Note/s: Excluded CVEN7831

Description of types of groundwater contaminants, sources of groundwater contamination, review of transport equations, mass transport in saturated media, advection and dispersion, biological and chemical transformation of groundwater contaminants, multiphase flow, migration of nonaqueous liquids. Groundwater sampling and analysis, monitoring well design and installation, soil-water and soil-gas monitoring. Treatment and prevention of groundwater contamination. Site investigation methods at contaminated sites. Site remediation: source control, pump and treat, soil vapour extraction, bioremediation.

CVEN9901
Special Topic in Civil Engineering 1
Staff Contact: School Office
UOC6 HPW3 WKS14 S3

Note/s: Excluded CVEN7830

This syllabus changes to allow presentation of a special topic of current interest particularly by visitors with recognised expertise in the topic.
CVEN9902
Special Topic in Civil Engineering
Staff Contact: School Office
UOC6 HPW3 WKS14 SS
This syllabus changes to allow presentation of a special topic of current interest particularly by visitors with recognised expertise in the topic.

CVEN9930
Masters Project
Staff Contact: School Office
UOC12 SS
A minor research investigation involving analysis and interpretation of data, or a critical review and interpretation of literature on a selected topic, or a design project and the presentation of same in a thesis format.

CVEN9940
Special Topics in Civil Engineering
Staff Contact: School Office
UOC3 SS
The syllabus and format changes to allow presentation of a special topic of current interest, including a topic covered by an approved short course, and a topic taught by a visitor with recognised expertise in the area.
The School, which was formerly the Department of Computer Science in the School of Electrical Engineering and Computer Science, was established on 1 January 1991. The School of Computer Science and Engineering and the restructured School of Electrical Engineering and Telecommunications have joint responsibility for the curriculum of the Computer Engineering course.

The Staff of the School are grouped into research areas of Artificial Intelligence, Computer Systems, Information Engineering and Software Engineering. Courses in these areas are offered to students taking major studies in computer science or computer engineering, while introductory-level computing courses are available more generally to students studying Science, Arts or Engineering. Computer science has links with discrete mathematics, which furnishes the theory behind the algorithms that computer software implements, and electrical engineering, which supplies the present technology underlying physical computing devices.

The School of Computer Science and Engineering, together with the School of Electrical Engineering and Telecommunications, jointly administers the BE Computer Engineering 3645. The BE Software Engineering 3646, which commenced in 1997, is jointly managed with the School of Information Systems. The BE MBiomedE 3728 is managed in conjunction with the Graduate School of Biomedical Engineering. The School of Computer Science and Engineering offers a major in Computer Science in the BSc (Science and Mathematics), BA and BSoSc, several combined BE/BSc and BE/BA programs, combined BSc/BA and combined BSc LLB.

The graduate programs offered are the Master of Engineering Science 8685, the Master of Computer Science 8680, Master of Information Science 8508. Graduate Diploma in Computer Science 5452, and Graduate Diploma in Information Science 5453. Opportunities are provided for graduate research leading to the award of the degree of Master of Engineering 2665, Master of Science 2765 and Doctor of Philosophy 1650.
Summary of Undergraduate Programs

Normal full-time

Bachelor of Engineering

- 3645 BE in Computer Engineering
- 3648 BE in Software Engineering
- 3722 BE BA in Computer Engineering
- 3726 BE BSc in Computer Engineering
- 3728 BE MBiomedE in Computer Engineering
- 3651 BE BSc in Software Engineering
- 3652 BE BA in Software Engineering

Duration
- 4 years
- 5 years
- 5 years
- 4 years
- 5 years
- 5 years
- 5 years

Combined BE/BSc in Computer Science

- 3725 BE BSc in Electrical Engineering
- 3730 BE BSc in Civil Engineering
- 3611 BE BSc in Aerospace Engineering
- 3661 BE BSc in Manufacturing Management
- 3681 BE BSc in Mechanical Engineering
- 3701 BE BSc in Naval Architecture
- 3746 BE BSc in Geomatic Engineering

Duration
- 5 years
- 5 years
- 5 years
- 5 years
- 5 years
- 5 years
- 5 years

Majors in Computer Science

Program and Degree

- 3978 BSc
- 3400 BA
- 3420 BSoc Sc
- 3930 BSc BA
- 4770 BSc LLB

Duration
- 3 years (Pass) 4 years (Hons)
- 3 years (Pass) 4 years (Hons)
- 3 years (Pass) 4 years (Hons)
- 4 years (Pass)
- 5 years

For a description of the combined BE BSc programs, see the entries in this Handbook for the schools conducting the engineering major. The BSc degree program is described in the Science Handbook. Majors are offered in Computer Science and Psychology, Computer Science and Geography, and Computer Science and Philosophy; for the BA and BSocSc degree programs, see the Arts and Social Sciences Handbook and for the BSc LLB program, see the Law Handbook.

Computing Requirements

Information regarding recommended computing equipment and software for the program is available from the School of Computer Science and Engineering Office.
Undergraduate Study

Program Outlines

3645

Computer Engineering - Full-time Program

Bachelor of Engineering

BE

Whilst jointly administered by the Schools of Computer Science and Engineering and Electrical Engineering and Telecommunications, for convenience, day to day administration of the program is conducted through the Computer Science and Engineering School Office, to which enquiries should be directed.

<table>
<thead>
<tr>
<th>HPW</th>
<th>UOC</th>
</tr>
</thead>
<tbody>
<tr>
<td>S1</td>
<td>S2</td>
</tr>
</tbody>
</table>

**Year 1**

- COMP1011  Computing 1A  6 - 6
- COMP1021  Computing 1B  - 6 6
- ELEC1011  Electrical Engineering 1 - 6 6
- MATH1141  Higher Mathematics 1A  - 
- MATH1131  Mathematics 1A  6 - 6
- MATH1241  Higher Mathematics 1B  or 
- MATH1231  Mathematics 1B  - 6 6
- MATH1081  Discrete Mathematics 6 - 6
- PHYS1131  Higher Physics 1A  or 
- PHYS1121  Physics 1A  6 - 6
- PHYS1231  Higher Physics 1B  or 
- PHYS1221  Physics 1B  - 6 6

Total HPW Session 1  24
Total HPW Session 2  24
Total Units of Credit  48

**Rules for Electives**

1. Electives for Stage 3 and 4 total 36 units of credit (6 courses of 6 units of credit, or equivalent) and are selected from the following groups. The number of units of credit for each course is either 6 (most) or 3 (eg. MATH).

- GROUP N: See the list of Networks Electives below
- GROUP S: See the list of Science Electives below
- GROUP C: See the list of level 3 Electrical Electives below
- GROUP E: See the list of level 4 Electrical Electives below
- GROUP D: See the list of Discontinued Courses below

2. Exactly 6 units of credit must be taken from group N.
3. At least 12 units of credit must be taken from groups C or E.
4. At most 12 units of credit may be counted from group S.
5. At most 6 units of credit may be counted from group D. (This is a transitional arrangement to allow students completing under the new program to obtain some credit for discontinued courses in the old program).

**Electives**

**Networks Courses (Group N)**

- TELE3018  Data Networks I
- COMP3331  Computer Networks and Application

**Science Courses (Group S)**

- MATH2301  Mathematical Computing A
- MATH2400  Finite Mathematics
- MATH3141  Mathematical Methods EE
- MATH3411  Information, Codes and Ciphers
88 ENGINEERING

PHYS2010 Mechanics 3
PHYS2020 Computational Physics 3
PHYS2040 Quantum Physics 3
PHYS2310 Nuclear Science Technology 3

Level 3 Computer Engineering Courses (Group C3)
COMP2411 Logic and Logic Programming 6
COMP3131 Parsing and Translation 6
COMP3231 Operating Systems 6
COMP3311 Database Systems 6
COMP3411 Artificial Intelligence 6
COMP3421 Computer Graphics 6
COMP3511 Human Computer Interaction 6

Level 3 Electrical Engineering Courses (Group E3)
ELEC3004 Signal Processing 1 6
ELEC3014 Systems & Control 1 6
ELEC3016 Electronics B 6

Level 4 Computer Engineering Courses (Group C4)
COMP4001 Object-Oriented System Development 6
COMP4012 Multimedia Authoring & Cooperative Agents 6
COMP4411 Experimental Robotics 6
COMP9116 Software Development Using the B-Method and B-Toolkit 6
COMP9242 Advanced Operating Systems 12
COMP9243 Distributed Systems 12
COMP9314 Next Generation Database Systems 6
COMP9315 Database System Implementation 6
COMP9333 Advanced Computer Networks 6
COMP9417 Machine Learning 6
COMP9517 Image Processing and Applications 6

Level 4 Electrical Engineering Courses (Group E4)
ELEC4042 Signal Processing 2 6
ELEC4412 Systems & Control 2 6
ELEC4413 Systems & Control 3 6
ELEC4483 Biomedical Instrumentation, Measurement and Design 6
ELEC4503 Electronics C 6
ELEC4522 Microelectronics Design & Technology 6
ELEC4532 Integrated Digital Systems 6
ELEC4540 Applied Photovoltaics 6
TELE4313 Optical Communications 6
TELE4323 Digital Modulation and Coding 6
TELE4334 Source Coding and Compression 6
TELE4352 Data Networks 2 6
TELE4353 Mobile and Satellite Communication Systems 6
TELE4363 Telecommunication Systems 6

Discontinued Courses (Group D)
COMP2031 Concurrent Computing 6
MATH3150 Transform Methods 3
PHYS2959 Introductory Semiconductor Physics 3

Award of Honours
Honours will be awarded to students who have achieved superior grades in courses over the whole program including the successful completion of a thesis at a sufficient standard. Weighted average marks required for Honours grades are given below:
Honours Class 1: WA ≥ 75
Honours Class 2: Division 1: 70 ≤ WA < 75
Division 2: 65 ≤ WA < 70

3648
Software Engineering - Full-time Program

Bachelor of Engineering
BE
The Software Engineering Program is jointly administered by the School of Computer Science and Engineering and the School of Information Systems, Technology and Management. Day to day administration is conducted through the Computer Science and Engineering School office, to which enquiries should be directed.

<table>
<thead>
<tr>
<th>HPW Session 1</th>
<th>HPW Session 2</th>
<th>Total Units of Credit</th>
</tr>
</thead>
<tbody>
<tr>
<td>24</td>
<td>20.5</td>
<td>48</td>
</tr>
</tbody>
</table>

| Stage 1 | SENG1010 Software Engineering Workshop 1A | 2.5 | 3 |
|         | SENG1020 Software Engineering Workshop 1B | 2.5 | 3 |
|         | COMP1011 Computing 1A                    | 6   | 6 |
|         | MATH1131 Mathematics 1A                  | 6   | 6 |
|         | MATH1141 Higher Math 1A                  | 6   | 6 |
|         | INF5101 Discrete Mathematics              | 6   | 6 |
|         | INF5102 Business Data Management          | 6   | 6 |
|         | COMP1021 Computing 1B                    | 6   | 6 |
|         | INF5111 Requirements Engineering         | 1.5 | 3 |
|         | MATH2400 Finite Mathematics               | 2   | 3 |
|         | Option - free elective                    | 6   | 6 |
| Total HPW Session 1 |  | 20.5 |
| Total HPW Session 2 |  | 24 |
| Total Units of Credit |  | 48 |

| Stage 2 | SENG2010 Software Engineering Workshop 2A | 2.5 | 3 |
|         | SENG2020 Software Engineering Workshop 2B | 2.5 | 3 |
|         | COMP2110 Software System Specification   | 2.5 | 3 |
|         | COMP2011 Data Organization               | 5   | 6 |
|         | COMP2021 Digital Systems Structures      | 5   | 6 |
|         | COMP2411 Logic & Logic Programming       | 5   | 6 |
|         | INF5203 Systems Analysis and Design      | 5   | 6 |
|         | MATH2859 Statistics for Computing         | 3   | 3 |
|         | Option - General Education               | 6   | 6 |
|         | Option - Free elective                    | 6   | 6 |
| Total HPW Session 1 |  | 20.5 |
| Total HPW Session 2 |  | 21.5 |
| Total Units of Credit |  | 48 |

| Stage 3 | SENG3010 Software Engineering Workshop 3A | 2.5 | 3 |
|         | SENG3020 Software Engineering Workshop 3B | 2.5 | 3 |
|         | COMP3141 Software System Design &        | 5   | 6 |
|         | Implementation                           |     | 6 |
|         | INF5207 Business Data Networks           | 5   | 6 |
|         | 4 options                                | 10  | 24 |
|         | General Education                        | 2   | 6 |
| Total HPW Session 1 |  | 19.5 |
| Total HPW Session 2 |  | 19.5 |
| Total Units of Credit |  | 48 |

| Stage 4 | SENG4921 Professional Issues and Ethics | 4   | 4 |
|         | SENG4910 Thesis Part A                   | 7   | 7 |
|         | SENG4911 Thesis Part B                   | 14  | 14 |
|         | 4 options                                | 10  | 10 |
| Total HPW Session 1 |  | 21 |
| Total HPW Session 2 |  | 24 |
| Total Units of Credit |  | 48 |

Notes:
1. The 8 options (48 UOC) for stages 3 and 4 are chosen from a list that includes all third and fourth stage COMP and INFS courses.
2. Industrial Training is incorporated into SENG4921 Professional Issues and Ethics.
Software Engineering Combined Programs

3651
BE BSc in Software Engineering

The BE(Software Engineering)/BSc combined program requires the completion of at least 84 UOC (Units of Credit) of Science courses, and must contain a major sequence of 42 UOC at stages 2 and 3, with at least 18 UOC at stage 3 in a single Science discipline. To satisfy the requirement of the combined program, the free electives and the General Education electives of the standard Software Engineering program are assigned to Science electives. The Science content of the generic combined program consists of:

- 18 UOC of Mathematics in stages 1 and 2;
- 6 UOC of Science electives in stage 1;
- 12 UOC of Science electives in stage 2;
- 6 UOC of Science electives in stage 3;
- an extra stage of 48 UOC of Science.

This yields a possible total of 90 uoc of Science. Combined Programs are exempt from the General Education requirement.

The major Science discipline may not be Computer Science.

Students who are enrolled in a combined program are expected to maintain a credit (65% or higher) average across courses taken from each of the composite programs. Students who fail to meet this condition will be counselled about their suitability to remain in the combined program.

The stages of a generic combined program are shown below. It should be noted that it is possible to adapt the program by moving courses, subject to prerequisite requirements and the overall requirements given above.

Refer to the School of Computer Science and Engineering web page for examples of specific SE/Science programs.

<table>
<thead>
<tr>
<th>Stage</th>
<th>UOC</th>
<th>S1</th>
<th>S2</th>
</tr>
</thead>
<tbody>
<tr>
<td>Stage 1</td>
<td>SENG1010</td>
<td>Software Engineering Workshop 1A</td>
<td>-</td>
</tr>
<tr>
<td></td>
<td>SENG1020</td>
<td>Software Engineering Workshop 1B</td>
<td>-</td>
</tr>
<tr>
<td></td>
<td>MATH1131</td>
<td>Mathematics 1A</td>
<td>6</td>
</tr>
<tr>
<td></td>
<td>MATH1081</td>
<td>Discrete Mathematics</td>
<td>6</td>
</tr>
<tr>
<td></td>
<td>MATH2400</td>
<td>Finite Mathematics</td>
<td>-</td>
</tr>
<tr>
<td></td>
<td>COMP1011</td>
<td>Computing 1A</td>
<td>6</td>
</tr>
<tr>
<td></td>
<td>COMP1021</td>
<td>Computing 1B</td>
<td>-</td>
</tr>
<tr>
<td></td>
<td>INF51611</td>
<td>Requirements Engineering</td>
<td>-</td>
</tr>
<tr>
<td></td>
<td>INF51603</td>
<td>Business Data Management</td>
<td>6</td>
</tr>
<tr>
<td></td>
<td>Stage 1 Science electives</td>
<td>-</td>
<td>6</td>
</tr>
<tr>
<td></td>
<td>Total Units of Credit</td>
<td>24</td>
<td>24</td>
</tr>
</tbody>
</table>

Stage 2

| SENG2010 | Software Engineering Workshop 2A | 3 | - |
| SENG2020 | Software Engineering Workshop 2B | 3 | - |
| COMP2110 | Software System Specification | 3 | - |
| COMP2011 | Data Organisation | - | 6 |
| COMP2021 | Digital Systems Structures | - | 6 |
| COMP2411 | Logic & Logic Programming | 6 | - |
| INF52603 | System Analysis & Design | 6 | - |
| MATH2859 | Statistics for Computing | - | 3 |
| | Stage 2 Science electives | 6 | 6 |
| | Total Units of Credit | 24 | 24 |

Stage 3

| SENG3010 | Software Engineering Workshop 3A | 3 | - |
| SENG3020 | Software Engineering Workshop 3B | 3 | - |
| COMP3141 | Software System Design & Implementation | 6 | - |
| INF52607 | Business Data Networks | - | 6 |
| | SE Electives | 12 | 12 |
| | Stage 2 Science electives | 3 | 3 |
| | Total Units of Credit | 24 | 24 |

Stage 4 |

<table>
<thead>
<tr>
<th>UOC</th>
<th>S1</th>
<th>S2</th>
</tr>
</thead>
<tbody>
<tr>
<td>Stage 2 or 3 Science electives</td>
<td>18</td>
<td>12</td>
</tr>
<tr>
<td>Stage 3 Science electives</td>
<td>6</td>
<td>12</td>
</tr>
<tr>
<td>Total</td>
<td>24</td>
<td>24</td>
</tr>
</tbody>
</table>

Stage 5

| SENG4921 | Professional Issues and Ethics | 6 | - |
| SENG4910 | Thesis part A | 6 | - |
| SENG4911 | Thesis part B | - | 12 |
| | SE Electives | 12 | 12 |
| | Total | 24 | 24 |

Notes
1. The chosen courses must form a major sequence of 42 units of credit at stages 2 and 3.
2. To satisfy prerequisites it may be necessary to use a different arrangement of courses than shown above.
3. The BE requirement of 60 days of approved industrial training has been incorporated into SENG4921.

3652
BE BA in Software Engineering

The BE(Software Engineering)/BA combined program requires the completion of at least 60 UOC (Units of Credit) of Arts courses, and must contain a major sequence of 42 UOC at stages 2 and 3 in a single Arts discipline. To satisfy the requirement of the combined program, the free electives and the General Education electives of the standard Software Engineering program are assigned to Arts electives. Combined Programs are exempt from the General Education requirement.

The major Arts discipline may not be Computer Science.

Students who are enrolled in a combined program are expected to maintain a credit (65% or higher) average across courses taken from each of the composite programs. Students who fail to meet this condition will be counselled about their suitability to remain in the combined program.

The stages of a generic combined program are shown below. In general, it will be necessary to adapt the program by moving courses to meet the requirements of particular Arts majors. This generic program can accommodate 72 UOC of Arts electives.

Refer to the School of Computer Science and Engineering web page for examples of specific SE/Arts programs.

All programs should be approved by the Faculty of Arts and Social Science.
### Combined Programs

Students in Computer Engineering who maintain a credit average (65%) performance may qualify for the award of two degrees in five years of combined full-time study in which the requirements of the degrees have been merged. (The degrees referred to here are the Bachelor of Engineering/Bachelor of Science BE BSc and the Bachelor of Engineering/Bachelor of Arts BE BA). Students wishing to enrol in a combined program may do so only on the recommendation of the Head of School of Computer Science and Engineering and with the approval of the Faculty of Engineering and either the Faculty of Arts or the Board of Studies in Science and Mathematics, as appropriate. Students wishing to enrol in, transfer into, or continue in a combined program shall have complied with all the requirements for prerequisite study, sequencing and academic attainment average (a creditable performance, is 65%) of both the Course Authorities concerned.

Students who commence a program but subsequently do not wish to proceed with both areas of study, or who fail to maintain a credit average performance, revert to a single degree program with appropriate credit for courses completed.

Students may transfer into a combined program after partially completing the requirements for either degree provided suitable courses have been studied. However, the choice of courses and the time taken to complete the program can be seriously affected by this. Thus, students considering program 3726 should contact the School of Computer Science and Engineering before completing the Year 2 enrolment. Students may opt to join the BE BA program (3722) in year 1, whereas transfer to 3726 normally occurs after year 2.

Students wishing to gain a degree at honours level in Arts or Science as part of their combined degree program shall meet all the relevant requirements of the Faculty concerned and of the appropriate Schools. Such students may enrol for the Honours year only on the recommendation of the Head of School of Computer Science and Engineering and with the approval of the Faculty of Engineering and either the Faculty of Arts and Social Sciences or the Board of Studies in Science and Mathematics, as appropriate.

Re-enrolment of students in Programs 3722, 3726 and 3728 each year, is arranged by the School of Computer Science and Engineering.

### 3728

**Computer Engineering/Biomedical Engineering – Full-time Course**

**Bachelor of Engineering Master of Biomedical Engineering BE MBiomedE**

The BE(Computing)/Master of Biomedical Engineering concurrent degree program is offered jointly through the School of Computer Science and Engineering and the Graduate School of Biomedical Engineering.

For more detailed information about the program, please see the entry in the Biomedical Engineering section of this handbook.

### 3722

**BE BA in Computer Engineering**

With this combined degree program students can add their choice of arts program to the standard, professionally accredited engineering program offered by the School of Computer Science & Engineering. The full range of Arts program is available.

### Eligibility

Anyone who meets the entry requirements for both Engineering and Arts is eligible for the combined program. Students may enter directly in first year or may apply to transfer from the normal engineering program later, although with late transfer it might not be possible to complete the program in minimum time.

### Organisation

The BE BA program is administered by the School of Computer Science & Engineering.

Students should work out for themselves the arts program they would like to add to their chosen engineering program. The Arts & Social Sciences Faculty Handbook describes the options, and the School of Computer Science & Engineering School Office can supply sample programs showing what previous students have arranged.

There are no special rules on what to include in each year. Students should schedule the arts and engineering components to suit their preferences while meeting the constraints of timetables and prerequisites. The sample programs can help here too.

The Arts component must be approved by the Faculty of Arts and Social Sciences.

The final program and schedule must be approved by the School of Computer Science & Engineering.

### Rules

1. In addition to the BE program, students must complete a major sequence offered within the BA program and meet the additional requirements listed below:

   i) If your major is chosen from the Faculty of Arts and Social Sciences then a minimum of 60 units of credit from the Schools of the Faculty of Arts and Social Sciences, including a major sequence in an approved area is required.

   ii) If your major is chosen from other Faculties, you are required to do a major sequence plus at least 12 units of credit from the Schools of the Faculty of Arts and Social Sciences.

Mathematics or Computer Science majors are not usually permitted. BE BSc combined degrees are more appropriate for this.

2. Students in the BE/BA program are exempt from all General Education requirements. However, if at any time a student reverts to the single degree program, the usual General Education requirements for that program apply.
3. There will be a testamur for each part of the combined degree program.

4. Students who complete the BE program first may proceed to graduation with the degree of Bachelor of Engineering in the usual way.

Honours

In the faculty of Engineering, Honours are awarded for superior performance in the standard program. In the Faculty of Arts the award of honours requires a separate program involving at least one further year of study, as detailed in the Faculty of Arts & Social Sciences Handbook.

3726
BE BSc in Computer Engineering

With this combined degree program students can add a Science program to the standard, professionally accredited engineering program offered by the School of Computer Science and Engineering. All Science majors within program 3970 are available (see Science Handbook for details of these).

Eligibility

Students who achieve a creditable performance in the first two years of their Computer Engineering program may apply to transfer to the combined Bachelor of Engineering/Bachelor of Science BE BSc program.

Organisation

The BE BA program is administered by the School of Computer Science & Engineering.

Students should choose for themselves the science major they would like to add to their chosen engineering program. The Science Faculty Handbook describes the options, and the School of Computer Science and Engineering School Office can supply sample programs showing what previous students have arranged.

There are no special rules on what to include in each year. Students should schedule the science and engineering components to suit their preferences while meeting the constraints of timetables and pre-requisites. The sample programs can help here too.

The Science component must be approved by the Science office. The final program and schedule must be approved by the School of Computer Science & Engineering.

Rules

1. In addition to the BE program, students must complete a major offered within the BSc program and meet the additional requirements listed below:

   60 units of credit from science courses, including a major in an approved area.

2. Students in the BE BSc course are exempt from all General Education requirements. However, if at any time a student reverts to a single degree program, the usual General Education requirements for that program apply.

3. There will be a testamur for each part of the combined degree program.

4. Students who complete the BE program first may proceed to graduation with the degree of Bachelor of Engineering in the usual way.

Honours

In the faculty of Engineering, Honours are awarded for superior performance in the standard program. In the Faculty of Science the award of honours requires a separate program involving at least one further year of study, as detailed in the Faculty of Science Handbook.
Postgraduate Study

The formal graduate programs offered in CSE are Master of Computer Science 8680, Master of Information Science 8508, Master of Engineering Science in Computer Science and Engineering 8685, Graduate Diploma in Information Science 5453, Graduate Diploma in Computer Science 5452.

Opportunities are provided for graduate research leading to the award of the degree of Master of Engineering 2665, Master of Engineering 8685, Graduate Diploma in Information Science 5453, Master of Engineering Science in Computer Science and Engineering.

Postgraduate Study

The formal graduate programs offered in CSE are Master of Computer Science 8680, Master of Information Science 8508, Master of Engineering Science in Computer Science and Engineering 8685, Graduate Diploma in Information Science 5453, Graduate Diploma in Computer Science 5452.

 Opportunities are provided for graduate research leading to the award of the degree of Master of Engineering 2665, Master of Science 2765, and Doctor of Philosophy 1650.

Course Work Programs

The postgraduate degrees offered by the School allow for flexibility of choice between formal course work and research and are available on a full or part-time basis which will be attractive to people working in industry. Most compulsory courses are available in an evening (6pm–9pm) or late afternoon (4pm–7pm) pattern.

The range of choice in courses is wide, allowing individual specialisation and breadth of aspirations to be satisfied. There is opportunity to choose courses from other disciplines, offered by this and other universities, providing they are of suitable graduate standard.

Graduate Programs in Information Science

The Information Science program has been designed to be taken by students from areas such as computer science, information systems, communications engineering, librarianship and ergonomics. A deep knowledge of computing theory is not required, but it is important to have considerable computing experience and to be aware of the features of the data processing environment. Familiarity with the way in which decision making and specification of user needs occur in the 'real world' is assumed. This is necessary to allow the student to appreciate how the elements of Information Science fit together.

The Information Science Program offers three major streams for graduate diploma or masters students:

-POS 1000 (General)
-POS 2000 (Database Systems)
-POS 3000 (Internetworking)

8508
Master of Information Science

MINFS

MINFS Students complete a program totalling 72 units of credit (UC), typically 12 courses. This may be done by enrolling in one of the three major streams.

The typical duration for the MINFS is 3 sessions full time or 6 sessions part time. This is based on an enrolment in the max full time load, i.e. 4 courses per session.

Students who are not eligible for entry to the Master of Information science, or who wish to take a shorter postgraduate qualification, may apply for the Graduate Diploma in Information Science.

8508/1000 (General)
Master of Information Science

MINFS

The following core courses must be completed by all who are undertaking this program:

- COMP9021 Principles of Programming
- COMP9311 Database Systems
- COMP9024 Data Structures and Algorithms
- COMP9511 Human Computer Interaction

One Subject from each of the following groups:

- COMP9314 Next Generation Databases
- COMP9315 Database System Implementation
- COMP9414 Artificial Intelligence
- COMP9416 Knowledge Based Systems
- INFS5927 Knowledge Based Information Systems
- INFS5991 Decision Support Systems
- GEOG9012 Remote Sensing Applications
- GMAT9604 Land Information Systems
- IMGT5110 Information Retrieval Systems
- COMP9331 Computer Networks and Applications
- INFS5982 Advanced Data Communications

The remaining 24 units of credit (4 courses) may be taken as electives, or as one elective plus a project worth 18 units of credit.

Admission to this project option is by permission of the program authority, given only to students who are able to (a) find a supervisor for the proposed project, and (b) obtain a Distinction average over the courses that they have taken at UNSW while enrolled in this program.

Enrolment in the project worth 18 units of credit will be in the final session of the MINFS program.

Electives may be chosen from the CSE Postgraduate timetable or, with the approval of the program and course authority, a course chosen from another school within the university.

8508/2000 (Database Systems)
Master of Information Science

This program provides specialised education in all aspects of data management, including database design, database programming, and database administration. The following core courses must be completed by all who are undertaking this program:

Core Requirement: (five courses)

- COMP9021 Principles of Programming
- COMP9511 Human Computer Interaction
- COMP9311 Database Systems
- COMP9314 Next Generation Databases
- INFS5926 Advanced Data Management

Compulsory Electives: (two courses)

- INFS5992 Data Management
- INFS5983 Business Data Communication
- COMP9024 Data Structures and Algorithms
- COMP9315 Database System Implementation

Network Requirement: (one course)

- COMP9331 Computer Networks and Applications
- INFS5982 Advanced Data Communications

Intelligent systems Requirement: (one course)

- COMP9414 Artificial Intelligence
- COMP9416 Knowledge Based Systems
- INFS5927 Knowledge Based Information Systems
- COMP9417 Machine Learning
The remaining 18 units of credit (3 courses) may be taken as electives, or as a project worth 18 units of credit. Admission to this program option is by permission of the program authority, given only to students who are able to (a) find a supervisor for the proposed project, and (b) obtain a Distinction average over the courses that they have taken at UNSW while enrolled in this program.

Enrolment in the project worth 18 units of credit will be in the final session of the MinSc program.

Electives may be chosen from the CSE Postgraduate timetable or, with the approval of the program and course authority, a course chosen from another school within the university.

Courses from the following list are suggested electives:

- COMP9417 Machine Learning
- COMP9415 Computer Graphics
- COMP9517 Image Processing and Applications
- IMGT5110 Information Retrieval Systems
- GEOG9012 Remote Sensing Applications
- INFS5982 Advanced Data Communications
- INFS5925 Object-Oriented Information Systems
- INFS5953 Information Systems Management
- INFS5957 Information and Decision Technology
- INFS5991 Decision Support Systems
- INFS5988 Business Information Systems
- GMAT9604 Land Information Systems

5453/3000 (Internetworking)

Master of Information Science

This program provides specialised education in all aspects of computer network programming and administration. It is aimed at graduates with a four year technical degree in science, mathematics or engineering. The following list of core courses must be completed by all who are undertaking this program:

- Core Requirement: (four courses)
  - COMP9021 Principles of Programming
  - COMP9022 Digital Systems Structures
  - INFS5983 Business Data Communications
  - COMP9024 Data Structures and Algorithms
  - COMP9331 Computer Networks and Applications
  - COMP9332 Network Routing and Switching
  - INFS5982 Advanced Data Communications
  - INFS5953 Advanced Computer Networks
  - INFS5911 Database Systems
  - SENG9338 Network Project

The remaining 12 units of credit may be taken as an elective course, normally from the following list:

- COMP9201 Operating Systems
- INFS5984 Information Systems Security
- ELEC9337 Data Networks 2
- COMP9314 Next Generation Database Systems
- INFS5928 Advanced Data Management
- INFS5985 Managing Electronic Commerce

Electives may be chosen from the CSE Postgraduate timetable or, with the approval of the program and course authority, a course chosen from another school within the university.

5453/1000 (General)

Graduate Diploma in Information Science

The following core courses must be completed by all who are undertaking this program:

- COMP9021 Principles of Programming
- COMP9311 Database Systems
- COMP9024 Data Structures and Algorithms
- COMP9511 Human Computer Interaction
- COMP9331 Computer Networks and Applications

One course from each of the following groups:

- COMP9314 Next Generation Databases
- COMP9315 Database System Implementation
- COMP9414 Artificial Intelligence
- COMP9416 Knowledge Based Systems
- INFS5927 Knowledge Based Information Systems
- INFS5991 Decision Support Systems
- GEOG9012 Remote Sensing Applications
- GMAT9604 Land Information Systems
- IMGT5110 Information Retrieval Systems

5453/2000 (Database Systems)

Graduate Diploma in Information Science

This program provides specialised education in all aspects of data management, including database design, database programming, and database administration. Advanced courses in Internetworking and Artificial Intelligence give breadth to the program. The following core courses must be completed by all who are undertaking this program:

- Core Requirement: (four courses)
  - COMP9021 Principles of Programming
  - COMP9511 Human Computer Interaction
  - COMP9311 Database Systems
  - COMP9314 Next Generation Databases

- Secondary Core: (two courses)
  - INFS5992 Data Management
  - INFS5983 Business Data Communications
  - COMP9304 Data Structures and Algorithms
  - COMP9315 Database System Implementation

- Network Requirement: (one course)
  - COMP9331 Computer Networks and Applications
  - INFS5982 Advanced Data Communications

- Intelligent systems Requirement: (one course)
  - COMP9414 Artificial Intelligence
  - COMP9416 Knowledge Based Systems
  - INFS5927 Knowledge Based Information Systems
  - COMP9417 Machine Learning

5453/3000 (Internetworking)

Graduate Diploma in Information Science

This program provides specialised education in all aspects of computer network programming and administration. It is aimed at graduates with a technical degree in science, mathematics or engineering. The following list of core courses must be completed by all who are undertaking this program:

- COMP9021 Principles of Programming
- COMP9022 Digital Systems Structures
- INFS5983 Business Data Communications
- COMP9024 Data Structures and Algorithms
- COMP9331 Computer Networks and Applications
- COMP9332 Network Routing and Switching
- INFS5982 Advanced Data Communications

The remaining 6 units maybe taken as an elective course.
Graduate Programs in Computer Science

The Master of Computer Science course is a re-training postgraduate program aimed towards graduates who have a four year degree in science or engineering who wish to become computing professionals. This two year full-time program addresses all aspects of modern computing systems, including its hardware, its software and its applications.

The Master of Engineering Science program is aimed at providing specialised postgraduate education in Computer Science and Engineering to practitioners and professionals who already have a four year undergraduate degree in computing. The flexibility in the program allows students to choose from specialising in a number of areas, including software engineering, computer systems engineering, database systems, knowledge-based systems, and visual information processing. The courses offered will be continually evaluated for their relevance and currency.

Students who are not eligible for entry to the Master of Computer Science, or who wish to take a shorter postgraduate qualification, may apply for the Graduate Diploma in Computer Science.

The typical duration of these programs are: MEngSc, two sessions full-time; four sessions part-time.

MCompSc, four sessions full-time; eight sessions part-time.
GradDipCS, three sessions full-time; six sessions part-time.

This is based on an enrolment in the maximum full time load, i.e. 4 courses per session.

8680 Master of Computer Science
MCompSc

MCompSc students complete a program totalling 96 units of credit (UC). The program can be completed in two modes:

Course work Option
16 x 6 UC
or
Project Option
12 x 6 UC, and a project taken during the final session worth 24 UC

The project option is only available to students who (a) have achieved a distinction average (75%) in the first 24 UC of courses attempted (excl Group A); and (b) have obtained approval for their proposed topic from the potential supervisor and the School’s Postgraduate Co-ordinator.

Postgraduate courses in the School of Computer Science and Engineering are divided into four groups. Each course is worth 6 units.

The units of credit which must be taken from each group is given below:

Mode: Course work
Group A 24 UC
Group B 36 UC
Group C 12 UC
Group C & D 24 UC
Other 24 UC PROJECT

Under both options, a student may be allowed to take up to two postgraduate courses from other schools with prior approval from the Postgraduate Co-ordinator. Approved courses are counted as Group D substitutions.

5452 Graduate Diploma in Computer Science

GradDip

GradDipCS students are required to complete a program totalling 72 units of credit (UC). The program can be completed by taking 12 x 6 UC.

Postgraduate courses in the School of Computer Science and Engineering are divided into four groups. Each course is worth 6 units.

The units of credit which must be taken from each group is given below:

Mode: Course work only
Group A 24 UC
Group B 36 UC
Group C & D 12 UC
Other 24 UC PROJECT

A student may be allowed to take one postgraduate course from another school with prior approval from the Postgraduate Co-ordinator. Approved courses are counted as Group D substitutions.
Core Courses

Group A
Group A consists of bridging material in computing taught at an accelerated pace for MCompSc and GradDip in CS students. Computer Science students who are able to demonstrate that they have thoroughly covered equivalent material in their previous studies may request Advanced Standing in some or all of these courses. These courses are not available in the MEngSc for credit.

- COMP9020 Foundations of Computer Science
- COMP9021 Principles of Programming
- COMP9022 Digital System Structures
- COMP9024 Data Structures and Algorithms

Group B
Group B courses constitute the knowledge in computing that every postgraduate student in computing should possess. Knowledge of many of these courses is essential before admission to the MEngSc course can be given.

- COMP9008 Software Engineering
- COMP9101 Design & Analysis of Algorithms
- COMP9201 Operating Systems
- COMP9221 Microprocessor's and Embedded Systems
- COMP9311 Database Systems
- COMP9414 Artificial Intelligence

Group C
Group C courses constitute the secondary core courses that emphasise important aspects of computing, but due to time constraints it is not feasible to expect students to take all of them.

- COMP9102 Compiling Techniques and Programming Languages
- COMP9331 Computer Networks & Applications
- COMP9415 Computer Graphics
- COMP9511 Human-Computer Interaction

Group D
The courses of interest to the MEngSc course are mainly from Group D. These are advanced electives that can be used to gain specialisation in one of several areas of computing.

- COMP4001 Object-Oriented Software Development
- COMP4141 Theory of Computation
- COMP9116 Software System Development
- COMP9211 Computer Architecture
- COMP9231 Integrated Digital Systems
- COMP9242 Advanced Operating Systems (12 UC)
- COMP9243 Distributed Systems
- COMP9314 Next Generation Database Systems
- COMP9315 Database System Implementation
- COMP9332 Advanced Computer Networks
- COMP9333 Network Switching and Routers
- COMP9416 Knowledge-Based Systems
- COMP9417 Machine Learning
- COMP9517 Image Processing & Applications
- COMP9518 Pattern Recognition
- COMP9519 Multimedia Authoring and Co-operative Agents

Note: See timetable for availability of courses.
Course Descriptions

Descriptions of all courses are presented in alphanumeric order within organisational units. For academic advice regarding a particular course consult with the contact for the course as listed. A guide to abbreviations and prefixes is included in the chapter Handbook Guide, appearing earlier in this book.

COMP1001
Introduction to Computing

Staff Contact: Dr T Papagelis
UOC6 HPW5 WKS14 S1 or S2

Introductory concepts and basic skills training for competence with personal computers. Foundational concepts of hardware and software. History of concepts, leading to modern practice in data processing, sound, graphics, animation, interfaces, the use of applications, programming languages and networks including the Internet. Practical training in MS Office applications and other software tools for the IBM PC, for graphical manipulation, Web page design, word processing, database, spreadsheet and elementary Visual Basic programming. Introduction to social and ethical issues of computer crime. The discriminating use of such technologies for a better world.

COMP1011
Computing 1A

Staff Contact: Mr R Buckland
UOC6 HPW6 WKS14 S1, S2
Prerequisite/s: HSC Math: 2 unit (90-100), or 2 & 3 unit (100-150), or 3 & 4 unit (100-200) or COMP1001
Corequisite/s: MATH1131 or MATH1141

Note/s: Excluded COMP1811 (science equivalent)

Defining problems. Reasoning about and solving problems using Logic, Abstraction, Specification, Algorithms and Data Structures. Exposure to a functional programming language (Haskell) for practical experience with these concepts. Introduction to software engineering and professional ethics Lab: programming assignments.

COMP1021
Computing 1B

Staff Contact: Dr A Taylor
UOC6 HPW6 WKS14 S1, S2
Prerequisite/s: COMP1011

Note/s: Excluded COMP1821 (science equivalent)


COMP1091
Computing 1C

Staff Contact: Dr K Engelhardt
UOC6 HPW6 WKS14 S1
Prerequisite/s: HSC Mathematics

Note/s: Excluded COMP1011

Introduction to computers as workplace tools: operating systems, spreadsheets, databases, web searching and authoring, professional ethics in using computers. Introduction to problem solving via computers; defining problems, reasoning about problems, designing and testing solutions. Introduction to programming (in the C language): data, control, functions, libraries, fundamental algorithms. Practical work: laboratories and programming assignments.

COMP2011
Data Organisation

Staff Contact: Dr A Mahidadia
UOC6 HPW5 WKS14 S1, S2
Prerequisite/s: COMP1021 or COMP1821

Data types and data structures: abstractions and representations; dictionaries, priority queues and graphs; AVL trees, splay trees, B-trees, heaps. File Structures: storage device characteristics, keys, indexes, hashing. Memory management. Lab: programming assignments including group project.

COMP2021
Digital System Structures

Staff Contact: Dr Jayasooriah
UOC6 HPW5 WKS14 S1 S2
Prerequisite/s: COMP1021 or COMP1821

Note/s: Excluded ELEC2012

Digital Systems: switches and gates, boolean algebra, minimisation techniques, combinational and sequential design, timing analysis, finite state machines; analysis, design and realisation of modest digital subsystems, understanding major subsystems in a model computer. Assembly language programming: translation of higher level programming abstractions and data structures to a real computer using an assembler as a target; study of the relationships between the programming model and the hardware model of a computer; understanding of instruction execution. Lab: take-home logic kits; programming assignments.

COMP2110
Software System Specification

Staff Contact: A/Prof K Robinson
UOC6 HPW2.5 WKS14 S2
Prerequisite/s: COMP1021
Corequisite/s: INFS2603

Formal specification: set theory, logic, schema calculus, case studies: the Z specification notation. The relationship between informal specification methods such as data flow, and Object-Oriented methods, such as OMT, and formal methods like Z. This course will attempt to develop the case for rigorous specification methods. Project work for this course will be done within SENG2010.

COMP2411
Logic and Logic Programming

Staff Contact: A/Prof R Van der Meyden
UOC6 HPW5 WKS14 S1

Introduction to logic for computer scientists: an elementary exposition of propositional logic and predicate logic from a computational point of view, including introduction to interpretations, models, proof procedures, soundness, and completeness. Automated deduction: clausal form logic and Horn clause logic, skolemisation, the Herbrand domain, unification, resolution and resolution strategies. Logic Programming: data representation, operational views of unification and backtracking, the notion of logical variable, reversibility, non-logical features, meta-programming, introduction to constraint logic programming and other paradigms. Lab: programming assignments in Prolog. Extensive practical work.

COMP3111
Software Engineering

Staff Contact: A/Prof A Nymeyer
UOC6 HPW5 WKS14 S1, S2
Prerequisite/s: COMP2011

Note/s: Excluded COMP9008

Informal specification: Data flow diagram methodology, analysis, design, testing, management and documentation of software. Formal specification: set theory, logic, schema calculus, case studies. The Z specification notation. Managing the project life cycle. CASE tools. A major group project is undertaken.
COMP3120
Introduction to Algorithms
Staff Contact: Mr R Buckland
UOC6 HPW2.5 WKS14 S2
Prerequisite/s: COMP2011
Note/s: Excluded COMP3121, COMP9101

COMP3121
Algorithms and Programming Techniques
Staff Contact: Mr R Buckland
UOC6 HPW5 WKS14 S2
Prerequisite/s: COMP2011
Note/s: Excluded COMP9101, COMP3120

COMP3131
Parsing and Translation
Staff Contact: Dr J Xue
UOC6 HPW5 WKS14 S2
Prerequisite/s: COMP2011
Note/s: Excluded COMP9102

COMP3141
Software System Design and Implementation
Staff Contact: A/Prof K Robinson
UOC6 HPW5 WKS14 S1
Prerequisite/s: COMP2110 or COMP3111
This course will present rigorous and formal methods for the design and implementation phases of software system development. Also considered are testing and reuse of designs. As far as possible, software tools that can assist the process will be used. The material will be presented using case studies, and students will be required to undertake a project.

COMP3211
Computer Architecture
Staff Contact: A/Prof H Elgindy
UOC6 HPW5 WKS14 S2
Prerequisite/s: COMP2021 or ELEC2012
Note/s: Excluded COMP9211
- Combinatorial and sequential circuit design; synchronisation, communication and arbitration; register transfer specification (Modal). Arithmetic Design Strategies. Memory Organisation: physical and virtual address space; operating system and compiler support; memory mapping and caching. Communications Organisation: shared memory, memory mapping; network systems. Processor Design: the instruction pipeline; hardwired and micro-programmed control; instruction sets; RISC and object-based processor organisation. Error Detection/Correction and Fault Tolerance; coding theory. Lab: major design project.

COMP3221
Microprocessors and Embedded Systems
Staff Contact: Dr WS Matheson
UOC6 HPW5 WKS14 S2
Prerequisite/s: COMP2021
Note/s: Excluded ELEC2041, ELEC3020, COMP9221
The concept of a microprocessor system, busses, address spaces, memory devices, bus timing, bus standards, the VME bus, I/O device interfacing, polling, interrupts, DMA interfaces, the 68000 processor family, the C programming language, device drivers, the device driver software environment, other microprocessors, advanced topics. Laboratory work involves interfacing to and programming MC68000-series microprocessor-based systems. Lab: experimental work involving hardware and software.

COMP3231
Operating Systems
Staff Contact: A/Prof G Heiser
UOC6 HPW5 WKS14 S1 S2
Prerequisite/s: COMP2011, COMP3201
Note/s: Excluded COMP9201

COMP3311
Database Systems
Staff Contact: Dr J Shepherd
UOC6 HPW5 WKS14 S2
Prerequisite/s: COMP2011
Note/s: Excluded COMP3911, INFS3608

COMP3331
Computer Networks and Applications
Staff Contact: Dr S Jha
UOC6 HPW5 WKS14 S2
Prerequisite/s: COMP2011
Note/s: Excluded COMP3931, ELEC4352
Networking technology and protocol overview. Local Area Networks: architectures; media; generalised Medium Access Control methods. IEEE802 LAN standards. Data link layer: design principles and protocols such as stop and wait, sliding windows, and Automatic Repeat Request schemes. Network Layer: design principles; addressing; message routing; congestion and traffic control. Internetworking: issues; bridges and routers. The Internet Protocol (IP) and the Internet. Internet Routing via exterior and interior router level protocols such as EGP, RIP, OSPF and HELO. Internet Transport Control Protocol (TCP), RPC and Session control. Network management using SNMP. The Domain Name System (DNS). Mail systems. File transfer protocols. Encryption and Security. A view to the future of networking.

COMP3411
Artificial Intelligence
Staff Contact: Dr A Hofmann
UOC6 HPW5 WKS14 S1
Prerequisite/s: COMP2021
Note/s: Excluded COMP4914
COMP3421
Computer Graphics

Staff Contact: Dr T Lambert

UOC6 HPW5 WKS14 S1

Prerequisite/s: COMP2011

Note/s: Excluded COMP9415, COMP9701


COMP3511
Human-Computer Interaction

Staff Contact: Dr G Mann

UOC6 HPW5 WKS14 S2

Prerequisite/s: COMP2011

Note/s: Excluded COMP9511

Provides an introduction to user-system interactions, both analysis and design. The approach is cognitive, focusing on matching user goals with computer technologies. Topics: the human information processing system, models of interaction, strategies for and process of design and evaluation. Project work is emphasised.

COMP3710
Software Project Management

Staff Contact: A/Prof A Sharma

UOC3 HPW2.5 WKS14 S2

Prerequisite/s: MATH2859, COMP2011

This course introduces various aspects of software project management. Special emphasis is given to planning, size measurement, size estimation, resource estimation, schedule estimation, and earned value tracking. Concepts of size estimation are introduced via a series of five programming assignments from Watts Humphrey's Personal Software Process.

COMP3720
Total Quality Management

Staff Contact: A/Prof A Sharma

UOC3 HPW3 WKS14 S1

Prerequisite/s: COMP3710, MATH2859

Note/s: Excluded COMP0001

This course introduces elements of statistical methods underlying quality management in the context of software development. Special emphasis is placed on economics of software development, development of a quality strategy, yield management, defect removal strategies and defect prevention strategies. Techniques for review, code review and inspections are also covered in detail. These ideas are introduced via a series of five programming assignments from Watts Humphrey's Personal Software Process.

COMP4001
Object-Oriented Software/Development

Staff Contact: Dr I Gorton

UOC6 HPW4 WKS14 S1

Assumed Knowledge: Competency in C

Note/s: Quota applies

This course will cover object-oriented design and implementation methods for complex software systems. Topics covered include: object-oriented program design techniques, object-oriented programming in C++, software reuse and designing for reuse, design patterns and styles, object persistence and distribution. Examples from a wide range of application areas will be used at all stages to illustrate concepts and techniques. Assessment will involve two short assignments and one substantial programming project to be carried out in small groups.

COMP4011/COMP4012
Occasional Elective S1 or S2 (Computer Engineering)

Staff Contact: School Office

Prerequisite/s: 24UOC COMP3###

A program of advanced course work offered by a new or visiting Staff member in an area of computer science/engineering. Syllabus details will be available from the school office before the start of session.

COMP4411
Experimental Robotics

Staff Contact: Dr A Sowmya,

UOC6 HPW5 WKS14 S1

Prerequisite/s: COMP3411 and 6UOC COMP3###.

Note/s: Excluded COMP4412 (1996)

First order logic, soundness and completeness, compactness, and non-monotonic reasoning.

COMP4910
Thesis Part A

Staff Contact: School Office

UOC3 HPW3 WKS S1 or S2

Note/s: See COMP4911 description

COMP4911
Thesis Part B

Staff Contact: School Office

UOC15 HPW15 WKS S1 or S2

Thesis part A and B are done in the last two sessions of the BE degree program. For full-time students, a nominal three hours per week in the first session and fifteen hours per week in the second session are devoted to directed laboratory and research work on an approved course under guidance of members of the academic staff. Usually, the Thesis involves the design and construction of experimental apparatus and/or software, together with appropriate testing and evaluation. For Part A, students are required to present a satisfactory seminar. For Part B, a written thesis must be submitted by the Tuesday of the final week of the session.

COMP4920
Professional Issues and Ethics

Staff Contact: School Office

UOC3 HPW2.5 WKS14 S2

Note/s: Excluded COMP4903

This subject will develop a framework on which professional and ethical issues can be developed. Topics covered will include team and meeting skills, communication skills, interpersonal skills, software quality and process, in addition to ethics. The subject will be delivered using lectures, class discussions, written assignments, reading lists, the Internet, presentations, and invited speakers.

COMP9008
Software Engineering

Staff Contact: Dr P Ho

UOC6 HPW4 WKS14 S1

Assumed Knowledge: COMP9024

Note/s: Excluded COMP3111

Informal specification: Data flow diagram methodology, analysis, design, testing, management and documentation of software. Formal specification: set theory, logic, schema calculus, case studies. The Z specification notation.

Managing the project lifecycle. CASE tools. A major group project is undertaken.
COMP9020
Foundations of Computer Science
Staff Contact: A/Prof A Ramer
UOC6 HPW3 WKS14 S1, S2

COMP9021
Principles of Programming
Staff Contact: Prof P Compton
UOC6 HPW3 WKS14 S1, S2
Note/s: Excluded COMP1811, COMP1021
This is a first programming subject. It provides an introduction to procedural programming in an object-oriented language (Java). Algorithmic processes: state, sequence, selection, iteration/recursion. Data modelling: atomic types, arrays, objects, inheritance. Introduction to fundamental data structures and algorithm s. A brief introduction to Unix is also included. Lab: programming exercises and assignments.

COMP9022
Digital System Structures
Staff Contact: Dr J Xue
UOC6 HPW3 WKS14 S1
Note/s: Excluded COMP2021

COMP9024
Data Structures & Algorithms
Staff Contact: Dr N Paramesh
UOC6 HPW3 WKS14 S2
Prerequisite/s: COMP9021
Data types and data structures: abstractions and representations; dictionaries, priority queues and graphs; AVL trees, B-trees, heaps. File structures: storage device characteristics, keys, indexes, hashing. Memory Management. Introduction to the study of algorithms. Lab: programming assignments.

COMP9101
Design and Analysis of Algorithms
Staff Contact: Mr R Buckland
UOC6 HPW3 WKS14 S2
Prerequisite/s: COMP9024
Note/s: Excluded COMP3121, COMP3120

COMP9102
Compiling Techniques and Programming Languages
Staff Contact: Dr J Xue
UOC6 HPW3 WKS14 S2
Corequisite/s: COMP9024
Note/s: Excluded COMP3131

COMP9116
Software System Development Using the B-Method and B-Toolkit
Staff Contact: A/Prof K Robinson
UOC6 HPW3 WKS14 S2
Prerequisite/s: COMP3111 or COMP9008
The B-Method is a rigorous mathematically based method for the development of reliable software. The method covers the complete software cycle from requirements analysis through specification, design, implementation, testing, maintenance, and re-use. The B-Method is supported by the B-Toolkit: a collection of tools that provide for specification animation, proof obligation generation, theorem proving, configuration management, code generation, and documentation. The B-method uses similar mathematical notation to Z, but does not use Z. Specifications are given in AMN (Abstract Machine Notation), which is a small abstract programming language. The B-Method is object based in the sense that systems of machines use a number of different forms of inheritance to control visibility and inherit operations. There is no dependence on a particular programming language, but the current code generator generates C. This subject will explore the use of the B-Method and the B-Toolkit. The topics covered will include: The Abstract Machine Notation; Machine Composition; refinement; Implementation; The method of presentation will use case studies to present the method; laboratory exercises to use the Tools; a major project to apply all aspects of the method, and use of the tools.

COMP9201
Operating Systems
Staff Contact: A/Prof G Heiser
UOC6 HPW3 WKS14 S2
Prerequisite/s: COMP9024, COMP9022
Note/s: Excluded COMP3231

COMP9211
Computer Architecture
Staff Contact: A/Prof H Elgindy
UOC6 HPW4 WKS14 S1
Prerequisite/s: COMP9022
Note/s: Excluded COMP3211

COMP9221
Microprocessors and Embedded Systems
Staff Contact: Dr D Woo
UOC6 HPW4 WKS14 S1
Prerequisite/s: COMP9022
Note/s: Excluded COMP3221, ELEC2041
Principles of microprocessor-based systems are covered, including programmers' models of general-purpose microprocessors and microcontrollers, assembly language programming, address maps, memory devices and interfacing, bus timing and standards, input/output interfacing, polling and interrupts and DMA interfaces. Examples are mostly taken from the MC68000 family, although aspects of other microprocessors are discussed. A key aspect is the
laboratory work involving an MC68HC11-based target system, where both the hardware and the software divers for additional subsystems are designed, implemented, and tested.

COMP9231
Integrated Digital Systems
Staff Contact: Prof G Rigby
UOC6 HWP4 WKS14 S2
Prerequisite/s: COMP9022 or COMP9021
Note/s: Excluded ELEC4532

Integrated circuit logic families with emphasis on MOS technologies, structured chip design, custom and semi-custom approaches, system architecture, computer aided design, layout considerations, timing estimates, circuit failures, faults, fault modelling, testing, design for testability. Lab: design project.

COMP9242
Advanced Operating Systems
Staff Contact: A/Prof G Heiser
UOC6 HWP4 WKS14 S2
Prerequisite/s: A minimum average of 65% in COMP9201 or COMP3231
Corequisite/s: COMP9211 or COMP3211
Note/s: Quota applies (50)

Covers operating systems design and implementation issues at an advanced level, focussing on specific issues such as performance and on current OS research areas. Topics selected from: Microkernels; user-level servers; performance; kernel implementation; device drivers; scheduling for real-time; effects and control of hardware caches; security and protection; persistent systems; security; dealing with large, sparse address spaces; experimental systems. A laboratory running a state-of-the-art microkernel system will be used to provide hands-on experience with low-level implementation of OS components.

COMP9243
Distributed Systems
Staff Contact: A/Prof G Heiser
UOC6 HWP3 WKS14 S1
Prerequisite/s: COMP3231 or COMP9201, COMP3331 or COMP9331

A detailed coverage of distributed systems, with a particular focus on operating systems issues: client-server paradigm, remote-procedure call as OS support for client-server; distributed shared memory, distributed memory coherency; distributed file systems; distributed process management, including load sharing and process migration; concurrency control; fault tolerance, recoverability and distributed transactions; naming; industry standards; case studies.

COMP9311
Database Systems
Staff Contact: Dr X Lin
UOC6 HWP3 WKS14 S1 S2
Corequisite/s: COMP9021

A first subject on data base management systems. Relational and ER data models; principles in database design; high level database languages such as relational algebra and SQL; procedural languages for interacting with databases; query processing; transaction management and a brief introduction to various advanced databases. This course may be offered in distance mode from 2001, depending on resources.

COMP9314
Next Generation Database Systems
Staff Contact: Dr A Ngui
UOC6 HWP3 WKS14 S1 S2
Prerequisite/s: COMP9311 or COMP3311

Detailed examination of current developments and future trends in database management systems and languages. The emphasis is on object-oriented database systems. Other topics are drawn from: deductive databases, temporal databases, multimedia databases, data warehousing, data mining, client/server systems, Web-based databases.

COMP9315
Database Systems Implementation
Staff Contact: Dr A Ngui
UOC6 HPW3 WKS14 S1
Prerequisite/s: COMP9311 or COMP3311

Detailed examination of techniques used in the implementation of relational, object-oriented and distributed database systems. Topics drawn from: query optimisation, transaction management, advanced file access methods, database performance tuning.

COMP9331
Computer Networks and Applications
Staff Contact: Dr S Jha
UOC6 HPW3 WKS14 S2
Prerequisite/s: COMP9021
Note/s: Excluded COMP3331

Networking technology overview. Protocol design and validation using the SDL language in conjunction with time-lines. Overview of the IEEE802 network data link protocol standards. Addressing at the data link and network layers. Network layer services. Static and dynamic routing. Routing policies. Congestion control mechanisms. Internetworking: issues and using intermediate systems to connect networks. The Internet Protocol Suite overview. The Internet protocols IPv4 and IPv6, exterior and interior router level protocols such as EGP and OSPF. Address name resolution using Arp and RARP. Transport layer: issues, transport protocols TCP and UDP. Application level protocols: FTP, TFTP, Domain Name System (DNS), Mail Systems and Security. Introduction to Remote Procedure Call (RPC) and network management using SNMP and Asn.1. There is a substantial network programming component in the assessable material.

COMP9332
Network Routing and Switching
Staff Contact: Dr S Jha
UOC6 HPW3 WKS14 S2
Prerequisite/s: COMP9021 and COMP9022

This course will take an engineering approach to designing and building networks, emphasizing not only how but also why. It will examine in detail the fundamental concepts of routing and switching data in communication networks and will be applied to state of the art systems and protocols such as integrated services networks, ATM, and the current and future Internet protocols. Topics include resource allocation, routing, traffic modeling, congestion control, service disciplines, and multicasting.

COMP9333
Advanced Computer Networks
Staff Contact: Dr P Nanda
UOC6 HPW3 WKS14 S1
Prerequisite/s: COMP9331 or COMP3331
Note/s: Quota applies (50)


COMP9414
Artificial Intelligence
Staff Contact: Dr W Wilson
UOC6 HWP4 WKS14 S1
Corequisite/s: COMP9021
Note/s: Excluded COMP3411

Overview of Artificial Intelligence. Topics include: the representation of knowledge, search techniques, problem solving, machine learning, expert systems, natural language understanding, computer vision and an Artificial Intelligence programing language (Prolog or LISP). Students may be required to submit simple Artificial Intelligence programs, or essays on an aspect of A.I, for assessment, in areas such as robotics, computer vision, natural language processing, and machine learning.
COMP9415
Computer Graphics
Staff Contact: Dr T Lambert
UOC6 HPW3 WKS14 S1
Corequisite/s: COMP9024
Note/s: Excluded COMP3421, COMP9701


COMP9416
Knowledge-Based Systems
Staff Contact: Prof C Sammut
UOC6 HPW3 WKS14 S2
Assumed knowledge: COMP9414 or COMP3411
This subject introduces students to the basic concepts in knowledge-based systems and provides practical experience through project work. The topics covered include: knowledge representation and problem solving; knowledge acquisition and machine learning; knowledge level modelling, expert systems lifecycles and expert system shells. A major component of this subject is a project in which students work in 3 teams to build expert systems that act as agents in a competitive simulation game.

COMP9417
Machine Learning
Staff Contact: Dr A Hoffman
UOC6 HPW3 WKS14 S2
Prerequisite/s: COMP9414 or COMP3411
Note/s: Excluded COMP4416. (1996)
Decision tree learning algorithms (such as C4.5), covering algorithms (such as AQ), instance based learning, case-based learning, nearest neighbour classifiers, genetic algorithms, inductive logic programming theoretical analysis of learning algorithms.

COMP9511
Human-Computer Interaction
Staff Contact: Dr G Mann
UOC6 HPW3 WKS14 S2
Note/s: Excluded COMP3511
Provides an introduction to user-system interactions, both analysis and design. The approach is cognitive, focusing on matching user goals with computer technologies. Topics: the human information processing system, models of interaction, strategies for and process of design, and evaluation. Project work is emphasised.

COMP9517
Image Processing and Applications
Staff Contact: Dr J Jin
UOC6 HPW3 WKS14 S1
Prerequisite/s: COMP9024 or 12UOC COMP3##.
Note/s: Excluded COMP4012 (1994-1997)
Fundamental principles for visual representation and image processing. Techniques in image transform, enhancement, compression and segmentation, feature extraction, pattern recognition, multimedia processing and authoring, and scientific visualisation. Applications in communications, consumer electronics, medicine, management, entertainment, defence, robotics, and geophysics.

COMP9519
Multimedia Authoring and Cooperative Agents
Staff Contact: Dr J Jin
UOC6 HPW4 WKS14 S2
Prerequisite/s: 18UOC COMP3## or COMP9021
Provides an introduction to multimedia computing and distributed multimedia systems. The subject includes multimedia and agent fundamentals; multimedia application, structures and organization; interactive multimedia software authoring basics; information management issues; and dynamic agent and distributed processing.

COMP9912
Project Report
Staff Contact: School Office
UOC24 HPW WKS S1 or S2
Note/s: MCompSc students only
Students undertake a supervised research project equivalent to 4 lecture courses worth 6 UOC each. Assessment is based on a project report produced by the student. Project reports must be spiral bound and submitted on the last day of the session to the School Office. A receipt will be issued.

COMP9945
Project Report
Staff Contact: School Office
UOC18 HPW WKS S1 or S2
Note/s: MEngSc and MInfSc students only
Students undertake a supervised research project equivalent to 3 lecture courses worth 6 UOC each. Assessment is based on a project report produced by the student. Project reports must be spiral bound and submitted on the last day of the session to the School Office. A receipt will be issued.

SENG1010
Software Engineering Workshop 1A
Staff Contact: School Office
UOC6 HPW2.5 WKS14 S1
Prerequisite/s: HSC minimum mark required: 2 unit Contemporary English (60-100), or 2 unit General English (60-100) or 2 unit English (53-100) or 3 unit English (1-50).
Corequisite/s: COMP1011, INFS1603
The Software Engineering Workshop is a series of subjects that span the first three years of the Software Engineering course. The subject series will provide an opportunity to work in small teams on substantial, realistic projects, covering most phases of the software production life cycle. The SE Workshop stream also provides an opportunity to apply the techniques and methods covered in other subjects of the course. Under guidance from staff, the intention of this series is to enable students to learn by reflective practice. Whatever steps are taken students should become aware of what they are doing, and reflect on the consequences. This is the essence of the Personal Software Process described in the textbook by Watts Humphrey. Each subject in the series will involve group project work, presentations, report writing, and documentation. This is the first subject in the series and will contain: an introduction to the software process and to a number of the software engineering practices to be adopted throughout the series; the formation of the first set of small groups; a number of exercises to develop group skills; a discussion of the project to be undertaken in SENG1020. The groups formed during this subject will not persist for the entire series of subjects. Groups will be reformed arbitrarily at various stages.

SENG1020
Software Engineering Workshop 1B
Staff Contact: School Office
UOC6 HPW2.5 WKS14 S2
Prerequisite/s: SENG1010
Corequisite/s: INFS1611, COMP1021
Note/s: See main entry SENG1010
This is the second subject in the series and during this phase each group will complete a domain analysis and a requirements analysis for the project determined in SENG1010. Each group will: examine similar systems; interview users or potential users of the system; develop a requirements document; validate the requirements by prototyping. This subject will form the practical component of INFS1611.

SENG2010
Software Engineering Workshop 2A
Staff Contact: School Office
UOC6 HPW2.5 WKS14 S1
Prerequisite/s: SENG1020
Corequisite/s: INFS2603, COMP2110
Note/s: See main entry SENG1010
This is the third subject in the series and will cover specification. During this subject the groups will take a requirements document
(not necessarily the same document developed by the current teams during SENG1020) and develop a logical specification document. The specification document must be developed using the modelling techniques discussed in INF2603 and COMP2110. As part of the specification document, the groups should identify a set of acceptance tests appropriate to the functional specification. This subject forms the practical components of COMP2110.

SENG2020
Software Engineering Workshop 2B
Staff Contact: School Office
UOC6 HPW2.5 WKS14 S2
Prerequisite/s: SENG2010
Note/s: See main entry SENG1010

In this subject, the fourth subject in the series, the groups will take a specification document, such as might have been produced in SENG2010, and will produce a design document describing how the specified system will be mapped onto physical components.

SENG3010
Software Engineering Workshop 3A
Staff Contact: School Office
UOC6 HPW2.5 WKS14 S1
Prerequisite/s: SENG2020
Note/s: See main entry SENG1010

Each group will take a design document, such as might have been produced in SENG2020, and carry out the implementation and testing of the components of the system. As for all components of this series the implementation and testing will be documented.

SENG3020
Software Engineering Workshop 3B
Staff Contact: School Office
UOC6 HPW2.5 WKS14 S2
Prerequisite/s: SENG3010
Note/s: See main entry SENG1010

In the sixth and final subject in the series, the groups will undertake the integration, testing, evaluation, and maintenance of a system, whose components have been produced in SENG2010.

SENG4910
Thesis Part A
Staff Contact: School Office
UOC6 HPW7 WKS14 SS
Note/s: See main entry for SENG4911.

This subject represents the thesis proposal component. The proposal is assessed by a seminar given at the end of session.

SENG4911
Thesis Part B
Staff Contact: School Office
UOC12 HPW14 WKS14 SS
Prerequisite/s: SENG4910

The thesis is done in the last two sessions of the BE degree course. For full-time students, seven hours per week in the first session and fourteen hours per week in the second session are devoted to directed laboratory and research work on an approved subject under guidance of members of the lecturing Staff of the Schools of Computer Science and Information Systems. Generally, the thesis involves the design, construction, and testing of a software application, but the thesis could be an exploration and evaluation of some aspects of a software development method. Each student is required to demonstrate the outcome of the thesis work, and present a written thesis at the end of the second session.

SENG4921
Professional Issues and Ethics
Staff Contact: School Office
UOC6 HPW4 WKS14 S1
Note/s: Excluded COMP4903, COMP4920

This subject will develop a framework on which professional and ethical issues can be developed. Topics covered will include team and meeting skills, communication skills, interpersonal skills, software quality and process, in addition to ethics. The subject will be delivered using lectures, class discussions, written assignments, reading lists, the Internet, presentations, and invited speakers.
The School comprises several discipline areas, indicating shared research interests and teaching commitments: Telecommunications (all aspects of theory, applied electronics and engineering relating to communication systems and networks such as computer data networks, telephones, broadcasting and television); Electric Power (generation, distribution and utilisation of electric energy using electrical machines); Electronics (electronic circuits, devices, micro-electronics and application of electronics to such areas as solar power generation); Systems and Control (development of theories for the control of complex systems and the application of these theories including computer simulation). The Australian Photonics Co-operative Research Centre conducts research into Optical Fibre communication devices and technology.

Electrical Engineering and Telecommunications has close links with the pure sciences and mathematics. Its technology is changing rapidly, and the School's teaching and research programs are constantly under review to meet the ever changing challenges of present and future needs.

The School offers undergraduate and graduate training in all branches of the profession of electrical engineering and telecommunications. A number of inter-departmental and specialised groups (such as Digital Systems, Biomedical Engineering, Measurement, Microelectronics, etc.) are also active.
Summary of Undergraduate Courses

Normal full-time

<table>
<thead>
<tr>
<th>Program and Degree(s)</th>
<th>Duration</th>
</tr>
</thead>
<tbody>
<tr>
<td>ELECA13640 BE in Electrical Engineering</td>
<td>4 years</td>
</tr>
<tr>
<td>TELEA13643 BE in Telecommunications</td>
<td>4 years</td>
</tr>
<tr>
<td>COMPA13645 BE in Computer Engineering</td>
<td>4 years</td>
</tr>
<tr>
<td>ELECB13720 BE BA in Electrical Engineering</td>
<td>5 years</td>
</tr>
<tr>
<td>TELEB13721 BE BA in Telecommunications</td>
<td>5 years</td>
</tr>
<tr>
<td>TELEB13723 BE MBiomedE in Telecommunications</td>
<td>5 years</td>
</tr>
<tr>
<td>TELEB13724 BE BSc in Telecommunications</td>
<td>5 years</td>
</tr>
<tr>
<td>ELECB13725 BE BSc in Electrical Engineering</td>
<td>5 years</td>
</tr>
<tr>
<td>ELECB13727 BE MBiomedE in Electrical Engineering</td>
<td>5 years</td>
</tr>
<tr>
<td>ELECB13640 BE MCom in Electrical Engineering</td>
<td>5 years</td>
</tr>
<tr>
<td>TELEB13643 BE MCom in Telecommunications</td>
<td>5 years</td>
</tr>
</tbody>
</table>


The undergraduate curriculums are being progressively revised to provide flexible training to suit the needs of today and tomorrow. Individual student needs can be further met by quite extensive substitution provisions within the programs.

Combined degree programs lead to the award of the Bachelor of Engineering in either Electrical Engineering or Telecommunications, combined with a Bachelor degree in Arts or Science (usually Computer Science, Mathematics or Physics). With the Graduate School of Biomedical Engineering there is also available a concurrent degree program leading to the award of Bachelor of Engineering/Master of Biomedical Engineering, while a program with the Faculty of Commerce and Economics leads to the award of Bachelor of Engineering/Masters of Commerce.

The formal graduate programs offered are: Graduate Diploma in Electrical Engineering 5458, Graduate Diploma in Telecommunications 5459, Master of Engineering Science in Electrical Engineering 8501, Master of Engineering Science in Telecommunications 8502. Opportunities are provided for graduate research leading to the award of the degrees of Master of Engineering 2660 and Doctor of Philosophy 1640.

Substitution of Courses

To suit the special abilities or needs of individual students a limited amount of substitution is permitted within each program. Any such substitution must have prior approval of the Head of School who will ensure that:

1. The replacement course is at least the same length and level as the prescribed course replaced;
2. Core courses are normally replaced with courses covering similar material; and
3. The resulting overall program of study is suited to the award of the degree as applicable.

Substitution is not permitted in Year 1.

Examples
(i) The normal Year 4 of the BE degree program includes 5 Professional Electives. Students may substitute for two of these electives, courses of suitable level and difficulty from areas relevant to the profession of Electrical Engineering.
(ii) Substitutions of graduate courses is permitted, provided that the student has passed the Year 3 Electrical Engineering and Telecommunications subjects at an adequate level.
(iii) One substitution from a relevant area taught outside the School may be permitted.
(iv) Part-time BE students in full-time employment may request substitution of Industrial Electives for up to three subjects in the BE degree course. See Industrial Elective subject descriptions for details.
Undergraduate Study

Computing Requirements

Information regarding recommended computing equipment for the courses offered by the School is available from the School Office.

Program Outlines

ELECA13640
Electrical Engineering – Full-time Program

Bachelor of Engineering in Electrical Engineering
BE (Electrical Engineering)

<table>
<thead>
<tr>
<th>HPW</th>
<th>S1</th>
<th>(UOC)</th>
<th>S2</th>
</tr>
</thead>
<tbody>
<tr>
<td>Year 1 ELEC1010</td>
<td>Introduction to Electrical Engineering</td>
<td>3 (2)</td>
<td>0</td>
</tr>
<tr>
<td>MATH1090</td>
<td>Discrete Mathematics</td>
<td>6 (6)</td>
<td>0</td>
</tr>
<tr>
<td>MATH1141</td>
<td>Higher Mathematics 1A</td>
<td>6 (6)</td>
<td>0</td>
</tr>
<tr>
<td>PHYS1969</td>
<td>Physics 1</td>
<td>6 (6)</td>
<td>0</td>
</tr>
<tr>
<td>COMP1011</td>
<td>Computing 1A</td>
<td>6 (6)</td>
<td>0</td>
</tr>
<tr>
<td>ELEC1041</td>
<td>Digital Circuits</td>
<td>6 (4)</td>
<td>0</td>
</tr>
<tr>
<td>MATH1241</td>
<td>Higher Mathematics 1B</td>
<td>6 (6)</td>
<td>0</td>
</tr>
<tr>
<td>TOTAL</td>
<td>24 (23)</td>
<td>24 (22)</td>
<td></td>
</tr>
</tbody>
</table>

Note: MATH1141 and MATH1241 may be taken at the ordinary level (MATH1131 and MATH1231).

Year 2

<table>
<thead>
<tr>
<th>HPW</th>
<th>S1</th>
<th>(UOC)</th>
<th>S2</th>
</tr>
</thead>
<tbody>
<tr>
<td>ELEC2031</td>
<td>Circuits and Systems</td>
<td>6 (6)</td>
<td>0</td>
</tr>
<tr>
<td>ELEC2041</td>
<td>Microprocessors and Interfacing</td>
<td>3 (3)</td>
<td>0</td>
</tr>
<tr>
<td>MATH2011</td>
<td>Several Variable Calculus</td>
<td>6 (4)</td>
<td>0</td>
</tr>
<tr>
<td>PHYS2939</td>
<td>Electromagnetism</td>
<td>6 (3)</td>
<td>0</td>
</tr>
<tr>
<td>ELEC2031</td>
<td>Circuits and Systems</td>
<td>6 (4)</td>
<td>0</td>
</tr>
<tr>
<td>ELEC2015</td>
<td>Electromagnetic Applications</td>
<td>6 (3)</td>
<td>0</td>
</tr>
<tr>
<td>ELEC2042</td>
<td>Real Time Instrumentation</td>
<td>6 (3)</td>
<td>0</td>
</tr>
<tr>
<td>MATH2620</td>
<td>Higher Complex Analysis</td>
<td>6 (2.5)</td>
<td>0</td>
</tr>
<tr>
<td>MATH2859</td>
<td>Probability, Statistics &amp; Information</td>
<td>6 (3)</td>
<td>0</td>
</tr>
<tr>
<td>MATH2509</td>
<td>Linear Algebra for Engineers</td>
<td>6 (3)</td>
<td>0</td>
</tr>
<tr>
<td>TOTAL</td>
<td>24 (20)</td>
<td>24 (20.5)</td>
<td></td>
</tr>
</tbody>
</table>

Note: MATH2620 may be taken at the ordinary level (MATH2520).

Year 3

<table>
<thead>
<tr>
<th>HPW</th>
<th>S1</th>
<th>(UOC)</th>
<th>S2</th>
</tr>
</thead>
<tbody>
<tr>
<td>ELEC3004</td>
<td>Signal Processing &amp; Transform Methods</td>
<td>6 (5)</td>
<td>0</td>
</tr>
<tr>
<td>ELEC3005</td>
<td>Electrical Energy 1</td>
<td>6 (5)</td>
<td>0</td>
</tr>
<tr>
<td>ELEC3006</td>
<td>Electronics A</td>
<td>6 (6)</td>
<td>0</td>
</tr>
<tr>
<td>ELEC3017</td>
<td>Electrical Engineering Design</td>
<td>6 (4)</td>
<td>0</td>
</tr>
<tr>
<td>TOTAL</td>
<td>6 (5)</td>
<td>0</td>
<td></td>
</tr>
</tbody>
</table>

3 Electives from

<table>
<thead>
<tr>
<th>HPW</th>
<th>S1</th>
<th>(UOC)</th>
<th>S2</th>
</tr>
</thead>
<tbody>
<tr>
<td>ELEC3013</td>
<td>Telecommunication Systems 1</td>
<td>6 (5)</td>
<td>0</td>
</tr>
<tr>
<td>ELEC3014</td>
<td>Systems &amp; Control 1</td>
<td>6 (5)</td>
<td>0</td>
</tr>
<tr>
<td>ELEC3015</td>
<td>Electrical Energy 2</td>
<td>6 (5)</td>
<td>0</td>
</tr>
<tr>
<td>ELEC3016</td>
<td>Electronics B</td>
<td>6 (5)</td>
<td>0</td>
</tr>
<tr>
<td>ELEC3041</td>
<td>Real Time Engineering</td>
<td>6 (5)</td>
<td>0</td>
</tr>
<tr>
<td>TELE3018</td>
<td>Data Networks 1</td>
<td>6 (5)</td>
<td>0</td>
</tr>
</tbody>
</table>

TOTAL 24 (20) 24 (20)

Note: MATH2620 may be taken at the ordinary level (MATH2520).

ELEC3040
Electrical Engineering – Full-time Program

Bachelor of Engineering in Electrical Engineering
BE (Electrical Engineering)

<table>
<thead>
<tr>
<th>HPW</th>
<th>S1</th>
<th>(UOC)</th>
<th>S2</th>
</tr>
</thead>
<tbody>
<tr>
<td>MATH3141</td>
<td>EE Mathematical Methods</td>
<td>6 (4)</td>
<td>0</td>
</tr>
<tr>
<td>COMP2011</td>
<td>Data Organisation</td>
<td>6 (5)</td>
<td>0</td>
</tr>
<tr>
<td>ELEC3402</td>
<td>Introductory Physiology for Engineers</td>
<td>6 (5)</td>
<td>0</td>
</tr>
<tr>
<td>TOTAL</td>
<td>24 (20)</td>
<td>24 (20)</td>
<td></td>
</tr>
</tbody>
</table>

Year 4

<table>
<thead>
<tr>
<th>HPW</th>
<th>S1</th>
<th>(UOC)</th>
<th>S2</th>
</tr>
</thead>
<tbody>
<tr>
<td>ELEC4010</td>
<td>Introduction to Management for Electrical Engineers</td>
<td>6 (4)</td>
<td>0</td>
</tr>
<tr>
<td>ELEC4910</td>
<td>Thesis Part A</td>
<td>6 (4)</td>
<td>0</td>
</tr>
<tr>
<td>ELEC4011</td>
<td>2 Professional Electives</td>
<td>12 (8)</td>
<td>0</td>
</tr>
<tr>
<td>ELEC4911</td>
<td>Thesis Part B</td>
<td>6 (3)</td>
<td>0</td>
</tr>
<tr>
<td>ELEC4912</td>
<td>Thesis Part C</td>
<td>6 (7)</td>
<td>0</td>
</tr>
<tr>
<td>TOTAL</td>
<td>24 (19)</td>
<td>24 (20)</td>
<td></td>
</tr>
</tbody>
</table>

Notes:
The Thesis is taken by students with an Honours-level weighted average at the end of Year 3. Other students enrol in the Project (ELEC4914, ELEC4915 and ELEC4916).

Students who intend to major in particular disciplines should note that certain Year 3 elective subjects may be prerequisites for the Professional Electives they choose in Year 4.

TELEA13643
Telecommunications Engineering Full Time Program

Bachelor of Engineering in Telecommunications
BE (Telecommunication s)

<table>
<thead>
<tr>
<th>HPW</th>
<th>S1</th>
<th>(UOC)</th>
<th>S2</th>
</tr>
</thead>
<tbody>
<tr>
<td>MATH1090</td>
<td>Discrete Mathematics</td>
<td>6 (6)</td>
<td>0</td>
</tr>
<tr>
<td>MATH1141</td>
<td>Higher Mathematics 1A</td>
<td>6 (6)</td>
<td>0</td>
</tr>
<tr>
<td>TELE1010</td>
<td>Introduction to Telecommunications</td>
<td>6 (4)</td>
<td>0</td>
</tr>
<tr>
<td>PHYS1969</td>
<td>Physics 1</td>
<td>6 (6)</td>
<td>0</td>
</tr>
<tr>
<td>COMP1011</td>
<td>Computing 1A</td>
<td>6 (6)</td>
<td>0</td>
</tr>
<tr>
<td>ELEC1041</td>
<td>Digital Circuits</td>
<td>6 (4)</td>
<td>0</td>
</tr>
<tr>
<td>MATH1241</td>
<td>Higher Mathematics 1B</td>
<td>6 (6)</td>
<td>0</td>
</tr>
<tr>
<td>PHYS1969</td>
<td>Physics 1</td>
<td>6 (6)</td>
<td>0</td>
</tr>
<tr>
<td>TOTAL</td>
<td>6 (7)</td>
<td>0</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>HPW</th>
<th>S1</th>
<th>(UOC)</th>
<th>S2</th>
</tr>
</thead>
<tbody>
<tr>
<td>ELEC2031</td>
<td>Circuits and Systems 1</td>
<td>6 (6)</td>
<td>0</td>
</tr>
<tr>
<td>ELEC2041</td>
<td>Microprocessors and Interfacing</td>
<td>6 (4)</td>
<td>0</td>
</tr>
<tr>
<td>MATH2011</td>
<td>Several Variable Calculus</td>
<td>6 (4)</td>
<td>0</td>
</tr>
<tr>
<td>MATH2859</td>
<td>Probability, Statistics &amp; Information</td>
<td>6 (3)</td>
<td>0</td>
</tr>
<tr>
<td>ELEC2031</td>
<td>Circuits and Systems</td>
<td>6 (4)</td>
<td>0</td>
</tr>
<tr>
<td>ELEC2042</td>
<td>Real Time Instrumentation</td>
<td>6 (3)</td>
<td>0</td>
</tr>
<tr>
<td>TELE3018</td>
<td>Data Networks 1</td>
<td>6 (4)</td>
<td>0</td>
</tr>
<tr>
<td>TOTAL</td>
<td>6 (5)</td>
<td>0</td>
<td></td>
</tr>
</tbody>
</table>

Note: MATH1141 and MATH1241 may be taken at the ordinary level (MATH1131 and MATH1231).

Year 2

<table>
<thead>
<tr>
<th>HPW</th>
<th>S1</th>
<th>(UOC)</th>
<th>S2</th>
</tr>
</thead>
<tbody>
<tr>
<td>COMP1021</td>
<td>Computing 1B</td>
<td>6 (6)</td>
<td>0</td>
</tr>
<tr>
<td>ELEC2031</td>
<td>Circuits and Systems</td>
<td>6 (3)</td>
<td>0</td>
</tr>
<tr>
<td>ELEC2041</td>
<td>Microprocessors and Interfacing</td>
<td>6 (4)</td>
<td>0</td>
</tr>
<tr>
<td>MATH2011</td>
<td>Several Variable Calculus</td>
<td>6 (4)</td>
<td>0</td>
</tr>
<tr>
<td>MATH2859</td>
<td>Probability, Statistics &amp; Information</td>
<td>6 (3)</td>
<td>0</td>
</tr>
<tr>
<td>ELEC2031</td>
<td>Circuits and Systems</td>
<td>6 (4)</td>
<td>0</td>
</tr>
<tr>
<td>ELEC2042</td>
<td>Real Time Instrumentation</td>
<td>6 (3)</td>
<td>0</td>
</tr>
<tr>
<td>TELE3018</td>
<td>Data Networks 1</td>
<td>6 (4)</td>
<td>0</td>
</tr>
<tr>
<td>TOTAL</td>
<td>6 (5)</td>
<td>0</td>
<td></td>
</tr>
</tbody>
</table>

Note: MATH2620 may be taken at the ordinary level (MATH2520).
The program selected by each student must be approved by the program; candidates transfer to the BE MCom program at the end of Year 3 of the BE, requiring a weighted average of 65% to do so, a recommendation from the Head of School of Electrical Engineering and Telecommunications, and approval of the Faculties of Engineering and Commerce. Commerce courses are taken in place of engineering electives in Year 4. The Master of Commerce program is fee-paying.

Students already in a BE Program who maintain a creditable performance may qualify for transfer to one of the Combined Degree Programs. Students wishing to enrol in a combined program may do so only on the recommendation of the Head of School of Electrical Engineering and Telecommunications, and approval of the Faculty of Engineering and either the Faculty of Arts, or the Board of Studies in Science and Mathematics, or the Postgraduate School of Biomedical Engineering as appropriate.

Combined Degree Programs

Students may apply to the Faculty of Engineering for direct entry into one of the Faculty’s Combined Degree Programs. The available programs are BE BA (Engineering and Arts), BE BSc (Engineering and Science, usually Computer Science, Mathematics or Physics) and BE MBiomedE (Engineering and Biomedical Engineering). The required standard for entry is normally higher than that for the associated BE program alone. Combined degree programs qualify candidates for the award of two degrees in five years of combined full-time study in which the requirements of the degrees have been merged.

A BE MCom offers accelerated entry into the Masters of Commerce program at the completion of the BE. There is no direct entry into the program; candidates transfer to the BE MCom program at the end of Year 3 of the BE, requiring a weighted average of 65% to do so, a recommendation from the Head of School of Electrical Engineering and Telecommunications, and approval of the Faculties of Engineering and Commerce. Commerce courses are taken in place of engineering electives in Year 4. The Master of Commerce program is fee-paying.

Students already in a BE Program who maintain a creditable performance may qualify for transfer to one of the Combined Degree Programs. Students wishing to enrol in a combined program may do so only on the recommendation of the Head of School, with the approval of the Faculty of Engineering and either the Faculty of Arts, or the Board of Studies in Science and Mathematics, or the Postgraduate School of Biomedical Engineering as appropriate. Students wishing to enrol in, transfer into, or continue in a combined course shall have complied with all the requirements for prerequisite study, sequencing and academic attainment (a creditable
BE (Electrical Engineering) Combined Degree Programs in Science and Arts

<table>
<thead>
<tr>
<th>HPW</th>
<th>(UOC)</th>
</tr>
</thead>
<tbody>
<tr>
<td>S1</td>
<td>S2</td>
</tr>
</tbody>
</table>

**Year 1**
As for Program ELECA13640

**Year 2**

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>HPW</th>
<th>UOC</th>
</tr>
</thead>
<tbody>
<tr>
<td>COMP1021</td>
<td>Computing 1B</td>
<td>6</td>
<td>6</td>
</tr>
<tr>
<td>ELEC2031</td>
<td>Circuits and Systems</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>ELEC2041</td>
<td>Microprocessors and Interfacing</td>
<td>6</td>
<td>4</td>
</tr>
<tr>
<td>MATH2011</td>
<td>Several Variable Calculus</td>
<td>6</td>
<td>4</td>
</tr>
<tr>
<td>PHYS2939</td>
<td>Electromagnetism</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>SI</td>
<td>Science/Arts Elective/Core</td>
<td>6</td>
<td>5</td>
</tr>
<tr>
<td>SI</td>
<td>Science/Arts Elective</td>
<td>6</td>
<td>5</td>
</tr>
<tr>
<td>ELEC2031</td>
<td>Circuits and Systems</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>ELEC2015</td>
<td>Electromagnetic Applications</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>MATH2620</td>
<td>Complex Analysis</td>
<td>3</td>
<td>2.5</td>
</tr>
<tr>
<td>MATH2859</td>
<td>Probability, Statistics &amp; Information</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>TOTAL</td>
<td></td>
<td>24</td>
<td>20</td>
</tr>
</tbody>
</table>

(21.5)

**Notes:**

The Elective/Core subject will be PHYS2999 for Science with a Physics major, COMP2011 for Computer Science, and is a free elective for either Arts or Science with a Mathematics major.

For Arts, or a Science Major other than Computer Science, COMP1021 can be moved to Session 2 to enable a Session 1 elective to be taken.

**Year 3**

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>HPW</th>
<th>UOC</th>
</tr>
</thead>
<tbody>
<tr>
<td>ELEC3004</td>
<td>Signal Processing &amp; Transform Methods</td>
<td>6</td>
<td>5</td>
</tr>
<tr>
<td>ELEC3006</td>
<td>Electronics A</td>
<td>6</td>
<td>5</td>
</tr>
<tr>
<td>ELEC3005</td>
<td>Electrical Energy 1</td>
<td>6</td>
<td>5</td>
</tr>
<tr>
<td>Year 2 Science/Arts Elective</td>
<td>6</td>
<td>5</td>
<td></td>
</tr>
</tbody>
</table>

**Year 4**

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>HPW</th>
<th>UOC</th>
</tr>
</thead>
<tbody>
<tr>
<td>COMP1021</td>
<td>Computing 1B</td>
<td>6</td>
<td>6</td>
</tr>
<tr>
<td>ELEC2031</td>
<td>Circuits and Systems</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>ELEC2041</td>
<td>Microprocessors and Interfacing</td>
<td>6</td>
<td>4</td>
</tr>
<tr>
<td>MATH2011</td>
<td>Several Variable Calculus</td>
<td>6</td>
<td>4</td>
</tr>
<tr>
<td>MATH2859</td>
<td>Probability, Statistics &amp; Information</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>SI</td>
<td>Arts/Science Core/Elective</td>
<td>6</td>
<td>5</td>
</tr>
<tr>
<td>SI</td>
<td>Arts/Science Elective</td>
<td>6</td>
<td>5</td>
</tr>
<tr>
<td>ELEC2031</td>
<td>Circuits and Systems</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>TELE3018</td>
<td>Data Networks 1</td>
<td>6</td>
<td>4</td>
</tr>
<tr>
<td>MATH2620</td>
<td>Higher Complex Analysis</td>
<td>2.5</td>
<td></td>
</tr>
<tr>
<td>TOTAL</td>
<td></td>
<td>24</td>
<td>20</td>
</tr>
</tbody>
</table>

(19.5)

**Notes:**

The Elective/Core subject will be PHYS2999 for Science with a Physics major, COMP2011 for Computer Science, and is a free elective for either Arts or Science with a Mathematics major.

For Arts, or a Science Major other than Computer Science, COMP1021 can be moved to Session 2 to enable a Session 1 elective to be taken.

**Electrical Engineering and Telecommunications**

The Elective/Core subject will be PHYS2999 for Science with a Physics major, COMP2011 for Computer Science, and is a free elective for either Arts or Science with a Mathematics major.

For Arts, or a Science Major other than Computer Science, COMP1021 can be moved to Session 2 to enable a Session 1 elective to be taken.

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>HPW</th>
<th>UOC</th>
</tr>
</thead>
<tbody>
<tr>
<td>ELEC2042</td>
<td>Real Time Instrumentation</td>
<td>0</td>
<td>3</td>
</tr>
<tr>
<td>ELEC3017</td>
<td>Electrical Engineering Design</td>
<td>0</td>
<td>6</td>
</tr>
<tr>
<td>MATH2509</td>
<td>Linear Algebra for Engineers</td>
<td>0</td>
<td>12</td>
</tr>
<tr>
<td>2 ELEC/TELE Electives</td>
<td>0</td>
<td>10</td>
<td></td>
</tr>
<tr>
<td>TOTAL</td>
<td></td>
<td>24</td>
<td>21</td>
</tr>
</tbody>
</table>

**Notes:**

The Elective/Core subject will be PHYS2999 for Science with a Physics major, COMP2011 for Computer Science, and is a free elective for either Arts or Science with a Mathematics major.

For Arts, or a Science Major other than Computer Science, COMP1021 can be moved to Session 2 to enable a Session 1 elective to be taken.

**Electrical Engineering and Telecommunications**

The Elective/Core subject will be PHYS2999 for Science with a Physics major, COMP2011 for Computer Science, and is a free elective for either Arts or Science with a Mathematics major.

For Arts, or a Science Major other than Computer Science, COMP1021 can be moved to Session 2 to enable a Session 1 elective to be taken.

**Electrical Engineering and Telecommunications**

The Elective/Core subject will be PHYS2999 for Science with a Physics major, COMP2011 for Computer Science, and is a free elective for either Arts or Science with a Mathematics major.

For Arts, or a Science Major other than Computer Science, COMP1021 can be moved to Session 2 to enable a Session 1 elective to be taken.

**Electrical Engineering and Telecommunications**

The Elective/Core subject will be PHYS2999 for Science with a Physics major, COMP2011 for Computer Science, and is a free elective for either Arts or Science with a Mathematics major.

For Arts, or a Science Major other than Computer Science, COMP1021 can be moved to Session 2 to enable a Session 1 elective to be taken.

**Electrical Engineering and Telecommunications**

The Elective/Core subject will be PHYS2999 for Science with a Physics major, COMP2011 for Computer Science, and is a free elective for either Arts or Science with a Mathematics major.

For Arts, or a Science Major other than Computer Science, COMP1021 can be moved to Session 2 to enable a Session 1 elective to be taken.
### Year 4

<table>
<thead>
<tr>
<th>HPW</th>
<th>S1</th>
<th>S2</th>
</tr>
</thead>
<tbody>
<tr>
<td>Four Arts Electives</td>
<td>24 (20)</td>
<td>0</td>
</tr>
<tr>
<td>ELEC3041 Real Time Engineering</td>
<td>0</td>
<td>6 (5)</td>
</tr>
<tr>
<td>Three Arts Electives</td>
<td>0</td>
<td>18 (15)</td>
</tr>
<tr>
<td><strong>TOTAL</strong></td>
<td>24 (20)</td>
<td>24 (20)</td>
</tr>
</tbody>
</table>

**Notes:**
- It will be possible to delay/advance electives by 1 or more sessions to enable as flexible a choice as possible, providing the structure of the program (i.e. units of credit in each session) is maintained, and that ultimately all required core and elective subjects are taken.

### Year 5

As for Year 4 of Program TELEA13643.

---

### BE (Electrical Engineering)

**BE (Telecommunications)**

**Combined Degree Programs with Master of Commerce**

Program ELEC13640 is the BE (Electrical Engineering) MCom; program TELE13643 is the BE (Telecommunications) MCom. The Programs for the BE MCom are identical to Programs ELECA13640 and TELEA13643 respectively, except for the following changes.

**Year 3**

A Professional Elective must be taken in place of one Year 3 elective.

**Year 4**

- **ACCT5901** Accounting A, A User Perspective | 6 (3) | 0
- **ECON5103** Business Economics | 0 | 6 (3)

### Rules for all Combined Degrees

For Science and Arts, in addition to the BE course, students must complete 60 Units of Credit offered by the relevant Faculty, comprising a major sequence within Science or Arts.

A Mathematics Major is not normally permitted for the BA. The BE BSc combined degree is more appropriate for this.

There will be a testamur for each part of a combined degree program. Testamurs for the BE BA, the BE BSc and the BE MBimedE are awarded at a single graduation ceremony.
Postgraduate Study

The formal postgraduate programs offered by the School of Electrical Engineering and Telecommunications are:

- **ELEC(A-F)S8501** Master of Engineering Science in Electrical Engineering
- **TELEAS8502** Master of Engineering Science in Telecommunications
- **ELEC(A-F)S5458** Graduate Diploma in Electrical Engineering
- **TELEAS5460** Graduate Diploma in Telecommunications
- **ELECAR2660** Master of Engineering in Electrical Engineering
- **ELECAR1640** Doctor of Philosophy in Electrical Engineering

Coursework Programs

- **ELEC(A-F)S8501** Master of Engineering Science in Electrical Engineering

MEngSc

Qualifications

A candidate for the degree shall have been awarded a Bachelor of Engineering from the University of New South Wales in an appropriate discipline, or a qualification considered equivalent from another university or tertiary institution at a level acceptable to the Higher Degree Committee of the Faculty of Engineering (hereinafter referred to as the Committee).

Articulation from a UNSW Graduate Diploma, or upgrading from a Graduate Diploma program with advanced standing may be allowed by the Committee. Upgrading in other circumstances may be permitted by the Higher Degree Committee on the recommendation of the Head of School, and may be offered with a reduced level of advanced standing. Upgrading to the MEngSc will be allowed after satisfactory progress and completion of at least 18 Units of credit, with advanced standing in subjects which meet the requirements for the MEngSc. Progress will not be deemed to be satisfactory unless all subjects are passed at the first attempt at Credit level.

In exceptional cases an applicant who submits evidence of such other academic and professional qualifications as may be approved by the Committee may be permitted to enrol for the degree. Where a potential candidate does not meet the prerequisite required knowledge, a qualifying program can be arranged which will generally require enrolment in the Graduate Diploma, with the inclusion of Year 4 Electives. Progression to the MEngSc is subject to the articulation and upgrading rules mentioned above.

Enrolment with advanced standing will be permitted where a candidate has completed non-award courses which would otherwise be acceptable for the MEngSc.

Enrolment and Progression

An application to enrol as a candidate for the degree shall be made on the prescribed form which shall be lodged with the Registrar at least two calendar months before the commencement of the session in which enrolment is to begin. Candidates may commence in Session 1 or Session 2.

All candidates elect to study in at least one of the Major programs offered by the School of Electrical Engineering and Telecommunications: each Program Coordinator will advise if applicants are adequately qualified to undertake the proposed courses and must recommend the chosen program to the Committee.

A candidate for the degree shall be required to undertake such courses and pass such assessment as prescribed.

The progress of a candidate shall be reviewed at least once annually by the Committee and as a result of its review the committee may cancel enrolment, permit the candidate to re-enrol in a Graduate Diploma, or take such other action as it considers appropriate. A candidate will not normally be permitted to re-enrol after failing more than two courses.

Major Areas of Study

Programs consist of 48 Units of Credit of coursework. At least 24 Units of Credit must be taken from one of the following areas of specialisation (plans):

- **A. Electrical Energy** Program Coordinator: A/Prof TR Blackburn
- **B. Electronics** Program Coordinator: Dr R Ramer
- **C. Photonics** Program Coordinator: Dr G Peng
- **D. Signal Processing** Program Coordinator: Dr D Taubman
- **E. Systems and Control** Program Coordinator: Dr DJ Clements
- **F. Photovoltaics** Program Coordinator: Dr C Honsberg

Course unit descriptions for Photovoltaics courses and programs can be found in the Centre for Photovoltaic Engineering section of this handbook.

Postgraduate Coordinator:

A/Prof C.Y. Kwok

The courses satisfying the 48 Units of Credit requirement may be selected from the following:

- 0 - 6 Units of Credit Year 4 Electives
- 12 - 48 Units of Credit Core Postgraduate Electives
- 0 or 12 Units of Credit Postgraduate Project
- 0 - 36 Units of Credit Postgraduate Electives

24 Units of Credit must be taken in the area of specialisation. At least 12 of these Units must be Core Postgraduate Electives.

One Year 4 Elective may be selected to make up prerequisite requirements for an area of study within the postgraduate program. These courses are taught by lecture during the day, and require attendance at laboratory sessions.

Core Postgraduate Electives are taught in-session at Kensington, and may include a component of web-based learning. However, these courses will require attendance at formal lectures.

The Postgraduate Project must be supervised by a member of the Academic Staff of the University. The project must relate to the major area of study being undertaken by the candidate. The project may take one of two forms:

- **Industry-related project.** Such a project will require the agreement of an industry "sponsor", who will define the industrial requirements of the project. The project must still meet academic requirements, defined by the academic supervisor. An industry co-supervisor may be appointed from persons with appropriate academic standing or industrial experience, acceptable to the Committee.

- **Academic project.** Such projects will be undertaken in the School's laboratories. The project may be motivated by an industrial problem, or it may be theoretical, experimental or design-based.

Postgraduate Electives may each contribute 3 or 6 Units of Credit, and may take one of several forms:

- **Formal Coursework** These courses will have the same format as the Core Postgraduate Electives above.
- **Distance Education** Such courses will be taught using web-based material, formal course notes, books and papers, and will require extensive self-study by the candidate. The subjects may require a component of attendance at lectures given within the School, or at other suitable venues.
Short Courses Short Courses are oriented toward continuing education. Each course will deal with a topical subject, and will provide Units of Credit which may be counted toward the MEngSc, or may be taken as a non-award course.

Short courses may contribute either 3 Units of Credit or 6 Units of Credit, (the equivalent of 75-90 hours or 150-180 hours of work on the part of the candidate). Short courses will typically require attendance at lectures, either periodically or in a block, supplemented by self-study and assignment work.

Symposia Symposia will be similar to Short Courses, except that material will be delivered in a conference format, by the course candidates themselves, and/or by members of academic staff and invited speakers.

---

### Core Postgraduate Electives

<table>
<thead>
<tr>
<th>Energy</th>
<th>Course Code</th>
<th>Course Name</th>
</tr>
</thead>
<tbody>
<tr>
<td>Electrical</td>
<td>ELEC9213</td>
<td>Electrical Energy Systems</td>
</tr>
<tr>
<td></td>
<td>ELEC9240</td>
<td>Power Electronics</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Electronics</th>
<th>Course Code</th>
<th>Course Name</th>
</tr>
</thead>
<tbody>
<tr>
<td>ELEC9340</td>
<td>Electronic Communication Systems</td>
<td></td>
</tr>
<tr>
<td>ELEC9503</td>
<td>Microelectronics Design</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Photonics</th>
<th>Course Code</th>
<th>Course Name</th>
</tr>
</thead>
<tbody>
<tr>
<td>ELEC9350</td>
<td>Theory of Optical Fibres and Optical Signal Processing</td>
<td></td>
</tr>
</tbody>
</table>

### Signal Processing

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Name</th>
</tr>
</thead>
<tbody>
<tr>
<td>ELEC9344</td>
<td>Speech and Audio Processing</td>
</tr>
<tr>
<td>ELEC9345</td>
<td>Neural Networks and Applications</td>
</tr>
</tbody>
</table>

### Systems and Control

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Name</th>
</tr>
</thead>
<tbody>
<tr>
<td>ELEC9403</td>
<td>Real Time Computing and Control</td>
</tr>
<tr>
<td>ELEC9404</td>
<td>Topics in Digital Control</td>
</tr>
<tr>
<td>ELEC9405</td>
<td>Human Movement Control Systems</td>
</tr>
<tr>
<td>ELEC9412</td>
<td>Biomedical Instrumentation and Informatics</td>
</tr>
</tbody>
</table>

### Photovoltaics

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Name</th>
</tr>
</thead>
<tbody>
<tr>
<td>SOLA9003</td>
<td>High Efficiency Solar Cells</td>
</tr>
<tr>
<td>SOLA9004</td>
<td>Solar Energy</td>
</tr>
<tr>
<td>SOLA9005</td>
<td>Advanced Semiconductor Devices</td>
</tr>
<tr>
<td>SOLA9006</td>
<td>Solar Cell Technology &amp; Manufacturing</td>
</tr>
<tr>
<td>SOLA9007</td>
<td>Grid Connected Photovoltaics</td>
</tr>
</tbody>
</table>

### Telecommunications

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Name</th>
</tr>
</thead>
<tbody>
<tr>
<td>TELE9301</td>
<td>Switching System Design</td>
</tr>
<tr>
<td>TELE9302</td>
<td>Computer Networks</td>
</tr>
<tr>
<td>TELE9303</td>
<td>Network Management</td>
</tr>
<tr>
<td>TELE9337</td>
<td>Advanced Networking</td>
</tr>
<tr>
<td>TELE9343</td>
<td>Principles of digital Communications</td>
</tr>
<tr>
<td>COMP9008</td>
<td>Software Engineering</td>
</tr>
<tr>
<td>COMP9242</td>
<td>Advanced Operating Systems</td>
</tr>
</tbody>
</table>

Computer Science and Engineering selected courses subject to the approval of both schools.

---

### Postgraduate Electives

Postgraduate Electives to be offered will be determined for a two-year rolling program, providing information for potential candidates about electives which will be offered for the foreseeable duration of a part-time program. The postgraduate electives for 2000-2001 are given below. Students should consult course advisors prior to completing enrolment in case the course offering has changed.

<table>
<thead>
<tr>
<th>Energy</th>
<th>Course Code</th>
<th>Course Name</th>
</tr>
</thead>
<tbody>
<tr>
<td>ELEC9201</td>
<td>Power System Planning &amp; Economics</td>
<td></td>
</tr>
<tr>
<td>ELEC9214</td>
<td>Power Systems Equipment</td>
<td></td>
</tr>
<tr>
<td>ELEC9223</td>
<td>Power Engineering Seminars</td>
<td></td>
</tr>
<tr>
<td>ELEC9226</td>
<td>Electrical Services in Buildings</td>
<td></td>
</tr>
<tr>
<td>ELEC9231</td>
<td>Electric Drive Systems</td>
<td></td>
</tr>
<tr>
<td>ELEC9232</td>
<td>Motion Control Systems</td>
<td></td>
</tr>
<tr>
<td>ELEC9233</td>
<td>Electrical Safety</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Electronics</th>
<th>Course Code</th>
<th>Course Name</th>
</tr>
</thead>
<tbody>
<tr>
<td>ELEC9353</td>
<td>Microwave Circuits, Theory, Techniques</td>
<td></td>
</tr>
<tr>
<td>ELEC9501</td>
<td>Advanced Semiconductor Devices</td>
<td></td>
</tr>
<tr>
<td>ELEC9502</td>
<td>VLSI Technology</td>
<td></td>
</tr>
<tr>
<td>ELEC9505</td>
<td>Micro-systems Technology - Design and Fabrication</td>
<td></td>
</tr>
</tbody>
</table>

### Photonics

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Name</th>
</tr>
</thead>
<tbody>
<tr>
<td>ELEC9355</td>
<td>Optical Communication Systems</td>
</tr>
</tbody>
</table>

### Signal Processing

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Name</th>
</tr>
</thead>
<tbody>
<tr>
<td>ELEC9344</td>
<td>Speech and Audio Processing</td>
</tr>
<tr>
<td>ELEC9345</td>
<td>Neural Networks and Applications</td>
</tr>
</tbody>
</table>

### Systems and Control

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Name</th>
</tr>
</thead>
<tbody>
<tr>
<td>ELEC9403</td>
<td>Real Time Computing and Control</td>
</tr>
<tr>
<td>ELEC9404</td>
<td>Topics in Digital Control</td>
</tr>
<tr>
<td>ELEC9405</td>
<td>Human Movement Control Systems</td>
</tr>
<tr>
<td>ELEC9412</td>
<td>Biomedical Instrumentation and Informatics</td>
</tr>
</tbody>
</table>

### Photovoltaics

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Name</th>
</tr>
</thead>
<tbody>
<tr>
<td>SOLA9003</td>
<td>High Efficiency Solar Cells</td>
</tr>
<tr>
<td>SOLA9004</td>
<td>Solar Energy</td>
</tr>
<tr>
<td>SOLA9005</td>
<td>Advanced Semiconductor Devices</td>
</tr>
<tr>
<td>SOLA9006</td>
<td>Solar Cell Technology &amp; Manufacturing</td>
</tr>
<tr>
<td>SOLA9007</td>
<td>Grid Connected Photovoltaics</td>
</tr>
</tbody>
</table>

### Telecommunications

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Name</th>
</tr>
</thead>
<tbody>
<tr>
<td>TELE9301</td>
<td>Switching System Design</td>
</tr>
<tr>
<td>TELE9302</td>
<td>Computer Networks</td>
</tr>
<tr>
<td>TELE9303</td>
<td>Network Management</td>
</tr>
<tr>
<td>TELE9337</td>
<td>Advanced Networking</td>
</tr>
<tr>
<td>TELE9343</td>
<td>Principles of digital Communications</td>
</tr>
<tr>
<td>COMP9008</td>
<td>Software Engineering</td>
</tr>
<tr>
<td>COMP9242</td>
<td>Advanced Operating Systems</td>
</tr>
</tbody>
</table>

Computer Science and Engineering selected courses subject to the approval of both schools.

---

### Master of Engineering Science in Telecommunications

MEngSc

#### Qualifications

As for program 8501.

#### Major Areas of Study

The program consists of 48 Units of Credit of coursework. The courses satisfying the 48 Units of Credit requirement may be selected from the following:

- 0 - 6 Units of Credit Year 4 Telecommunications Electives
- 18 - 48 Units of Credit Core Postgraduate Telecommunications Electives
- 0 or 12 Units of Credit Postgraduate Telecommunications Research Project
- 0 - 30 Units of Credit Graduate Electives
- 30 Units of Credit must be taken in the area of Telecommunications. At least 18 of these Units must be Core Postgraduate Telecommunications Electives.

One Year Telecommunications Elective may be selected to make up prerequisite requirements for an area of study within the postgraduate program. These courses are taught by lecture during the day, and require attendance at laboratory sessions.

Core Postgraduate Telecommunications Electives are taught in session at Kensington, and may include a component of web-based learning. However, these courses will require attendance at formal lectures.

The Postgraduate Telecommunications Research Project must be supervised by a member of the Academic Staff of the University.

Postgraduate Electives are as for Program 8501.

---

### Core Postgraduate Telecommunications Electives

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Name</th>
</tr>
</thead>
<tbody>
<tr>
<td>TELE9301</td>
<td>Switching System Design</td>
</tr>
<tr>
<td>TELE9302</td>
<td>Computer Networks</td>
</tr>
<tr>
<td>TELE9303</td>
<td>Network Management</td>
</tr>
</tbody>
</table>
Supporting Program
The Telecommunications Program Coordinator will ensure that each student has prior knowledge equivalent to that embodied in the courses given below. Where such prior knowledge is lacking, candidates may be asked to undertake a qualifying program, usually in the form of a Graduate Diploma, which will ensure that prior knowledge requirements are met. Note that one undergraduate course may be included as part of the requirements for the MEngSc (Telecommunications).

- ELEC3004 Signal Processing 1
- ELEC3006 Electronics 2
- ELEC3016 Electronics 3
- ELEC3041 Real Time Engineering
- ELEC4010 Introduction to Management for Electrical Engineers
- TELE3010 Network Management
- TELE3013 Communication Systems 2
- TELE3018 Data Networks 1
- TELE4353 Mobile and satellite Communication Systems
- TELE4363 Telecommunication Systems 2
- COMP3231 Operating Systems
- Other Year 4 Telecommunications Electives

ELEC(A-F)S5458
Graduate Diploma in Electrical Engineering

TELEAS5460
Graduate Diploma in Telecommunications

Students will enrol in the Graduate Diploma for one of three reasons:

- A student may wish to undertake postgraduate coursework in one area of electrical engineering or telecommunications with a specialised focus.
- A student may wish to transfer from a related discipline such as science into electrical engineering or telecommunications.
- A student may use the Graduate Diploma as a qualifying program for the MEngSc.

GradDip

Qualifications
A candidate for the degree shall have been awarded a Bachelor of Engineering from the University of New South Wales in an appropriate discipline, or a qualification considered equivalent from another university or tertiary institution at a level acceptable to the Higher Degree Committee of the Faculty of Engineering (hereinafter referred to as the Committee). In exceptional cases an applicant who submits evidence of such other academic and professional qualifications as may be approved by the Committee may be permitted to enrol for the degree.

Where a potential candidate does not meet the prerequisite required knowledge, a non-award qualifying program can be arranged which will generally require enrolment in undergraduate courses, recommended by the relevant Program Coordinator.

Enrolment with advanced standing may be permitted where a candidate has completed non-award courses which would otherwise be acceptable for the Graduate Diploma.

Enrolment and Progression
An application to enrol as a candidate for the degree shall be made on the prescribed form which shall be lodged with the Registrar at least two calendar months before the commencement of the session in which enrolment is to begin. Candidates may commence in Session 1 or Session 2.

All candidates elect to study in at least one of the Major programs offered by the School of Electrical Engineering and Telecommunications: each Program Coordinator will advise if applicants are adequately qualified to undertake the proposed courses and must recommend the chosen program to the Committee.

A candidate for the degree shall be required to undertake such courses and pass such assessment as prescribed.

The progress of a candidate shall be reviewed at least once annually by the Committee and as a result of its review the committee may cancel enrolment, permit the candidate to re-enrol in a Graduate Diploma, or take such other action as it considers appropriate. A candidate will not normally be permitted to re-enrol after failing more than two courses.

Students who have previously undertaken an electrical engineering undergraduate qualification at a sufficiently high standard (Credit level) will normally be offered advanced standing for 18 Units of Credit.

Major Areas of Study
A usual program will comprise 36 Units of Credit. A full program consists of up to 54 Units of Credit of coursework, taken over three sessions. Advanced standing for up to 18 Units of Credit of undergraduate subjects will be given for students suitably qualified in electrical engineering.

The Graduate Diploma Program comprises coursework only (there is no project in the Graduate Diploma). A Graduate Diploma Program comprises the following:

- 18 Units of Credit Year 3 and year 4 courses
- 0 - 12 Units of Credit Year 4 Electives
- 12 - 36 Units of Credit Core Postgraduate Electives
- 0 - 24 Units of Credit Postgraduate Electives

Undergraduate and postgraduate courses and electives are listed earlier.
Course Descriptions

Descriptions of all courses are presented in alphanumeric order within organisational units. For academic advice regarding a particular course consult with the contact for the course as listed. A guide to abbreviations and prefixes is included in the chapter Handbook Guide, appearing earlier in this book.

ELEC0807
Electrical Engineering 1E
Staff Contact: Mr E Spooner
UOC3 HPW4 S2
Prerequisite/s: PHYS1002 or equivalent (e.g. PHYS1918 or PHYS2920)

Circuit theory: analysis and design of DC and AC circuits, comprising various energy sources and complex impedances, 3 phase circuits. Laboratory methods: electrical safety, transformers and power supplies, signal generators, measuring devices, oscilloscopes. Digital logic: combinational logic, memory, sequential logic and state machines, programmable logic devices. Instrumentation: operational amplifiers, sensors, simple signal processing, data transmission, A/D/A conversion. AC machines and induction motors. DC machines and motors.

ELEC0809
Electrical Engineering 1C
Staff Contact: Dr B. D. Farah
UOC3 HPW2 S1
Prerequisite/s: PHYS1002 or equivalent (e.g. PHYS1918 or PHYS2920)
Note/s: Excluded ELEC0807

Circuit theory: analysis and design of DC and AC circuits, comprising various energy sources and complex impedances, 3-phase circuits, frequency response. Laboratory methods: electrical safety, signal generators, measuring devices, oscilloscopes. Transformers and power supplies. AC machines and induction motors. DC machines and motors.

ELEC0931
Industrial Elective
Staff Contact: UOC3 HPW4 S1 or S2
Prerequisite/s: Students must be in at least the third stage of part-time BE degree course and be in full-time
Note/s: New enrolments in the part-time BE or sandwich course are not accepted, as those courses are no longer offered.

Each Industrial Elective represents one year of appropriate quality concurrent industrial experience for students in approved full-time employment. Students must submit evidence and a written report to the satisfaction of the Head of School. Some attendance at the University for verbal reporting may also be required. A maximum of three such electives can be taken and they may be substituted for certain subjects in course 3640 requirements. The substitution is not available for work done during the first year of employment if this coincides with the first year of part-time enrolment. The period of employment claimed must precede the completion of the thesis ELEC4912. An Industrial Elective cannot be claimed for work submitted for credit as ELEC4912 Thesis. Details of the procedure for registering and the requirements to be met can be obtained from the School of Electrical Engineering and Telecommunications.

ELEC0933
Industrial Elective
Staff Contact: UOC12 S1 or S2
Prerequisite/s: Students must be in at least the third stage of part-time BE degree course and be in full-time
Note/s: New enrolments in the part-time BE or sandwich course are not accepted, as those courses are no longer offered.

Each Industrial Elective represents one year of appropriate quality concurrent industrial experience for students in approved full-time employment. Students must submit evidence and a written report to the satisfaction of the Head of School. Some attendance at the University for verbal reporting may also be required. A maximum of three such electives can be taken and they may be substituted for certain subjects in course 3640 requirements. The substitution is not available for work done during the first year of employment if this coincides with the first year of part-time enrolment. The period of employment claimed must precede the completion of the thesis ELEC4912. An Industrial Elective cannot be claimed for work submitted for credit as ELEC4912 Thesis. Details of the procedure for registering and the requirements to be met can be obtained from the School of Electrical Engineering and Telecommunications.

ELEC1010
Introduction to Electrical Engineering
Staff Contact: A/Prof HR Outhred
UOC6 HPW6 S1 or S2
Prerequisite/s: HSC mark range required - 2 unit English (General) 60-100, or 2 unit English 53-100, or 3 unit

Introduction to the nature and scope of electrical engineering, including communications, computing, electrical energy, electronics and systems. Careers for electrical engineers in public and private enterprise. Verbal and written communication and inter-personal skills in engineering.

ELEC1011
Electrical Engineering 1
Staff Contact: Dr R Ramer
UOC6 HPW6 S1 or S2
Corequisite/s: PHYS1969 or equivalent


ELEC1041
Digital Circuits
Staff Contact: Dr DJ Clements
UOC6 HPW4 S2
Prerequisite/s: ELEC1011
Note/s: Excluded:COMP2021

Realisations of combinational circuits: MSI devices, ROM's. PLA's. synchronous. sequential logic circuits: latches, flip flops, counters, registers. Algorithmic state machines: systematic design procedures. A Synchronous sequential logic circuits, design applications. PLD's.
ELEC2015
Electromagnetic Applications
Staff Contact: A/Prof F Rahman/Dr I M Skinner
U0C3 HPW3 S2
Prerequisite/s: PHYS2949


ELEC2031
Circuits and Systems
Staff Contact: Dr K C Daly
U0C3 HPW3 S1S2
Prerequisite/s: ELEC1011
Note/s: Excluded ELEC2032

Revision of basic circuit theory; RLC circuits; sinusoidal circuit response; mutual inductance and transformers; operational amplifiers; computer aided circuit design; state space circuit representations and time responses; homogenous and particular solutions for first and second order linear differential equations; computer aided analysis of signals and systems, including state space representations; continuous time signals, sinusoids and signal norms; convolution, impulse and step responses; phasors; AC circuits (transient and steady state responses); complex power; frequency responses of circuits and systems; three phase circuits.

ELEC2032
Circuits and Systems B
Staff Contact: Dr K C Daly
U0C3 HPW3 S2
Prerequisite/s: ELEC1011
Note/s: Excluded ELEC2031

Revision of basic circuit theory; RLC circuits; sinusoidal circuit response; mutual inductance and transformers; operational amplifiers; computer aided circuit design; state space circuit representations and time responses; homogenous and particular solutions for first and second order linear differential equations; computer aided analysis of signals and systems; discrete time signals and systems, including state space representations; continuous time signals, sinusoids and signal norms; convolution, impulse and step responses; phasors; AC circuits (transient and steady state responses); complex power; frequency responses of circuits and systems; three phase circuits.

ELEC2041
Microprocessors and Interfacing
Staff Contact: Dr WS Matheson
U0C6 HPW4 S1
Prerequisite/s: COMP1011, ELEC1041
Corequisite/s: COMP1021
Note/s: Excluded COMP3221, COMP9221.

The programmer's model of a microprocessor: writing assembly language programs. The hardware model of a microprocessor: synchronous and asynchronous busses. Interfacing concepts: I/O Organisation, address decoding, static and dynamic memory interfacing. Direct I/O for simple peripherals. I/O support devices: PlAs, ACIsAs. Interrupt-driven I/O: interrupt vectors, interrupt handlers, DMA controllers. Standard microprocessor busses: VME, EISA, SCSI and others. Laboratory interfacing experiments using 8-bit and 16-bit hardware, assembly language software, real-time kernels and operating systems.

ELEC2042
Real Time Instrumentation
Staff Contact: A/Prof T Hesketh
U0C3 HPW4 S2
Prerequisite/s: ELEC1041, ELEC2041, or MECH3202


ELEC3004
Signal Processing 1
Staff Contact: Dr A Bradley
U0C6 HPW4 S2
Prerequisite/s: ELEC2031, MATH2849, MATH2859
Note/s: Assumed Knowledge: Fourier analysis, Laplace transforms, z-transforms and linear system theory.

Processing and analysis of continuous (analog) and discrete (digital) signals. Analog filters; approximation theory. Butterworth, Bessel, Chebyshev and elliptic filters. Examples of realisations of analog filters using operational amplifiers. Filter stability and sensitivity. Sampling continuous signals; sampling theorem, signal reconstruction and aliasing errors. The discrete Fourier transform (DFT) and fast Fourier transform (FFT) algorithms. Fundamentals of the design and realisation of finite impulse response (FIR) and infinite impulse response (IIR) digital filters. Digital processing of analog signals, including implementations on programmable digital signal processing (DSP) chips. The representation and modelling of random signals, correlation functions and power density spectra.

ELEC3005
Electric Energy 1
Staff Contact: A/Prof C Grantham
U0C6 HPW4 S1
Prerequisite/s: ELEC2015


ELEC3006
Electronics A
Staff Contact: A/Prof CY Kwok
U0C6 HPW5 S1
Prerequisite/s: ELEC2031


ELEC3014
Systems and Control 1
Staff Contact: A/Prof PD Nelson
U0C6 HPW4 S2
Prerequisite/s: ELEC2031

Consolidation and extension of basic material on continuous-time and discrete-time systems, and the relationships between them. Includes dynamic systems modelling, block diagrams, signal flow graphs, frequency and time domain relationships, stability criteria, Nyquist diagrams and root locus methods. Also includes introductory state space analysis.

ELEC3015
Electrical Energy 2
Staff Contact: A/Prof C Grantham
U0C6 HPW4 S2
Prerequisite/s: ELEC3005

Basic aspects of both the supply and utilisation of electrical energy, with some emphasis on contemporary aspects of energy utilisation, including modern developments, energy efficiency and environmental aspects. Electrical energy supply systems: transmission and distribution systems, power transfer, reactive power.
effects, fault current calculation and protection. Quality of electricity supply; transient overvoltages, harmonics etc. and their ramifications in the operation of electrical power equipment. Electromagnetic compatibility (EMC). Utilisation of electrical energy: Industrial supply; transient overvoltages, harmonics etc. and their ramifications. Fault current calculation and protection. Quality of electricity supply; transient overvoltages, harmonics etc. and their ramifications. Fault current calculation and protection. Quality of electricity supply; transient overvoltages, harmonics etc. and their ramifications.

**ELEC3016**

**Electronics B**

**Staff Contact:** A/Prof CY Kwok

UOC6 HPW4 S2

**Prerequisite(s):** ELEC3006

**Notes:** Excluded ELEC4512, ELEC9501

Operating principles and fabrication technologies of devices used in electronic circuits and the resulting impact on circuit operation and design. Devices covered include p-n junctions, BJT's & MOSFET's in analogue and integrated circuits (TTL, ECL, CMOS etc) LEDs, lasers and optical waveguides as used in communication systems and microwave devices.

**ELEC3017**

**Electrical Engineering Design**

**Staff Contact:** Dr A Bradley

UOC6 HPW5 S2

**Prerequisite(s):** ELEC2042, ELEC3006

Electrical product design in a manufacturing environment, from original idea through technical specifications, prototype, manufacture and finally to marketing. In particular: Design Project Management: Introduction to scheduling and other management techniques. Also introductions to costing, pricing, marketing, standards, patents, quality and reliability, safety, (electronic) manufacturing methods and systems, engineering innovation. Design Methodology: Systematic design procedures, design documentation. Designing for quality, for manufacture, for maintenance, for minimum life cycle cost. Use of computer aids for project management, drawing, PCB design, circuit analysis and synthesis, documentation, etc. Engineering Drawing and Graphical Communications: Standards, projections, dimensioning, tolerancing, drawing interpretation, use of CAD tools. Report Writing and Oral Presentations Aspects of Electronic Design: Device specifications, component choices, sourcing, data sheets, tolerances, aging, thermal dissipation, passive component characteristics. Also RFI and EMC, earthing, shielding, PCB layout principles, prototyping methods, interconnection technologies. Group Project: including specification, marketing and business plans, scheduling, design, prototype production, testing, formal technical report and seminar presentation.

**ELEC3041**

**Real Time Engineering**

**Staff Contact:** A/Prof T Hesketh

UOC6 HPW4 S1

**Prerequisite(s):** ELEC2042 or MECH3202

Real-Time Specification and Design: program specification methods; state-based discrete event specification; Petri nets; timing analysis; simulation techniques. Real-Time Kernels: Co-routines and multithreading; queueing models and realisations; pre-emptive scheduling; scheduling algorithms; interrupt communication and synchronisation; event-driven systems; real-time memory management; system performance, analysis and optimisation; reliability, testing and fault tolerance; multiprocessing systems. Control System Realisation: controller structures; implementation of continuous and discrete controllers; robustness issues; programmable logic controllers. Networks: coding; serial data transmission; modems, layered protocols; standards; simple LANs.

**ELEC3402**

**Introductory Physiology for Engineers**

**Staff Contact:** Prof BG Celler

UOC6 HPW4 S1

An introduction to biophysics and physiology for engineers. Cells, tissues and organ systems with emphasis on their functional and regulatory characteristics and their interaction. An introduction to computer models of physiological control systems demonstrating their value in understanding the dynamics of complex neural, hormonal and circulatory responses to changes in homeostasis.

**ELEC4010**

**Introduction to Management for Electrical Engineers**

**Staff Contact:** A/Prof T Hesketh

UOC3 HPW4 S1

The purpose of this subject is to introduce students to key management concepts and techniques in the content of electrical engineering. Topics to be discussed will be taken from accounting, economics, finance, marketing, decision-making techniques, operations research, project and strategic management, human resources, industrial relations and law.

**ELEC4011**

**Ethics and Electrical Engineering Practice**

**Staff Contact:** A/Prof HR Outhred

UOC3 HPW2 S2

**Prerequisite(s):** ELEC4010

An introduction to the nature and origins of ethical systems; the application of ethical bases to engineering practice with particular reference to electrical engineering and computing; codes of ethics in the professions, with special reference to the Code of Ethics of the Institution of Engineers, Australia; social, political, environmental and economic considerations. Students are required to complete a minimum of 60 days of industrial training with one or more companies, preferably before the commencement of this course. The objectives of industrial training are (i) to develop an appreciation for the structure and operation of industrial organisations, (ii) to understand the role of the engineer and engineering in industry, (iii) to appreciate the importance of good communication and interpersonal skills, and (iv) to develop these skills, and (iv) to appreciate the ethical basis of engineering practice in industry. Students are required to submit to the School evidence from their employers of each period of training, confirming the work performed, together with a report. The report, typically 2000-3000 words long, should summarise the actual technical work performed, and should address the extent to which the aims of the industrial training, above, have been met. It is preferred that some industrial training should be obtained in Australia. When the industrial training is done overseas, the report should include a more detailed description of the company concerned.

**ELEC4042**

**Signal Processing 2**

**Staff Contact:** Dr D Taubman

UOC6 HPW3 S1

**Prerequisite(s):** ELEC3004

This subject discusses the analysis and design of control systems, building on the classical methods taught in Year 3. The course covers:

**ELEC4205**
**Electrical Energy Systems**
*Staff Contact: A/Prof C Grantham*
*UOC6 HPW4 S1*
*Prerequisite/s: ELEC3005*

Review of the basic concepts used in power system analysis: phasors, complex power, three phase systems and per-unit methodology. Modelling of power system components, including transformers and synchronous machines. Aspects of power system operation, including power flow, reactive power control and fault analysis. Harmonics and their effects. Choice and use of protective equipment, including fuses, circuit breakers, relays and surge arresters. Equipment rating for operation in steady state and cyclic modes. Insulation system design and practical limitations. High voltage equipment testing methods and their use in insulation condition monitoring of electrical energy systems. Quality of supply. The impact of EMC and EMI requirements on electrical energy systems.

**ELEC4216**
**Electrical Drive Systems**
*Staff Contact: A/Prof C Grantham/A/Prof M F Rahman*
*UOC6 HPW4 S2*
*Prerequisite/s: ELEC3005*


**ELEC4240**
**Power Electronics**
*Staff Contact: A/Prof FM Rahman*
*UOC6 HPW4 S1*
*Prerequisite/s: ELEC3006*

Modern power semiconductor devices eg, diodes, thyristors, mosfets, and other insulated gate devices such as the IGBT, MCT and the FCT; Static and switching characteristics, gate drive and protection techniques; Various DC-DC, AC-DC, DC-AC and AC-AC converter circuit topologies, their characteristics and control techniques; Application considerations for remote and uninterruptable power supplies, and for computer systems, telecommunications, automobiles, traction and other industrial processes; Utility interaction, harmonic distortion, and power factor; EMI and EMC considerations.

**ELEC4333**
**Communications Systems 2**
*Staff Contact: Prof A Seneviratne*
*UOC6 HPW4 S2*
*Prerequisite/s: ELEC2015, ELEC3013*

This subject provides a fundamental coverage of important communication systems, their basic components, as well as legal and commercial aspects affecting the design and operation of these systems. This subject is intended for students who wish to major in telecommunications or to strengthen their knowledge of modern communication systems. Basic principles of guided and unguided wave propagation. Antenna radiation. Active microwave devices. Radar and navigation systems. Broadcast radio and TV systems. Cable systems. Introduction to mobile and satellite communications.

**ELEC4412**
**Systems and Control 2**
*Staff Contact: Dr D Clements*
*UOC6 HPW4 S1*
*Prerequisite/s: ELEC3014*

This subject discusses the analysis and design of control systems, building on the classical methods taught in Year 3. The course covers:

- process modelling, root locus and frequency response design, classical PID control, discrete control continuous and discrete state space analysis, state variable feedback, pole placement and optimal control, robust control, nonlinearsystems.

**ELEC4413**
**Systems and Control 3**
*Staff Contact: A/Prof T Hesketh*
*UOC6 HPW4 S2*
*Prerequisite/s: ELEC4412*

Covers the design of practical control systems intended for implementation using digital computers and embedded systems. Controllers may be developed using both continuous and discrete designs. The topics covered include: identification of model parameters; noise models and stochastic systems; numerical integration and implementation of continuous designs; observers and Kalman filtering; LQG control; simple loop shaping; internal models and model following; Aspects of implementation are constantly emphasised.

**ELEC4483**
**Biomedical Instrumentation, Measurement and Design**
*Staff Contact: Prof BG Celler*
*UOC6 HPW4 S2*
*Prerequisite/s: ELEC3004*

Note/s: ELEC3402 recommended.


**ELEC4503**
**Electronics C**
*Staff Contact: A/Prof CY Kwok*
*UOC6 HPW4 S1*
*Prerequisite/s: ELEC3016*


**ELEC4522**
**Microelectronics Design and Technology**
*Staff Contact: A/Prof CY Kwok*
*UOC6 HPW4 S1*
*Prerequisite/s: ELEC3006*


**ELEC4532**
**Integrated Digital Systems**
*Staff Contact: A/Prof CY Kwok*
*UOC6 HPW4 S2*
*Prerequisite/s: ELEC1041 or COMP2021*

Integrated circuit logic families with emphasis on MOS technologies, structured chip design, custom and semi-custom approaches, system architecture, computer aided design, layout considerations, timing estimates, circuit failures, faults, fault modelling, testing, design for testability.
ELEC4540  
Applied Photovoltaics  
Staff Contact: A/Prof SR Wenham  
UOC6 HPW4 S1 or S2  
Corequisite/s: ELEC3017

The use of solar cells (photovoltaic devices) as electrical power supplies based on the direct conversion of sunlight into electricity. The emphasis is placed on applications including system design and construction, although the properties of sunlight, the operating principles of solar cells and the interaction between sunlight and the cells are also treated.

ELEC4910  
Thesis Part A  
Staff Contact: School Office  
UOC3 HPW4 S1 or S2  
Corequisite/s: ELEC3017

ELEC4911  
Thesis Part B  
Staff Contact: School Office  
UOC3 HPW3 S1 or S2  
Prerequisite/s: ELEC4910

The thesis is carried out in the last two sessions of the BE degree course for full-time students. Five hours per week in the first session, and ten hours per week in the second session are devoted to directed laboratory and research work on an approved subject under the guidance of members of the lecturing staff. Part-time students may need to attend the University full-time in their final session or attend for one further part-time session, if facilities are not available for the thesis to be done at work. Generally, the thesis involves the design and construction of experimental apparatus, software simulations or models with laboratory tests. Each student is required to present a seminar as part of the requirements for ELEC4910, Thesis Part A. Satisfactory performance in subject ELEC4910 is a prerequisite for progress to subject ELEC4911 and ELEC4912. Thesis Part B typically involves the theoretical development or modelling. A written thesis report must be submitted on each project by the Tuesday of the 14th week of the second session of enrolment to satisfy the requirements for ELEC 4911 and ELEC4912, Thesis Part B and C.

ELEC4914  
Thesis Project Part A  
Staff Contact: School Office  
UOC3 HPW4 S1 or S2  
Prerequisite/s: ELEC4910

ELEC4915  
Thesis Project Part B  
Staff Contact: School Office  
UOC3 HPW3 S1 or S2  
Prerequisite/s: ELEC4914

ELEC4916  
Thesis Project Part C  
Staff Contact: School Office  
UOC6 HPW7 S1 or S2  
Prerequisite/s: ELEC4914

The Project is carried out in the last two sessions of the BE degree course for full time students with a weighted average of less than 63 at the end of Year 3, and others who elect to take the Project in preference to the Thesis. Five hours per week in the first session and ten hours per week in the second session are devoted to directed laboratory work on an approved project under the guidance of a member of the lecturing staff. Part time students may need to attend the university full time in the final session, or attend for one further part time session if they cannot otherwise make arrangements to participate in group activities. Generally the project involves team work in carrying out graduated laboratory and design exercises, aimed at emulating project work that might be encountered by a newly graduated engineer in a project team, and to meet a stated group objective. Each group will produce a full set of specifications for their designs (user, design, test), and report the final results of tests which indicate the specifications are met. Students will form groups of 10-15, and will be required to allocate work to each member of the group to carry out the various design objectives. Each student is required to participate in presentations to the group at regular meetings. The group will present a seminar as part of the requirements for ELEC4914, Project Part A. Satisfactory performance in ELEC4914 is a prerequisite for progress to ELEC4915 and ELEC4916. A written project report must be submitted by each member of a group by the Tuesday of the 14th week of the second session of enrolment to satisfy the requirements for ELEC4915 and ELEC4916, Project Part B and C. The group will engage in an Open Day Project Demonstration.

ELEC9213  
Electrical Energy Systems  
Staff Contact: A/Prof CY Kwok  
UOC6 HPW3 S1

ELEC9240  
Power Electronics  
Staff Contact: Dr K Daly  
UOC6 HPW3 S1

Modern power semiconductor devices eg, diodes, thyristors, mosfets, and other insulated gate devices such as the IGBT, MCT and the FCT; Static and switching characteristics, gate drive and protection techniques; Various DC-DC, AC-DC, DC-AC and AC-AC converter circuit topologies, their characteristics and control techniques; Application considerations for remote and uninterruptible power supplies, and for computer systems, telecommunications, automobiles, traction and other industrial processes; Utility interaction, harmonic distortion, and power factor; EMI and EMC considerations.

ELEC9340  
Electronic Communication Systems  
Staff Contact: A/Prof CY Kwok  
UOC6 HPW3 S2

Electronic aspects of modern analogue and digital communication systems. Topics selected from: electronic system noise; analogue modulators, demodulators, frequency conversion circuits, AM and FM transmitters and receivers; television electronics; phase locked loops; switched capacitor and other practical filter technologies; surface acoustic wave devices.

ELEC9342  
Digital Signal Processing and Applications  
Staff Contact: Dr E Ambikairajah  
UOC6 HPW3 S2


ELEC9344  
Speech and Audio Processing  
Staff Contact: Dr A Bradley  
UOC6 HPW3 S1

tools in the real-time context. Design of the man-machine interface using interactive computer display systems. The role of simulation and other CAD tools. Steps of engineering development from concept to commissioning. The viewpoint of industrial design is maintained throughout.

ELEC9404
Topics In Digital Control
Staff Contact: A/Prof T Hesketh
UOC6 HPW3 S1
Possible modules include: identification, estimation, multivariable systems, robust control, optimisation, adaptive control, biomedical applications, instrumentation and sensors, robotics, industrial design case studies, variable structure systems, expert systems and fuzzy control, neural networks.

ELEC9405
Advanced Control Topics
Staff Contact: A/Prof PD Neilson
UOC6 HPW3 S2
From one to three models, covering advanced control theory, with an emphasis on applications. The modules are not limited to digital control. Typical modules include: identification, estimation, multi-variable systems, robust control, optimisation, adaptive control, biomedical applications, instrumentation and sensors, robotics, industrial design case studies, non-linear identification, non-linear control, variable structure systems, expert systems and others to be decided.

ELEC9412
Biomedical Instrumentation and Informatics
Staff Contact: Prof BG Celler
UOC6 HPW3 S2
Digital computer methods of extracting information from biological signals using filtering and averaging, expectation density functions, correlation functions, spectral analysis and other techniques. Methods of constructing models of biological systems.

ELEC9421
Robust and Linear Control Systems
Staff Contact: A/Prof PD Neilson
UOC6 S1

ELEC9422
Analysis and Design of Nonlinear Controllers
Staff Contact: Dr D Clements
UOC6 S1
Analysis. General state description of nonlinear systems, linearisation techniques, Lyapunov stability, constrained linear systems, constrained optimisation, multimode control. Design. Actuator saturation, linearisation and gain scheduling, feedforward control, interactions and LQG control, sliding mode control, adaptive control. The above will be developed with illustrative simulation study and CAD, and both physical modeling and systems identification will be covered.
ELEC9501
Advanced Semiconductor Devices
Staff Contact: A/Prof CY Kwok
UOC6 HPW3 S2
Theory and operating characteristics of a range of semiconductor devices including bipolar diodes and transistors, MOS devices and circuit connections, solar cells, light emitting diodes and semiconductor lasers.

ELEC9502
VLSI Technology
Staff Contact: A/Prof CY Kwok
UOC6 S2
Introduction to silicon VLSI technology. Future trends in VLSI technology. Technology limitations. Basic technology modules include: crystal growth and wafer preparation; mask generation techniques; lithography; diffusion process; ion implantation; oxidation; etching techniques - wet etching and plasma etching; thin film deposition - epitaxial growth, chemical vapor deposition techniques, metallisation; clean room technology; Advanced process integration for CMOS, BiCMOS and Bipolar fabrication; Failure analysis techniques.

ELEC9503
Microelectronics Design
Staff Contact: A/Prof CY Kwok
UOC6 HPW3 S1
An advanced treatment of the design of integrated circuits with emphasis on the relationships between technology, device characteristics and circuit design. Includes properties and modelling of bipolar and MOS circuit components, circuit analysis and simulation, layout rules, analog functions such as operational and power amplifiers; multipliers, D A and A D converters. Analog MOS circuits. Switch capacitor filters. Digital circuits include gates, compound functions, RAM, ROM, speed and power analysis. Yield, reliability, failure analysis and packaging. MEMS technology. Non-volatile memory, low voltage low power circuits.

ELEC9505
Micro-Systems Technology: Design and Microfabrication
Staff Contact: A/Prof CY Kwok
UOC6 S2

ELEC9912
Project Report
Staff Contact: A/Prof CY Kwok
UOC12 S2
The project is done in a major area, in which it is offered under the supervision of an academic member of staff. Where the work is carried out externally a suitable co-supervisor may be required. Projects can take many forms such as the design and construction of experimental equipment or a theoretical investigation. At the end of the work a comprehensive project report giving an account of the student's own research must be submitted. Information on the preparation of project reports is contained in the University Calendar.
Geomatics is a modern scientific term to describe an integrated approach to the acquisition, analysis, storage, distribution, management and application of spatially-referenced data. It embraces the traditional area of surveying and mapping, as well as the comparatively new fields of remote sensing and spatial information systems. Today, a geomatic engineer may choose to work in Surveying or Spatial Information Systems or in other areas.

**Surveying:**
- Satellite Surveying (position determination techniques using satellite signals)
- Geodesy (determining the mathematical model of the Earth, and its gravity field, and the practice of control network surveying)
- Hydrography (mapping the seabed and waterways for navigation and off-shore resource management)
- Engineering Surveying (precise surveying for engineering projects)
- Cadastral Surveying (knowledge of the laws and practices for survey of property boundaries)
- Land Management and Development (project management for land development, environmental assessment for resource management and change of land use)

**Spatial Information Systems:**
- Land Information Management (the use of computer-based information systems of spatially related data for planning and administration purposes)
- Geographic Information Systems (GIS) (computer-based information systems for environmental assessment and monitoring)
- Photogrammetry and Remote Sensing (the use of airborne and spaceborne remotely sensed images for mapping and resource surveys)

The School boasts a proud record of achievement; its graduates are leaders in industry, government and academic circles. It has forged strong links with leading research and teaching institutions in North America, Europe and Asia, and members of the School's staff hold positions of leadership in both international and national scientific and professional bodies.

The four undergraduate programs in the School are: the Bachelor of Engineering in Geomatic Engineering (Program 3741) and the combined degrees of Bachelor of Engineering in Geomatic Engineering/Bachelor of Science in Computer Science (Program 3746), the combined Bachelor of Engineering (Geomatic Engineering)/Bachelor of Arts (Program 3747), and the Bachelor of Engineering (Geomatic Engineering)/Master of Commerce (Program 3748).

Students taking the BE in Geomatic Engineering (3741) can specialise in the third and fourth years. Formal graduate courses lead to the award of the degree of Master of Engineering Science in Geomatic Engineering 8651, Master of Engineering Science in Geographic Information Systems 8652, and Master of Engineering Science (Land Administration) 8653; of the Graduate Diploma in Geomatic Engineering 5492, and of the Graduate Diploma in Land Administration 5493. Opportunities are provided for graduate research leading to the award of the degrees of Master of Engineering in Geomatic Engineering 2721 and Doctor of Philosophy 1681. Students may undertake selected programs in the Master of Engineering Science and Graduate Diploma by distance learning.

The School of Geomatic Engineering is also involved in the Centre for Remote Sensing and Geographic Information Systems in association with the School of Geography in the Faculty of Science and Technology. The Centre supports graduate programs leading to the award of the degree of Master of Engineering Science in Remote Sensing 8641 or Master of Applied Science 8720.4003 or the Graduate Diploma in Remote Sensing and Geographic Information Systems 5522.4003, in addition to supervision for the degree of Doctor of Philosophy (1681).
Bachelor of Engineering (Geomatic Engineering) Program
(Program No. 3741)

The BE (Geomatic Engineering) degree program is a well rounded program aimed at preparing the graduate for a broad range of career opportunities in the various branches of Geomatic Engineering and in associated fields. Graduates will use their fundamental knowledge, and the skills they acquired during their undergraduate studies to practice as surveyors, consultants, managers, teachers or researchers. Indeed a single graduate may take on several of these roles during his or her career. To this end, the BE (Geomatic Engineering) degree program covers general scientific principles with special emphasis on surveying and computing, as well as other specialised Geomatic Engineering applications. Theoretical studies are complemented by practical exercises in the field and in the laboratory.

The BE (Geomatic Engineering) is a four year, full time degree program, although the program may be taken in a sandwich form in which a student may, after completing the first year of the program on a full-time basis, alternate his or her studies with one or more periods of employment by taking leave of absence of up to two consecutive sessions.

Recognition

Depending on the selected elective subjects, the degree of BE (Geomatic Engineering) is recognised by the Board of Surveyors of New South Wales as meeting all examination requirements for registration as a Registered Surveyor in New South Wales, and is recognised by the Institution of Surveyors, Australia and the Institution of Engineers Australia (IEAust.) for admission as corporate members.

Students wishing to become Registered Surveyors, after graduation, are advised to gain practical experience under a Registered Surveyor during their program. Details are obtainable from the Registrar, Board of Surveyors of NSW, P.O. Box 39, Sydney NSW 2001.

Field Excursions

Students may have to complete a number of field projects as part of their program and are expected to complete all necessary fieldwork for any course. They must be prepared to pay all the appropriate costs associated with these field projects, and must be in attendance at all scheduled examinations except in exceptional circumstances.

Combined Bachelor of Engineering in Geomatic Engineering/Bachelor of Science in Computer Science Program
(Program No. 3746)

This combined degree program of five years full-time study enables a student to qualify for the award of the two degrees of Bachelor of Science in Computer Science and Bachelor of Engineering in Geomatic Engineering. The program authority for the combined degree is the School of Geomatic Engineering. The program is open to all students who satisfy both the Geomatic Engineering and Computer Science entry conditions.

The program is specifically designed for students wishing to enter a career in Geomatic Engineering specialising in surveying, satellite positioning, spatial data handling for land and geographic information systems, remote sensing, digital mapping and terrain analysis. The content of the program comprises courses from the BSc in Computer Science and BE degree courses with some variations to accommodate the requirements of both degrees. The selection of courses from both programs is flexible and it should be possible to complete the requirements for the award of the BE degree after four years study and the BSc degree after five years.

Combined Bachelor of Engineering (Geomatic Engineering)/Bachelor of Arts Program
(Program No. 3747)

General

With this combined degree program, students can add their choice of an Arts major to the standard, professionally accredited engineering program offered by the School of Geomatic Engineering. It provides flexibility in the choice of courses within the full Arts program and enables students to gain a broad education in Arts and Social Sciences, as well as to engage in specialised studies in Geomatic Engineering.

Because the Geomatic Engineering and Arts programs can have a common content, such as mathematics and physics, only one more year of study is required to gain the additional qualification of Bachelor of Arts.

Eligibility

The program is open to all students who satisfy both the Engineering and Arts entry conditions. Students may enter directly in Year 1 or may apply to transfer from the Geomatic Engineering program later, although with late transfer it might not be possible to complete the program in minimum time.

Organisation

The BE (Geomatic Engineering)/ Bachelor of Arts program is administered by the School of Geomatic Engineering.
GEOMATIC ENGINEERING 121
Bachelor of Engineering (Geomatic Engineering)/Master of Commerce program
(Program No. 3748)

This program will provide professional qualifications in engineering and business/commerce. It is suited to high ability students who have interests in technology and wish to work with, and manage teams of professionals, projects and business. The strength of the program is that you can graduate with a technical degree and complete the Master of Commerce (MCom) degree on a full-time or part-time basis, combining management training with on-the-job experience.

In this combined degree, students complete years 1 to 3 of the Bachelor of Engineering in Geomatic Engineering (Program 3741). In Year 4, students are not required to complete GMAT7722 Project Management of the BE program, but must complete the following three M.Com programs:
- ACCT 5901 Accounting: A User Perspective
- ECON 5103 Business Core Elective
- 1 Commerce Core Elective

Students continuing the MCom program must complete six non-core Commerce electives in Year 5 and two non-core Commerce electives in Year 6. Students should consult the Handbook of the Faculty of Commerce and Economics for details of the electives.

There is a testamur awarded for each degree. The BE degree will be awarded on the satisfactory completion of the first four years of the program.

Undergraduate Study

Computing Requirements

Information regarding recommended computing equipment and software for the courses offered by the School is available from the School Office.

English Requirement

Students entering the program are expected to have achieved HSC scores in English as follows: 2 unit English (General) 53–100, or 2 unit English (Related) 49–100, or 3 unit English (Related) 1–50, or 2 unit Contemporary 60–100. Students not meeting these standards are required to take remedial English studies offered by the English Support Unit.

Program Outlines

3741
Geomatic Engineering

Bachelor of Engineering in Geomatic Engineering

<table>
<thead>
<tr>
<th>Year 1</th>
<th>HPW</th>
<th>UOC</th>
<th>S1</th>
<th>S2</th>
</tr>
</thead>
<tbody>
<tr>
<td>GMAT1100 Principles of Surveying</td>
<td>5</td>
<td>0</td>
<td>6</td>
<td></td>
</tr>
<tr>
<td>GMAT1300 Computing Applications in Geomatics</td>
<td>4</td>
<td>0</td>
<td>6</td>
<td></td>
</tr>
<tr>
<td>MATH1131 Mathematics 1A</td>
<td>6</td>
<td>0</td>
<td>6</td>
<td></td>
</tr>
<tr>
<td>or MATH 1141 Higher Mathematics 1A</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>PHYS1998 Physics</td>
<td>6</td>
<td>0</td>
<td>6</td>
<td></td>
</tr>
<tr>
<td>GMAT1150 Survey Methods &amp; Computations</td>
<td>0</td>
<td>5</td>
<td>6</td>
<td></td>
</tr>
<tr>
<td>GMAT1200 Visualisation of Spatial Data</td>
<td>0</td>
<td>4</td>
<td>6</td>
<td></td>
</tr>
</tbody>
</table>

The program structure for Years 3 and 4 of the program depends on the electives chosen by students.

<table>
<thead>
<tr>
<th>Year 3</th>
<th>HPW</th>
<th>UOC</th>
<th>S1</th>
<th>S2</th>
</tr>
</thead>
<tbody>
<tr>
<td>GMAT3200 Geospatial Information Technologies</td>
<td>0</td>
<td>6</td>
<td></td>
<td></td>
</tr>
<tr>
<td>GMAT3400 Cadastral Surveying</td>
<td>3</td>
<td>0</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>General Education courses</td>
<td>2</td>
<td>0</td>
<td>6</td>
<td></td>
</tr>
<tr>
<td>Electives (Session 1)</td>
<td>12</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>GMAT3500 Photogrammetry &amp; Remote Sensing</td>
<td>0</td>
<td>5</td>
<td>6</td>
<td></td>
</tr>
<tr>
<td>GMAT3410 Land Economics &amp; Valuation</td>
<td>0</td>
<td>2</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>Electives (Session 2)</td>
<td>12</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Total Units of Credit 48
### Electives: Session 1

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>S1</th>
<th>S2</th>
</tr>
</thead>
<tbody>
<tr>
<td>CVEN0646</td>
<td>Water and Wastewater Engineering</td>
<td>3</td>
<td>0</td>
</tr>
<tr>
<td>GMAT3100</td>
<td>Surveying Applications</td>
<td>5</td>
<td>0</td>
</tr>
<tr>
<td>PLAN1093</td>
<td>Planning Perspectives</td>
<td>2</td>
<td>0</td>
</tr>
<tr>
<td>COMP1011</td>
<td>Computing 1A</td>
<td>6</td>
<td>0</td>
</tr>
<tr>
<td>MATH1081</td>
<td>Discrete Mathematics</td>
<td>6</td>
<td>0</td>
</tr>
<tr>
<td>COMP1021</td>
<td>Computing 1B</td>
<td>6</td>
<td>0</td>
</tr>
<tr>
<td>COMP2011</td>
<td>Data Organisation</td>
<td>6</td>
<td>0</td>
</tr>
</tbody>
</table>

The following electives may be chosen once COMP1011, COMP1021 and MATH1081 have been completed:

- COMP2021: Digital System Structures
- COMP2041: Software Construction: Techniques and Tools
- COMP2411: Logic and Logic Programming
- COMP3111: Software Engineering
- COMP3121: Algorithms and Programming Techniques
- COMP3131: Parsing and Translation
- COMP3211: Computer Organisation and Design
- COMP3221: Microprocessors and Interfacing
- COMP3231: Operating Systems
- COMP3241: Real-Time Systems: Specifications, Design and Implementation
- COMP3311: Database Systems
- COMP3331: Computer Networks and Applications
- COMP3411: Artificial Intelligence
- COMP3421: Computer Graphics
- COMP3511: Human Computer Interaction

### Year 1

#### Session 1: COMP1011, GMAT1100, MATH1131 or MATH1141, PHYS1998

- Session 1: COMP1011, GMAT1100, MATH1131 or MATH1141, and Year 1 GMAT elective (either GMAT1400 Land Studies in Geomatics, or GMAT1200 Visualisation of Spatial Data)

#### Session 2: COMP1021, GMAT1150, MATH1231 or MATH1241, and Year 1 GMAT elective (either GMAT1400 Land Studies in Geomatics, or GMAT1200 Visualisation of Spatial Data)

### Year 2

#### Session 1: GMAT2100, GMAT2700, MATH1081, MATH2829, PHYS2969

#### Session 2: GMAT2110, GMAT2200, GMAT2300, COMP2011, and Year 2 free elective

### Year 3

#### Session 1: COMP2 (a level 2 computing elective), GMAT3200, GMAT3400, Year 3 Electives: CVEN0646, GMAT3100, PLAN1093, General Education course/s

#### Session 2: GMAT3410, GMAT3450, GMAT3500, COMP 2 (a level 2 computing elective), Year 3 Electives: CVEN 0656, GMAT3150, General Education course/s

### Year 4 (from 2001)

#### Session 1: GMAT4000, COMP3 (a level 3 computing elective), GMAT4850, Year 4 GMAT Electives from: GMAT4400, GMAT4410, GMAT4900, GMAT9121

#### Session 2: GMAT4750, COMP3 (a level 3 computing elective) and Year 4 GMAT Electives from: GMAT4020, GMAT4450, GMAT4910, GMAT9211

### Year 5 (from 2001)

#### Session 1: GMAT4000 (Thesis Part A), COMP3 (2 level 3 Comp Sci & Eng. Electives totalling 12 units of credit)

#### Year 5 Electives (totalling 9 units of credit)

#### Session 2: GMAT4001 (Thesis Part B), COMP3 (a level 3 Comp Sci & Eng. Elective), and Year 5 Electives (9 units of credit).

#### Year 5 Electives may be chosen from any of the remaining GMAT Year 4 Electives or COMP level 3 or 4 courses.

Other arrangements of electives are possible with the approval of the Head of School.

The School of Geomatic Engineering is the program authority.

Students may choose to do 3 units of General Education in Year 2, and another 3 units in Year 3. It is possible to revert to the single BE (Geom. Eng.) degree; progress and conversion will be determined on an individual student basis by the program authority.
Combined Bachelor of Engineering (Geomatic Engineering)/Bachelor of Arts Program  
(Program No. 3747)

Organisation

The BE (Geomatic Engineering)/Bachelor of Arts program is administered by the School of Geomatic Engineering.

Students should start discussing their program with representatives of the School and the Faculty of Arts and Social Sciences as soon as possible - preferably well before enrolment. Students should work out for themselves the BA program they would like to add to their Geomatic Engineering program. The Faculty of Arts and Social Sciences Handbook describes the options, and the School of Geomatic Engineering can supply sample programs.

There are no special rules on what to include in each year. Students should schedule the Arts and Geomatic Engineering components to suit their preferences while meeting the constraints of timetables and prerequisites.

The Arts component must be approved by the Faculty of Arts and Social Sciences.

The final program and schedule must be approved by the School of Geomatic Engineering.

Rules

1. In addition to the BE program, students must complete 60 units of credit in the BA program, with no more than 24 units of credit obtained at Level 1 (ie in programs designed for students in their first year of study). Of these 24 Level 1 units of credit, no more than 12 units of credit may be from any one School or Department.

2. Students must complete a major sequence (42) units of credit in one of the areas of:

   - Chinese Studies
   - Education
   - English
   - Environmental Studies*
   - French
   - German Studies
   - Greek (Modern)
   - History
   - Indonesian Studies
   - Japanese Studies
   - Korean Studies
   - Linguistics
   - Music
   - Philosophy
   - Policy Studies
   - Political Science
   - Russian Studies
   - Science and Technology Studies
   - Sociology
   - Spanish and Latin American Studies
   - Theatre
   - Film and Dance.

   * Students completing an Environmental Studies major sequence must complete:

   - In addition to the 30 Upper Level units of credit specified, 6 Level 1 units of credit in an approved program.

   Students must also complete a minor sequence of 24 units of credit in one of the other areas listed in Rule 2, above.

3. Except for courses completed as part of the Environmental Studies major sequence, no more than 12 units of credit may be obtained from courses in the BA program which are offered by Schools outside the Faculty of Arts and Social Sciences. The course GEOG 3032 Remote Sensing Applications is excluded for all students in the BE (Geomatic Engineering) program.

4. No course included for credit in the BE program can be included in the 60 units of credit required at Rule 1 for the BA program.

5. Students are exempt from the general studies requirement of the BE program. However, students will not be eligible for graduation for the BE until a minimum of 12 units of credit of the BA have been successfully completed.

6. Students who complete the requirements for the BA program and the first two years of the BE program may proceed to graduation with the degree of Bachelor of Arts.

7. Students may be awarded Honours in the BA by successful completion of the honours year. It should be noted that entry into a particular BA Honours program requires completion of courses additional to those specified under Rules 1 - 4.

8. There will be a separate testamur for each part of the combined degree program.

---

BE/MCom Fast Track Program Structure Combined Bachelor of Engineering (Geomatic Engineering)/Master of Commerce program  
(Program No. 3748)

This program will provide professional qualifications in engineering and business/commerce. It is suited to high ability students who have interests in technology and wish to work with, and manage teams of professionals, projects and business. The strength of the program is that you can graduate with a technical degree and then complete the Master of Commerce (MCom) degree on a full-time or part-time basis, combining management training with on-the-job experience.

Program Structure BE (Geomatic Engineering)/Master of Commerce

Students must complete years 1 to 3 of the Bachelor of Engineering in Geomatic Engineering (Program 3741).

Years 4 to 6 are as follows:

**Year 4 (from 2001)**

**Session 1**

<table>
<thead>
<tr>
<th>Electives:</th>
<th>UOC</th>
</tr>
</thead>
<tbody>
<tr>
<td>GMAT4850 Geomatic Engineering for Sustainability</td>
<td>3</td>
</tr>
<tr>
<td>Electives</td>
<td>15</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>24</td>
</tr>
</tbody>
</table>

**Electives:**

- GMAT0580 Mining Surveying
- GMAT4000 Thesis Part A
- GMAT4020 Project in Geomatic Engineering
- GMAT4400 Land Management and Development Project 1
- GMAT4410 Land Subdivision and Development
- GMAT4900 Principles of GNSS Positioning
- GEOG3911 Environmental Impact Assessment
- CS & Eng. Elective

**Year 4 (from 2001)**

**Session 2**

<table>
<thead>
<tr>
<th>Electives:</th>
<th>UOC</th>
</tr>
</thead>
<tbody>
<tr>
<td>GMAT4750 Project Management 2</td>
<td>3</td>
</tr>
<tr>
<td>Two Master of Commerce courses</td>
<td>12</td>
</tr>
<tr>
<td>Electives</td>
<td>9</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>24</td>
</tr>
</tbody>
</table>

**Electives:**

- GMAT4001 Thesis Part B
- GMAT4450 Land Management and Development Project 2
- GMAT4910 Modern Navigation and Positioning Technologies
- CS&Eng Elective
- PLAN 1022 The Development Process
- PLAN 2012 Economic Development Planning
- PLAN 3032 Integrated Planning 3 – New Development

Other electives with the approval of the Head of School

**Year 5**

Students must complete six non-core Commerce electives.

**Year 6**

Students must complete two non-core Commerce electives.

Students should consult the Handbook of the Faculty of Commerce and Economics for details of the electives.

There is a testamur awarded for each degree. The BE degree will be awarded on the satisfactory completion of the first four years of the program.

Eligibility and Application

A minimum of 65% average in the first 3 years of the BE program is required. Students should apply at the end of Year 3 to undertake the MCom programs in Year 4. Normal HECS/fees applies for the 4 years of the undergraduate degree including the MCom programs in Year 4. However, course fees apply to the 8 remaining MCom courses.
Postgraduate Study

Formal graduate programs lead to the award of the degrees of Master of Engineering Science 8651, 8652 and 8653, and of Graduate Diplomas in Geomatic Engineering 5492 and Land Administration 5493.

Opportunities are provided for graduate research leading to the award of the degrees of Master of Engineering Science 2721 and Doctor of Philosophy 1681.

The School of Geomatic Engineering is also involved in the Centre for Remote Sensing and Geographic Information Systems in association with the School of Geography in the Faculty of Science and Technology. The Centre supports graduate programs leading to the award of the degree of Master of Engineering Science in Remote Sensing 8641 or Master of Applied Science 8720.4003 or the Graduate Diploma in Remote Sensing and Geographic Information Systems 5522.4003.

8651
Geomatic Engineering

Master of Engineering Science MEngSc

Programs of study leading to the degree of MEngSc are offered by the School of Geomatic Engineering in a range of topics including:

• advanced surveying,
• geodesy,
• image analysis in photogrammetry and remote sensing,
• land administration,
• land and geographic information systems,
• remote sensing

Candidates are allowed a wide choice in selecting courses. These can be selected to suit individual student needs and typical course structures can be supplied by the School on request. The program of study must total at least 48 units of credit. About 2 units of credit are normally equal to attendance for one hour per week for one session. Some senior undergraduate courses may be taken for partial credit towards the degree. Examples of suitable external courses are computing, statistics, oceanography, project management and a range of others.

8653
Land Administration

Master of Engineering Science MEngSc

The program is specifically designed for employees in developing countries and Australian consultants who are associated with the introduction of Land Title Reform programs in developing countries. Candidates are required to complete a program totalling at least 48 units of credit made up of seven compulsory core courses and one elective. Compulsory courses not offered in a particular year may be substituted by an equivalent course approved by the appropriate Head of School. The program comprises one year of full-time study or two years of part-time study.

Core Courses

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>UOC</th>
</tr>
</thead>
<tbody>
<tr>
<td>CVEN8731</td>
<td>Project Management Framework</td>
<td>6</td>
</tr>
<tr>
<td>GMAT9604</td>
<td>Land Information Systems</td>
<td>6</td>
</tr>
<tr>
<td>GMAT9608</td>
<td>Cadastral Systems</td>
<td>6</td>
</tr>
<tr>
<td>GMAT9609</td>
<td>Land Registration Systems</td>
<td>6</td>
</tr>
<tr>
<td>GMAT9610</td>
<td>Reform in Land Titling and Registration</td>
<td>6</td>
</tr>
<tr>
<td>GMAT9611</td>
<td>Land Law for Land Administration</td>
<td>6</td>
</tr>
<tr>
<td>SOCI5336</td>
<td>Sociology of Development</td>
<td>6</td>
</tr>
</tbody>
</table>

Elective Courses

Candidates are allowed a wide choice in selecting courses. These can be selected to suit individual student needs and typical course structures can be supplied by the School on request. The program of study must total at least 48 units of credit. About 2 units of credit are normally equal to attendance for one hour per week for one session. Some senior undergraduate courses may be taken for partial credit towards the degree. Examples of suitable external courses are computing, statistics, oceanography, project management and a range of others.

8652
Geographic Information Systems

Master of Engineering Science MEngSc

Candidates are required to complete a program totalling at least 48 units of credit made up of compulsory core courses and electives. Compulsory courses not offered in a particular year may be substituted by an equivalent course approved by the appropriate Head of School. The program comprises one year of full-time study or two years of part-time study.

Core Courses

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>UOC</th>
</tr>
</thead>
<tbody>
<tr>
<td>GEOG9016</td>
<td>Principles of Geographic Information Systems</td>
<td>6</td>
</tr>
<tr>
<td>GEOG9017</td>
<td>Advanced Geographic Information Systems, or</td>
<td>6</td>
</tr>
<tr>
<td>GMAT9604</td>
<td>Land Information Systems</td>
<td>6</td>
</tr>
<tr>
<td>GMAT9609</td>
<td>Land Registration Systems</td>
<td>6</td>
</tr>
<tr>
<td>GMAT9610</td>
<td>Reform in Land Titling and Registration</td>
<td>6</td>
</tr>
<tr>
<td>GMAT9611</td>
<td>Land Law for Land Administration</td>
<td>6</td>
</tr>
<tr>
<td>SOCI5336</td>
<td>Sociology of Development</td>
<td>6</td>
</tr>
</tbody>
</table>

Elective Courses

Candidates are allowed a wide choice in selecting courses. These can be selected to suit individual student needs and typical course structures can be supplied by the School on request. The program of study must total at least 48 units of credit. About 2 units of credit are normally equal to attendance for one hour per week for one session. Some senior undergraduate courses may be taken for partial credit towards the degree. Examples of suitable external courses are computing, statistics, oceanography, project management and a range of others.
Elective Courses UOC

REST0005 Real Estate Valuation 3
CVEN8701 Engineering Economics & Financial Management 6
GEOG9016 Principles of Geographic Information Systems 6
GEOG9018 Transport Applications of GIS 6
GEOG9020 Application and Management of Geographical Information Systems 6
GMAT3200 Geospatial Information Tech & App 6
GMAT9533 Land Use Mapping and Administration 6
ACCT5917 Strategic Management: Systems and Processes 6
IMGT 5110 Information Retrieval Systems 6

8641 Remote Sensing

Master of Engineering Science MEngSc
Candidates are required to complete a program totalling at least 48 units of credit, made up of core courses and electives. Compulsory courses not offered in a particular year may be substituted by an equivalent course, approved by the appropriate Head of School. The degree will normally comprise one year of full-time study (two sessions of 24 units of credit) or two years of part-time study.

Core courses UOC
GEOG9012 Remote Sensing Applications 6
GEOG9021 Image Analysis in Remote Sensing 6
GMAT9600 Principles of Remote Sensing 6
GMAT9606 Microwave Remote Sensing 6
2 Electives chosen from the list below 12

Elective courses
Candidates may include additional courses selected from the following listed elective courses, or from other relevant courses offered within the University, as approved by the appropriate Head of Schools.

UOC
COMP1011 Computing 1A 6
COMP1021 Computing 1B 6
ELEC9370 Digital Image Processing Systems 6
ELEC9408 Computer Display Systems and Interactive Instrumentation 6
GEOG9014 Computer Mapping and Data Display 6
GEOG9016 Principles of GIS 6
GEOL0360 Remote Sensing Applications in Geoscience 6
GMAT9604 Land Information Systems 6
GEOG9020 Application and Management of GIS 6

5492 Graduate Diploma in Geomatic Engineering GradDip
Candidates are required to complete a program totalling 36 units of credit. Details of the recommended programs of study may be obtained from the Head of the School of Geomatic Engineering. Programs from the Masters programs can be taken in the Graduate Diploma programs subject to the approval of the Postgraduate Coordinator.

5493 Graduate Diploma in Land Administration GradDipLandAdmin
Candidates are required to complete a program totalling 36 units of credit, made up of six compulsory courses, with compulsory attendance at seminars and work experience as prescribed by the program authority. The diploma will normally comprise one year of full-time study or two years of part-time study.

Core courses UOC
CVEN8731 Project Management Framework 6
GMAT9604 Land Information Systems 6
GMAT9608 Cadastral Systems 6
GMAT9609 Land Registration Systems 6
SOCI5336 Sociology of Development 6
1 Elective

5496 Graduate Diploma in Remote Sensing GradDip
Candidates are required to complete a program totalling 36 units of credit. Details of the recommended programs of study may be obtained from the Head of the School of Geomatic Engineering. Programs from the Masters programs can be taken in the Graduate Diploma programs subject to the approval of the program coordinator.
Course Descriptions

Descriptions of all courses are presented in an alphanumeric order within organisational units. For academic advice regarding a particular course consult with the contact for the course as listed. A guide to abbreviations and prefixes is included in the chapter Handbook, appearing earlier in this book.

GMAT0411
Surveying in Building and Construction
Staff Contact: School Office
UOC3 HPW3 WKS14 S1 and S2
Note/s: This is a servicing subject taught within courses offered by other schools and faculties

GMAT0441
Surveying for Engineers
Staff Contact: Dr BR Harvey
UOC3 HPW3 WKS14 S2
Note/s: This is a servicing subject taught within courses offered by other schools and faculties
Principles of surveying; coordinate systems, levelling, linear and angular measurement. Traversing, tacheometry and electronic distance measurement. Areas and volumes. Horizontal and vertical curves. Control, underground and construction surveys. Outline of photogrammetry, GPS and deformation surveys.

GMAT0442
Surveying for Civil Engineers
Staff Contact: Contact School Office
UOC3 HPW3 WKS14 S1
Note/s: This is a servicing subject taught within courses offered by other schools and faculties
A servicing subject for civil engineering students to introduce them to surveying and principles of geomatic engineering. Topics include: Linear and angular measurement (band and electronic distance measurement); Levelling principles and applications including laser levelling and bar code levelling; 3D coordinate systems; Traversing and control surveys; field-to-final electronic data survey; electronic data recording; horizontal and vertical curves and construction survey set outs; areas and volumes, survey to monitor deformations of structures and mine walls; GPS (satellite positioning); and an introduction to consulting services available from Geomatic Engineers.

GMAT0491
Survey Camp
Staff Contact: School Office
UOC3 HPW3 WKS1
Prerequisite/s: GMAT0441 or GMAT0442
Note/s: This is a servicing subject taught within courses offered by other schools and faculties
A one-week field camp for students studying GMAT0441 Surveying for Civil Engineers.

GMAT0580
Mining Surveying
Staff Contact: A/Prof JM Rüeger
UOC3 HPW3 WKS14 S1
Prerequisite/s: GMAT0441
Note/s: This is a servicing subject taught within courses offered by other schools and faculties

GMAT0753
Introduction to Spatial Information Systems
Staff Contact: Dr E G Masters
UOC3 HPW2 WKS14 S1 and S2
Note/s: This is a servicing subject taught within courses offered by other schools and faculties
To provide an overview of the available sources of information and technologies of Spatial Information Systems and an introduction to analysis and modelling of spatial data. A review of the importance of geographic location to environmental problems. An introduction to various types of mapping, as well as coordinate systems used in surveying and mapping, especially with reference to systems used in Australia. An overview of various application, including field surveying, GPS, remote sensing and aerial photography, photogrammetry and digitising existing maps. Use of GIS technology to manage, analyse and display spatial information. The link with remote sensing image processing. Classifying information and spatial analysis methodology. A selection of field and laboratory exercises using GIS software, image processing software, field surveying and GPS technology.

GMAT1100
Principles of Surveying
Staff Contact: A/Prof W Kearsley
UOC6 HPW5 WKS14 S1
Induction to Geomatic Engineering: a 2 day workshop will be held in week 3 of the course to discuss the range of topics covered in Geomatic Engineering, gain hands-on experience with the School's facilities and laboratories, and develop teamwork amongst the students. Horizontal reference frames and positions. Tubular bubbles, surveying telescopes. Theodolites; direction measurement. Distance measurement with steel tapes, bands and electronic tacheometers. Total stations. GPS positioning. Detail surveys. Levelling, level runs, instrument errors and tests. Field techniques and data recording. Use of minor survey equipment. Reconnaissance surveys: field sketches and planning. Recovery sketches.

GMAT1150
Survey Methods and Computations
Staff Contact: Dr B Harvey
UOC6 HPW5 WKS14 S2
Prerequisite/s: GMAT1100

GMAT1200
Visualisation of Spatial Data
Staff Contact: Dr B Harvey
UOC6 HPW4 WKS14 S2

GMAT1300
Computing Applications in Geomatics
Staff Contact: Dr EG Masters
UOC6 HPW4 WKS14 S1
Applications of computing technology to Geomatics including the development of proficiency with commonly used software packages. Overview of hardware, operating systems, networks, the Internet, applications software, and peripherals including storage media,
printers, scanners, digitizers. Use of word processors, spreadsheets, databases, presentation packages, graphics and visualisation packages, publishing and multi-media, browsers and email. The application of these packages to various aspects of Geomatics including data input, data manipulation, data management and storage, data presentation and communication.

**GMAT1400**
**Land Studies In Geomatics**
*Staff Contact: A/Prof C Rizos*
UOC6 HPW5 WKS14 S2

What is “Land”? Topographic and geomorphological descriptions of land. Land cover classification: soils and vegetation. Land use: rural and urban land. Land value and land economics. Land as a recreational resource, national parks, and ecological issues. Land as Real Estate. Land ownership and rights to use and redevelopment. Land from the cultural, social and spiritual perspectives. Native and other forms of “title”. Land, water and air space rights. Law of the Sea and sovereign rights over marine resources. State, Local and Federal Government jurisdictions over land. Professional communications will be an integral component of the subject. Students will be expected to analyse the subject material and prepare appropriate responses, including: poster presentations, addresses to a mock local government council meeting, PowerPoint presentations, and application of research methodology for the WWW and subsequent preparation of reports.

**GMAT2100**
**Electronic Surveying Instrumentation:Principles and Practice**
*Staff Contact: A/Prof JM Rüeger*
UOC8 HPW5 WKS14 S1

Prerequisite/s: GMAT1100, GMAT1150

Precise digital levelling (bar code) instruments and techniques; design, accuracy, errors. Precise levelling techniques, design and location of bench marks. Systematic and random errors, motorised levelling. Electronic theodolites, construction, circle reading, level sensors, centring systems, constrained centring, electronic data recording. Sources, testing and elimination of errors in electronic theodolites, eccentricities of alidade and horizontal circle. Vertical circle and level sensor errors; circle graduation errors. Centring and levelling of theodolites. Precise horizontal angle measurement, definition of an arc of directions, observation procedures, elimination of errors, National and State specifications; precise zenith angle measurement. Trigonometric heighting, effects of earth curvature and refraction, observation procedures, precision of computed heights; EDM-height traversing.

**GMAT2110**
**Electronic and GPS Positioning Techniques**
*Staff Contact: A/Prof JM Rüeger*
UOC6 HPW5 WKS14 S2

Prerequisite/s: GMAT1100, GMAT1150
Corequisite/s: GMAT2100

Principles and applications of EDM: basic working principles; phase measurement techniques, coefficient of refraction, flight-time measurement in short range pulse distance meters, working principles of microwave distance meters; wave propagation in atmosphere, atmospheric transmittance and range equation; measurement of atmospheric parameters, velocity corrections; geometric reductions, reductions of distances to the spheroid, analysis of errors, corrections to EDM measurements; electro-optical distance meters; calibration of electro-optical instruments; reflectors; field procedures. GPS surveying; the GPS signal and measurement characteristics; GPS instruments; GPS planning, field and office procedures; GPS observations and equations; baseline measurements; networks; presentation of GPS measurements, datums, coordinate systems and heights; data acquisition from maps and images.

**GMAT2200**
**Geographic Information Systems & CAD**
*Staff Contact: Dr EG Masters*
UOC6 HPW5 WK514 S2

Corequisite/s: GMAT 2110, GMAT 2700

Inputting both spatial and attribute data to the GIS. Transformation of data between coordinate systems, such as digitizer coordinates, geodetic and geographic coordinates, and map projection coordinates. Editing data and creating topologically clean data. Tagging spatial data with attributes, linking spatial data to attribute databases. Use of basic analysis functions: spatial selection, attribute selection, making reports of spatial and attribute data, interfacing to the system using a high level language. Surveying CAD familiarisation with at least one CAD package commonly used in engineering surveying. Data entry for detail survey. Editing and setting attributes within the package. Contouring. Plan drawing. Demonstration of alternative CAD packages.

**GMAT2300**
**Analysis of Observations**
*Staff Contact: Dr EG Masters*
UOC3 HPW3 WK514 S2

Prerequisite/s: MATH1231, GMAT1150
Corequisite/s: MATH2019


**GMAT2350**
**Computing for Spatial Information Sciences**
*Staff Contact: Dr EG Masters*
UOC3 HPW3 WK514 S1

Corequisite/s: GMAT1300

Principles of program design. Algorithm development and programming languages. Procedural programming and event driven programming. Constant and variables types, data elements, input, output, event, syntax, loops, condition statements, procedures, forms and controls, menus and multiple document interface. Applications and GUI; application development in common programming languages. Exercises in program development.

**GMAT2700**
**Geometry of Coordinate Reference Systems**
*Staff Contact: A/Prof W Kearsley*
UOC6 HPW5 WK514 S1

Cartesian coordinate systems, applications of Cartesian coordinate transformations in geomatics. Mathematical transformations between geodetic, Cartesian and topocentric coordinate systems, ellipsoid geometry, orthometric and ellipsoid height systems; Keplerian orbit representation and the transformation of Keplerian elements into other satellite coordinate and velocity representations. Map projections and ellipsoidal geometry, principles of map projections, surveying and mapping projections, transverse Mercator projection, ellipsoidal computations. Corrections to field observations. Geodetic and astronomical reference systems; the relationship between natural and geodetic reference systems, deflection of the vertical; geoid models and reference ellipsoids, height systems, celestial coordinate systems. Geodetic coordinate systems and datums; definition of AGD, GDA and AHD.

**GMAT 3100**
**Surveying Applications**
*Staff Contact: A/Prof JM Rüeger*
UOC 6 HPW 5 WK5 14 S1

Prerequisite/s: GMAT2100, GMAT2110

This subject introduces the student to a wide variety of surveying applications undertaken as part of engineering projects. The student will be expected to perform common engineering surveying tasks.
such as the determination of volumes as well as the design, computation and set out of horizontal and vertical curves, roads, buildings and large structures. In addition, selected topics of specialist survey applications will be dealt with using lectures, site visits, guest speakers and technology demonstrations. Topics will be selected from the following areas of special surveys: mining surveying (including Azimuth transfer, north-seeking gyro theodolites, plumbing of shafts and high structures), industrial surveying, tunnel engineering, hydrographic surveying, alignments, monitoring of deformations and settlement of terrain, structures and machines, design of precise engineering networks, dimensional measurement.

GMAT3150
Field Projects
Staff Contact: Dr BR Harvey
U0C3 HPW6 WKS14 S2
Prerequisite/s: GMAT2100, GMAT2110
Corequisite/s: GMAT3100
Note/s: Students are required to attend a one week survey camp during the mid-year recess (equivalent to 3 contact hours per week) followed by 3 hours per week processing during session.

At camp, a survey project of substantial extent is carried out involving detail surveys, contour surveys and the setting-out of a road. The processing of the field data and the preparation of plans and reports is done during session.

GMAT3200
Geospatial Information Technologies and Applications
Staff Contact: Dr EG Masters
U0C6 HPW5 WKS14 S1
Corequisite/s: GMAT2200

Concepts and definitions of spatial systems, coordinate systems, mapping and spatial issues with maps, data structures including vector, raster and surface modelling. An overview of the components of the technology, database management in the context of spatial data, database design, data acquisition techniques including overviews of digitizing, scanning, field survey and remote sensing, the data conversion process, data management, display of geospatial data, cartography, colour and 3D views. Analysis of geospatial problems including components of data acquisition and database development, spatial analysis and display, and customising and performing advanced analysis using macro languages and integrating with other software, using the World Wide Web to disseminate information. Management and institutional issues including how the technology and data is used by various organisations and government departments, geo-spatial data issues for government and industry, standards, Metadata, legal issues associated with these systems, intellectual property, copyright, liability, project management and implementation of these systems.

GMAT 3400
Cadastral Surveying 1
Staff Contact: M Green
U0C3 HPW3 WKS14 S1

The legal system in Australia and NSW; the nature of land law including land tenure, estates in land, interests in land. Land title systems. Land administration in Australia and NSW. Boundary surveying principles. Cadastral mapping in NSW.

GMAT 3410
Land Economics and Valuation
Staff Contact: M Green
U0C3 HPW2 WKS14 S2

The surveyor's role in the economic use of land. Variation of land use and land value. Temporal change of land use due to supply and demand, and its effect on land development and urbanisation. Location theory, public measures for directing land use, introduction to valuation; factors affecting value of land, valuation principles and practice.

GMAT3450
Cadastral Surveying 2
Staff Contact: M Green
U0C3 HPW3 WKS14 S2
Corequisite/s: GMAT3400

Survey investigation for both artificial and natural boundaries; survey and title searching. Fieldnote preparation for cadastral surveying. Survey marking and preparation of plans of survey. Study of appropriate statutes and regulations. Cadastral survey techniques for urban and rural properties; the status of roads in NSW, strata plan surveys, identification surveys, consents for MHWM, railways, rivers, kerbs in Sydney. The role of coordinates in cadastral surveying.

GMAT3500
Photogrammetry and Remote Sensing
Staff Contact: School Office
U0C6 HPW5 WKS14 S2

Introduction to geometric and spectral properties of remotely sensed images. Analogue and digital images - photography, electro-optical and microwave systems. Introduction to the physics of visible, infrared and microwave remotely sensed imagery. Atmospheric effects. Image geometry - central projection, scan and microwave systems. Concept of stereovision. Inner orientation of central projection, collinearity equations, deviations from collinearity. Exterior orientation of sensor systems; object geometry from overlapping images, for block photography for aerial and close range applications. Digital photogrammetric workstations and their functions. Photogrammetric project planning. Image interpretation.

GMAT77001
Thesis Part A
Staff Contact: A/Prof C Rizos
U0C3 HPW2 WKS14 S1
Corequisite/s: GMAT8002

Generally, the thesis involves directed laboratory, investigatory, design, field or research work on an approved subject under the guidance of members of the academic staff. Time devoted to the project is two hours per week in Session 1 for library methodology instruction and preliminary work and six hours per week in Session 2 to carry out the major part of the work. Each student is required to prepare a thesis proposal with literature review as part of the requirements for GMAT77001 Thesis Part A. Satisfactory performance in subject GMAT7701 is a prerequisite for progress to subject GMAT8002. Each student is required to present a seminar and to submit a written thesis report on the work undertaken to satisfy the requirements for GMAT8002 Part B.

GMAT77052
Field Projects 3
Staff Contact: School Office
U0C3 HPW3 WKS14 S1
Prerequisite/s: all Year 3 subjects

Note/s: Students are required to attend a one week survey camp during session (equivalent to 2 contact hours per week)

The field projects are selected from areas of cadastral, engineering and geodetic surveying. One hour per week during the session is set aside for the planning and preparation for field work and computations and the preparation of plans and reports.

GMAT77512
Photogrammetry and Mapping
Staff Contact: School Office
U0C3 HPW3 WKS14 S1
Prerequisite/s: GMAT6512

GMAT7532  
Spatial Information Systems 2  
Staff Contact: Dr EG Masters  
UOC3 HPW2 WKS14 S1  
Prerequisite/s: GMAT6532  
Management and application of spatial information systems; system life cycle; costs and benefits. Institutional issues. Data management; land information as maps and records. Existing systems. Future developments.

GMAT7612  
Land Management and Development Project 1  
Staff Contact: Mr M Green  
UOC3 HPW2 WKS14 S1  
Corequisite/s: GMAT7811  
Design and studio project for a residential neighbourhood development. Constraint and site analysis; preparation of maps of land use, vegetation, surface and soils, drainage and terrain, slopes, climate and aspect; composite overlay maps. Structure plan design: residential precincts, schools, commercial areas, industrial areas, active and passive recreation, pedestrian ways and road hierarchy.

GMAT7711  
Professional Practice Part A  
Staff Contact: A/Prof JM Rüeger  
UOC3 HPW2 WKS14 S1  
Corequisite/s: GMAT8712  
Students are individually examined in several practical surveying tasks (including levelling and traversing), both for the field component and the calculation component. Students are required to calibrate the electronic tacheometer used and to prepare a report.

GMAT7722  
Project Management 1  
Staff Contact: School Office  
UOC3 HPW3 WKS14 S1  
Corequisite/s: GMAT8722  

GMAT7811  
Land Subdivision and Development  
Staff Contact: School Office  
UOC3 HPW3 WKS14 S1  
Subdivision and development control in New South Wales. Administration of subdivision and development under Local Government and environmental planning and assessment legislation; procedures and legal controls. Statutory requirements for land development and subdivision of land, particularly as they apply to broad-acre subdivisions.

GMAT8002  
Thesis Part B  
Staff Contact: A/Prof C Rizos  
UOC6 HPW6 WKS14 S2  
Corequisite/s: GMAT7001  
Generally, the thesis involves directed laboratory, investigatory, design, field or research work on an approved subject under the guidance of members of the academic staff. Time devoted to the project is two hours per week in Session 1 for library methodology instruction and preliminary work and six hours per week in Session 2 to carry out the major part of the work. Each student is required to prepare a thesis proposal with literature review as part of the requirements for GMAT7001 Thesis Part A. Satisfactory performance in subject GMAT7001 is a prerequisite for progress to subject GMAT8002. Each student is required to present a seminar and to submit a written thesis report on the work undertaken to satisfy the requirements for GMAT8002 Part B.

GMAT8011  
Project Surveying  
Staff Contact: A/Prof JM Rüeger  
UOC3 HPW3 WKS14 S2  
Corequisite/s: GMAT5011  
Selected topics from: monitoring of deformations and settlement of terrain, structures and machines; design and optimisation of precise engineering networks; high precision distance measurement; 3-D measuring systems; computer controlled surveying; lengths transducers; alignment surveys; interferometer applications; collimation and auto-collimation techniques; optical tools; principle and use of gyrotheodolite; electronic tiltmeters; inertial surveys. Laboratory exercises on dimensional measurement and north-seeking gyroscope.

GMAT8222  
Physical and Space Geodesy  
Staff Contact: A/Prof AHW Kearsley  
UOC3 HPW2.5 WKS14 S2  
Prerequisite/s: GMAT5222  

GMAT8311  
Offshore Positioning  
Staff Contact: A/Prof C Rizos  
UOC3 HPW2.5 WKS14 S2  
Prerequisite/s: GMAT5222  

GMAT8612  
Land Management and Development Project 2  
Staff Contact: Mr M Green  
UOC3 HPW2 WKS14 S1  
Prerequisite/s: GMAT7612  
Corequisite/s: GMAT7811  
Continuation of design and studio project for a residential neighbourhood development. Plan of detailed lot layout: consideration of access, grades, drainage reserves, parks and pedestrian ways. Engineering design and plans: catchment details, road longitudinal and cross-sections, drainage layout, flow schedule, hydraulic grade line calculations, longitudinal sections of kerb profiles.

GMAT8712  
Professional Practice Part B  
Staff Contact: Dr BR Harvey  
UOC3 HPW1 WKS14 S2  
Corequisite/s: GMAT7711  
Students must complete 60 days of approved professional practice prior to the completion of this subject. Professional practice is to be taken during the vacation periods. Students are required to provide evidence of this practice in a special log-book (available from the School). A detailed report must be submitted and a seminar must be presented summarising the work done and the experience gained during the professional practice period.
GMAT8722

Project Management 2

Staff Contact: School Office

UC06 HPW3 WK514 S2

Corequisites: GMAT7722

Aims and forms of project organisation. Preparation of contracts and specifications: contract law, subcontracting, contract work, bidding. Project scheduling, control and documentation. Project teams in a corporation. Psychology of professionals. Qualifications of a project manager. Decision making process in project management: authority, power, interaction, leadership, assignments. Human resource management: small group behaviour, learning curve, management of teams in professional practice, professional liabilities and responsibilities. Case studies in the application of project management.

GMAT9106

Special Topic In Geomatic Engineering A

Staff Contact: School Office

UC06 HPW3 WK514

This syllabus changes to allow presentation of a special topic of current interest particularly by visitors with recognised expertise in the topic.

GMAT9107

Special Topic In Geomatic Engineering B

Staff Contact: School Office

UC06 HPW3 WK514

A special subject taken by an individual student or a small group of students by private study in conjunction with tutorial sessions with the member(s) of staff in charge of the subject.

GMAT9121

Network and Deformation Analysis

Staff Contact: Dr BR Harvey

UC06 HPW3 WK514

Selected topics from: Geodetic datum and invariant quantities, measures of accuracy, testing of hypotheses, outlier detection, internal and external reliability and sensitivity criteria, variance component estimation, design and optimisation of deformation monitoring networks, two-epoch analysis, multi-epoch analysis, case studies of monitoring networks.

GMAT9211

Introduction to Geodesy

Staff Contact: AProf AHW Kearsley

UC06 HPW3 WK514 S2


GMAT9212

GPS Surveying

Staff Contact: AProf C Rizos

UC06 HPW3 WK514

Introduction to GPS, satellite positioning, the GPS system, field planning and office procedures, GPS instrumentation, modelling, GPS observables, introduction to data processing, use of software, ambiguity resolution, modern GPS surveying techniques, baseline adjustment within networks, transformations, height determination. Tutorials and field exercises will focus on mathematical modelling issues, understanding GPS performance using commercial hardware/software systems.

GMAT9532

Data Acquisition and Terrain Modelling

Staff Contact: School Office

UC06 HPW3 WK514


GMAT9533

Land Use Mapping and Administration

Staff Contact: School Office

UC06 HPW3 WK514

Physical, social, economic factors affecting rural and urban land use around the world. Land use administration procedures. Data/information needs. Land use classification systems; capability; resource inventory surveys. Mapping tools; properties of photogrammetric and remotely sensed images. Image geometry, analysis procedures and interpretation; photogrammetric mapping procedures. Topographic and thematic map production. Various uses of map products and GIS.

GMAT9600

Principles of Remote Sensing

Staff Contact: School Office

UC06 HPW3 WK514 S1


GMAT9604

Land Information Systems

Staff Contact: Dr EG Masters

UC06 HPW3 WK514 S2


GMAT9606

Microwave Remote Sensing

Staff Contact: School Office

UC06 HPW3 WK514 S2

Use of passive and active (radar) microwave techniques in remote sensing of earth resources. Topics include: real and synthetic aperture radar systems; passive microwave radiometry; energy-surface interactions; interpretation of microwave image data: applications in agriculture, geology, oceanography and hydrology; issues in signal and image processing; characteristics of airborne and spaceborne microwave sensors.

GMAT9608

Cadastral Systems

Staff Contact: School Office

UC06 HPW3 WK514

Components, administration and principles of cadastral systems. Systems of land tenure. Cadastral parcel identification systems. Cadastral surveys and adjudication; title searching, survey marking and preparation of plans: statutes and regulations; quality control of cadastral practitioners; accuracy control procedures. Reference systems: local survey and national geodetic datums. Title definition by metes and bounds or coordinates, and GPS in cadastral surveys. Cadastral reform: International case studies.

GMAT9609

Land Registration Systems

Staff Contact: School Office

UC06 HPW3 WK514

Classification and historical background of registration systems - especially current systems in Australia and Asia. Deed and title registration, hybrid systems. First registration, qualified and limited titles. State land titles, owners and state rights, adverse possession. Land transactions, processes and record keeping; regulations for various dealings and transfers of land. Record keeping, Assessment of implementation and acceptance of various land registration systems.
GMAT9610
Reform In Land Titling and Registration
Staff Contact: School Office
UOC6 HPW3 WKS14
Introduction to the characteristics, purposes and outcomes of reform. Social, economic, political and institutional influences; Planning and impact: current land use, ownership, registration, traditions, and methods of survey, resistance to change and community involvement, appeal structures. Schedules of implementation, man-power requirements. Examples of overseas land reforms (Thailand Land Titling project). Change options and comparisons: impact of advanced measurement techniques and information storage and transfer methods.

GMAT9611
Land Law for Land Administration
Staff Contact: School Office
UOC6 HPW3 WKS14
Principles and historical development; legal foundations of land administration and ownership in established and developing countries. Customary and legal rights: state vs. individual in different jurisdictions. Relationships of land law to other arms of the law. Interests in land; responsibilities under land laws. International perspectives - comparative land law, nature and sources of international law, relationship between international and domestic law; international agreements and litigation.

GMAT9906
Major Assignment
Staff Contact: A/Prof W Kearsley
UOC6 HPW3 WKS28

GMAT9950
Modern Technology in Geomatic Engineering
Staff Contact: A/Prof W Kearsley
UOC6 HPW3 WKS14
Note/s: By distance learning
Introduction to geodetic reference systems; coordinate systems for satellite orbits, global positions, maps; geoid models. Contemporary computing techniques. New developments in field survey equipment. Satellite positioning and processing for surveying and navigation. Data acquisition for GIS, including field surveys, map digitising, photogrammetry and remote sensing. An introduction to GIS database design, development and applications.

GMAT9951
Land Information Systems
Staff Contact: Dr EG Masters
UOC6 HPW3 WKS14
Note/s: By distance learning
Land information as maps and records. GIS development and implementation. Selected topics from system life cycles, economics and cost-benefit analysis, methods of data collection, data refinement, data storage, data analysis and manipulation, data presentation, programming. Application of GIS technology. Land management and administration, cadastral systems, land tenure, identifying issues in Land Information Systems, data issues, software, hardware, standards, institutional issues, coordinate systems, data validation, quality.

GMAT9952
GPS Surveying
Staff Contact: A/Prof C Rizos
UOC6 HPW3 WKS14
Note/s: By distance learning
Introduction to GPS and satellite positioning, the GPS system; field planning and office procedures; GPS instrumentation; modelling GPS observables; introduction to data processing and the use of software; ambiguity resolution; modern GPS surveying techniques; baseline adjustment with networks; transformations; height determination. Tutorials and field exercises will focus on the mathematical modelling issues, as well as understanding GPS performance using commercial hardware/software systems.

GMAT9953
Principles of Remote Sensing
Staff Contact: School Office
UOC6 HPW3 WKS14
Note/s: By distance learning
School of Mechanical and Manufacturing Engineering
(incorporating Aerospace Engineering, Mechatronic Engineering and Naval Architecture)

Head of School
Professor KP Byrne

Executive Assistant to Head of School
Dr JM Challen

Administrative Officer
Vacant

The School offers a Bachelor of Engineering program 3710 with plans in Aerospace Engineering, Manufacturing Engineering and Management, Mechanical Engineering, Mechatronic Engineering and Naval Architecture. Also offered are combined Bachelor degree programs with Science, 3711 or Arts, 3712 and concurrent Master degree programs with Biomedical Engineering, 3710/3749 or Commerce, 3710/8404.

No formal part-time plans are offered by the School. However, it is possible for students to undertake studies with a reduced load of courses. Students intending to take a reduced load are advised that very few undergraduate courses are offered in the evening.

Formal graduate coursework programs offered are the Graduate Diploma 5710 and the Master of Engineering Science 8710 both offering plans in Manufacturing Engineering and Management and in Mechanical Engineering. Opportunities are provided for graduate research leading to the award of the degrees of Master of Engineering 2692 and Doctor of Philosophy 1662.

The Co-op Program
The School offers the industry-linked Co-op Program within the Bachelor of Engineering program 3710 with plans in Manufacturing Engineering and Management, Mechanical Engineering and Mechatronic Engineering. In the Co-op Program students are funded from scholarships awarded by Australia's premier industries.

Co-operative scholars are selected largely on the basis of academic attainment, personal skills and motivation, as well as non-academic achievements. Together with receiving a rigorous and broadly-based academic education, scholars gain first-hand experience in a wide variety of industries during four industrial training periods. These take place in the summers at the ends of Years 1 and 2 and in two half-year periods, each at a different industry, in Year 4. Hence, the total duration is five years which includes more than one year of experience in industry.

Scholars must be prepared to sacrifice leisure during non-academic periods to gain the considerable practical training available.
Undergraduate Study

Program Outlines

Summary of Programs and Plans

The plans under program 3710, which lead to the award of the degree of Bachelor of Engineering (BE), are designed to provide the appropriate academic training for the professional engineer in the fields of Aerospace Engineering, Manufacturing Engineering and Management, Mechanical Engineering/Mechatronic Engineering and Naval Architecture. The first two years of these plans are identical whilst the third and fourth years of the plans contain a number of common courses. Students enrolled in the various plans usually attend the common courses together. Elective courses provide for a limited degree of specialisation in the fourth year of the Mechanical Engineering and Mechatronic Engineering plans. The Aerospace Engineering, Manufacturing Engineering and Management, and Naval Architecture plans do not have elective components. Each student is required to submit a thesis at the end of the final year and to deliver a short paper on the topic of the thesis.

The School also offers combined programs with Science, 3711 or Arts, 3712, leading to the award of the degrees of Bachelor of Engineering and Bachelor of Science (BE BSc) and Bachelor of Engineering and Bachelor of Arts (BE BA) respectively. These combined programs enable students to major in the area of computer science, materials science, mathematics, physics, statistics or another relevant field, in addition to studying their chosen engineering plan.

Concurrent Bachelor/Masters programs are also available. Mechanical Engineering students may study a special plan under Bachelor of Engineering program 3710 and then, in a fifth year, study under the Master of Biomedical Engineering program 3749 to obtain the award of Bachelor of Engineering/Master of Biomedical Engineering (BE MBiomedEd). The special plan under 3710 commences in first year. Similarly Manufacturing Engineering and Management students and Mechanical Engineering students may study special plans under Bachelor of Engineering program 3710 and then, in their fifth year, study under the Master of Commerce program 8404, to obtain the award of Bachelor of Engineering/Master of Commerce (BE MCom). The special plans under 3710 commence in fourth year.

Industrial Experience

Industrial experience is an integral part of the programs. This can be taken within Australia or overseas. Students must complete a total of sixty working days of industrial experience between second and third year and third and fourth year. A written report describing this experience is a requirement to passing the common, fourth year course MECH4001 Communications for Professional Engineers.

Recognition

The Institution of Engineers, Australia, recognises the degree of BE in any of the undergraduate programs offered by the School as meeting the examination requirements for admission to graduate and corporate membership. Substantial or complete recognition is accorded to the BE degree programs by overseas engineering institutions.

The award of the BE degree in Aerospace Engineering is recognised by the Royal Aeronautical Society as giving exemption from the formal examination required for corporate membership. Advancement from graduate membership to associate membership grade is awarded on a case by case basis after a further period of some years of professional experience.

Program Progression Guidelines

The student's attention is directed to the Faculty's General Rules for Progression contained in this Handbook. As well, the following points should be noted.

- A student who is faced with compiling a timetable comprising courses from two academic years must give preference to courses from the lower year.

Thesis Arrangements

- The course MECH4001 Communications for Professional Engineers must only be taken in conjunction with either MECH4003 Thesis A or MECH4004 Thesis B.
- MECH4003 and MECH4004 must be undertaken in two consecutive sessions which are the final two sessions of candidature.
- A student must not be enrolled in more than 24 Units of Credit in any session involving MECH4003 and MECH4004.
- A single thesis project is commenced in MECH4003 and completed in MECH4004.
- MECH4003 is graded satisfactory/unsatisfactory and MECH4004 carries the mark for the thesis project.
- If the project is abandoned during MECH4004, or if MECH4004 is failed, then the satisfactory for MECH4003 is deleted. If the student decides to complete the degree a completely new topic must be chosen and the student must enrol again in both MECH4003 and MECH4004.

Single Degree Program

3710

Bachelor of Engineering

Aerospace Engineering Plan

Manufacturing Engineering and Management Plan

Mechanical Engineering Plan

Mechatronic Engineering Plan

Naval Architecture Plan

Year 1 of all plans

<table>
<thead>
<tr>
<th>Code</th>
<th>Name</th>
<th>HPW</th>
<th>UOC</th>
</tr>
</thead>
<tbody>
<tr>
<td>CHEM1817</td>
<td>Chemistry 1ME</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>MANF1130</td>
<td>Introduction to Manufacturing</td>
<td>7</td>
<td>6</td>
</tr>
<tr>
<td>MATH1131</td>
<td>Mathematics 1A</td>
<td>6</td>
<td>6</td>
</tr>
<tr>
<td>MATH1231</td>
<td>Mathematics 1B</td>
<td>6</td>
<td>6</td>
</tr>
<tr>
<td>MATS9520</td>
<td>Engineering Materials</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>MECH1120</td>
<td>Design and the Engineering</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>MECH1300</td>
<td>Engineering Mechanics 1</td>
<td>4</td>
<td>6</td>
</tr>
<tr>
<td>MECH1400</td>
<td>Mechanics of Solids 1</td>
<td>4</td>
<td>6</td>
</tr>
<tr>
<td>MECH1500</td>
<td>Computing 1M</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>PHYS1169</td>
<td>Physics ICME</td>
<td>6</td>
<td>6</td>
</tr>
</tbody>
</table>
The proviso is that Head of the School is satisfied that the courses studied at the other institution are equivalent, and he gives his satisfaction to the requirements of the first two years of a Mechanical Engineering four year degree program at any Australian tertiary institution may be admitted to Years 3 and 4 of the program leading to the Bachelor of Engineering degree in Aerospace Engineering.

The Faculty has approved an arrangement whereby students who are already in another course of study and who are able to satisfy the requirements of the first two years of a Mechanical Engineering four year degree program at another institution and who are eligible for admission to the Bachelor of Engineering degree in Aerospace Engineering, may be admitted to Years 3 and 4 of the program leading to the Bachelor of Engineering degree in Aerospace Engineering. The proviso is that Head of the School is satisfied that the courses studied at the other institution are equivalent, and he gives his recommendation.

Aerospace Engineering Plan

**Years 3 and 4**

The Aerospace Engineering plan covers the analysis, design and operation of aircraft and spacecraft. Graduates work mainly on the design and manufacture of flight vehicles, their operation with major or satellite airlines and research for civil and military aerospace organisations. Owing to the international nature of the aerospace industry, the topics studied cover a similar area and, in general, to the same depth of understanding as professional training programs in aerospace in other industrial countries. The aerospace industry is one of Australia's major exporters of high value-added manufactured goods.

The Faculty has approved an arrangement whereby students who satisfy the requirements of the first two years of a Mechanical Engineering four year degree program at any Australian tertiary institution may be admitted to Years 3 and 4 of the program leading to the Bachelor of Engineering degree in Aerospace Engineering. The proviso is that Head of the School is satisfied that the courses studied at the other institution are equivalent, and he gives his recommendation.

### Aerospace Engineering Plan

#### Year 3

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>HPW</th>
<th>UOC</th>
</tr>
</thead>
<tbody>
<tr>
<td>AERO3101</td>
<td>Aerospace Design 1A</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>AERO3250</td>
<td>Flight Dynamics and Systems</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>AERO3102</td>
<td>Aerospace Design 1B</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>AERO3400</td>
<td>Analysis of Aerospace Structures 1</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>AERO3610</td>
<td>Aerodynamics and Propulsion</td>
<td>6</td>
<td>6</td>
</tr>
<tr>
<td>MECH3000</td>
<td>Professional Responsibilities</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>MECH3203</td>
<td>Engineering Experimentation A</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>MECH3211</td>
<td>Linear Systems Analysis</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>MECH3212</td>
<td>Principles of Control</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>MECH3330</td>
<td>Vibration Analysis</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>MECH3400</td>
<td>Mechanics of Solids 3</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>MECH3520</td>
<td>Programming and Numerical Methods</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>MECH3530</td>
<td>Computing Applications in</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Mechanical Systems</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>General Education Elective</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td></td>
<td>General Education Elective</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td></td>
<td>General Education Elective</td>
<td>2</td>
<td>3</td>
</tr>
</tbody>
</table>

or

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>HPW</th>
<th>UOC</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Computing Applications in</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Mechanical Systems</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>General Education Elective</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td></td>
<td>General Education Elective</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td></td>
<td>General Education Elective</td>
<td>2</td>
<td>3</td>
</tr>
</tbody>
</table>

#### Year 4

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>HPW</th>
<th>UOC</th>
</tr>
</thead>
<tbody>
<tr>
<td>AERO4101</td>
<td>Aerospace Design 2A</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>AERO4102</td>
<td>Aerospace Design 2B</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>AERO4401</td>
<td>Analysis of Aerospace Structures 2A</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>AERO4402</td>
<td>Analysis of Aerospace Structures 2B</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>AERO4610</td>
<td>Advanced Aerodynamics and Propulsion</td>
<td>6</td>
<td>6</td>
</tr>
</tbody>
</table>

### Manufacturing Engineering and Management Plan

#### Years 3 and 4

The Manufacturing Engineering and Management plan is designed for students with engineering ability whose interests lie in the planning, development and control of manufacturing or service operations.

In the Manufacturing Engineering and Management courses the problems associated with the practical economics of manufacturing operations are stressed. The aim is to provide students with the education necessary to carry out an industrial job and to examine it critically in the light of economic efficiency.

Traditional engineering programs do not embrace the problems which are characteristic of Manufacturing Engineering and Management. These problems include the analysis of a product to ensure satisfactory functioning with regard to methods and sequence of manufacturing operations; the disposition of buildings and of equipment within them to permit efficient handling of materials; the avoidance of bottlenecks; the related problems of quality and cost control, testing and inspection, labour and personnel relations; and, finally, the problem of distribution and sales.

The financial and economic aspects are studied as the problem in manufacturing has not been solved until the final translation of the product into money has been accomplished successfully. While it is not intended to develop an expert in accounting practice or economics, it is intended to produce an engineer with an appreciation of the problems of cost and one who can apply considerations of ultimate economy to all industrial problems. The techniques of operations research may be applied here, where mathematical models of real-life situations are constructed and manipulated to yield optimal solutions as guides to management.

An engineer trained in Manufacturing Engineering and Management may initially be employed in any of the following major areas of industrial activity: industrial economic analysis; planning and control of production; product and process design; methods engineering; operations research.

### Manufacturing Engineering and Management Plan

#### Years 3 and 4

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>HPW</th>
<th>UOC</th>
</tr>
</thead>
<tbody>
<tr>
<td>ACCT9003</td>
<td>Introduction to Accounting Principles</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>MANF3210</td>
<td>Product Manufacture</td>
<td>6</td>
<td>6</td>
</tr>
<tr>
<td>MANF3300</td>
<td>Design of Manufacturing Facilities 1</td>
<td>4</td>
<td>6</td>
</tr>
<tr>
<td>MANF3420</td>
<td>Industrial Experimentation</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>MANF3500</td>
<td>Computers in Manufacturing</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>MANF3601</td>
<td>Manufacturing Operations Analysis A</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>MANF3602</td>
<td>Manufacturing Operations Analysis B</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>MECH3900</td>
<td>Professional Responsibilities</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>MECH3311</td>
<td>Linear Systems Analysis</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>MECH3312</td>
<td>Principles of Control</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>MECH3520</td>
<td>Programming and Numerical Methods</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>MECH3530</td>
<td>Computing Applications in Mechanical Systems</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td></td>
<td>General Education Elective</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td></td>
<td>General Education Elective</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td></td>
<td>General Education Elective</td>
<td>2</td>
<td>3</td>
</tr>
</tbody>
</table>
Mechanical Engineering Plan

Years 3 and 4
The Mechanical Engineering plan provides a versatile, comprehensive coverage of areas involving the conception and design of machinery and mechanical plant, the supervision of its construction, operation and maintenance, the planning and supervision of large engineering projects, and general engineering management. Due to its wide range, a number of options are provided as Technical Elective courses in the final year. These are preferentially linked to provide a direction appropriate to the needs of Australian industry and to the specific interests of students, although some flexibility is available if required. Typical fields which may be encompassed by the course include building services, computer controlled plant, manufacturing, robotics and transport. An emphasis is placed on the application of engineering science, development and management in these fields.

Mechanical Engineering Technical Electives
Twenty four (24) Units of Credit of Technical Elective courses are required. They may be selected from the postgraduate list of courses of the School or from Years 3 and 4 courses from other plans run by the School. Pre- and corequisite requirements must be satisfied. Approval is required for the selection of any course from outside the School.

Due to staff availability and to demand, it is likely that not all of the Technical Electives will be always on offer. Students are advised in November which Technical Electives will be offered in the following year.

Mechatronic Engineering Plan

Years 3 and 4
The Mechatronic Engineering plan provides the student with the ability to acquire a hybrid range of skills based on mechanics, electronics and computing. Whilst there is a comprehensive coverage of mechanical engineering and design areas, the plan enables a deeper understanding of the principles supporting the conception, design, construction, maintenance, integration and repair of intelligent machines. Typical examples of these machines are robots, white goods, cameras, automated test equipment and transport vehicles.

Typical fields which may be encompassed by the plan include building services, computer controlled plant, manufacturing, robotics and materials handling.

An emphasis is placed on the application of engineering science, development and management in these fields.
Mechatronic Engineering Technical Electives

Fifteen (15) Units of Credit of Technical Elective courses are required. It is recommended that they be primarily chosen from the Preferred Electives List given below. Included must be at least one of COMP3111, COMP3331 or ELEC3041 and at least one three (3) Units of Credit course. However they may, with approval be selected from the postgraduate list of courses of the School or from Years 3 and 4 courses from other undergraduate plans run by the School. Pre- and corequisite requirements must be satisfied. Approval is required for the selection of any course from outside the School.

Due to staff availability and to demand, it is likely that not all of the Technical Electives listed will be always on offer. Students are advised in September which Technical Electives will be offered in the following year.

HPW UOC
S1 S2

Preferred Electives List
COMP3111 Software Engineering 5 or 5 6
COMP3331 Computer Networks and Applications 5 6
ELEC3041 Real Time Engineering 4 6
MECH4223 Machine Condition Monitoring 3 6
MECH4300 Mechanics of Manipulators 3 6
MANF3500 Computers in Manufacturing 1 3 3
MECH9211 Modelling and Control of Mechatronic Systems* 6
MECH9222 Intelligent Machines 3 6

* Not offered in 2000

Naval Architecture Plan

Years 3 and 4

Naval Architecture is the branch of engineering which is concerned with the design, building and utilisation of all types of ships and marine vehicles.

Naval architects must be conversant with a wide variety of skills, including most forms of engineering and architecture. This is because a ship or a boat must be a completely self-sufficient vehicle containing a number of systems and able to withstand the loads from the sea. Yachts, fishing boats, frigates, ferries, catamarans and pleasure craft are just a few of the types of vessels that are studied during the course.

The Faculty has approved an arrangement whereby students who satisfy the requirements of the first two years of a Mechanical Engineering four year degree program at any Australian tertiary institution may be admitted to Years 3 and 4 of the program leading to the Bachelor of Engineering degree in Naval Architecture. The proviso is that Head of the School is satisfied that the courses studied at the other institution are equivalent, and he gives his recommendation.

Year 3

HPW UOC
S1 S2

MECH3000 Professional Responsibilities 3 3
MECH3211 Linear Systems Analysis 3 3
MECH3212 Principles of Control 3 3
MECH3330 Vibration Analysis 3 3
MECH3400 Mechanics of Solids 3 3
MECH3520 Programming and Numerical Methods 3 3

or
MECH3530 Computing Applications in Mechanical Systems

NAV3100 Principles of Ship Design 1 3 3
NAV3110 Ship Practice 3 3
NAV3400 Ship Structures 1 3 3
NAV3601 Ship Hydromechanics A 3 3
NAV3602 Ship Hydromechanics B 6 6
NAV3700 Ship Propulsion 3 3
General Education Elective 2 3

Combined Degree Programs

3711 Bachelor of Engineering/Bachelor of Science

Aerospace Engineering (BSc) Plan

Manufacturing Engineering and Management (BSc) Plan

Mechanical Engineering (BSc) Plan

Mechatronic Engineering (BSc) Plan

Naval Architecture (BSc) Plan

The combined degree program of five years full-time study enables a student to qualify for the degrees of Bachelor of Engineering and Bachelor of Science (BE BSc). Every session of the program contains only the standard 24 Units of Credit of courses and hence workload should not be greater than in a single degree program. The combined degree program is administered by the School of Mechanical and Manufacturing Engineering. For the Bachelor of Engineering the student selects a plan, given below, from Aerospace Engineering, Manufacturing Engineering and Management, Mechanical Engineering, Mechatronic Engineering or Naval Architecture.

For the Bachelor of Science the student selects a second plan based on an approved major sequence of courses. Majors can be in areas of computer science, materials science, mathematics, physics or statistics. A major sequence is defined to comprise 42 Units of Credit of courses at Levels 2 and 3 with at least 18 Units of Credit being at Level 3.

In some BSc majors, science courses specific to engineering degrees, e.g. PHYS1169 Physics 1CME, MATH2029 Engineering Mathematics 2A, will be exchanged for courses within that major. These substitutions may require some courses to be rescheduled.

The general layout for the combined degree is given below. Detailed outlines for each combination of engineering and science are available from the School.

Students who commence the program and do not complete the Engineering component may take out a BSc degree on completion of all Science requirements. Similarly, students not wishing to complete the BSc degree, may transfer to a plan under the single degree Engineering program and be given appropriate credit for courses satisfactorily completed.
THE BE BA PROGRAM

With this combined degree program students can add their choice of an Arts plan to a professionally accredited engineering plan in Aerospace Engineering, Manufacturing Engineering and Management, Mechanical Engineering, Mechatronic Engineering or Naval Architecture. The basic BE BA engineering plans are the same as the BE BSc plans described immediately above. Thus every session of the combined degree program contains only the standard 24 Units of Credit of courses and hence workload should not be greater than in a single degree program. Students may enter directly in Year 1 or may apply to transfer from the normal engineering program later, although with late transfer it might not be possible to complete the course in minimum time. In this case the student will have to prescribe their own engineering plan following discussion with the School. The full range of Arts plans is available. Because the Engineering and Arts programs have common content, such as mathematics and physics, only one more year of study is required to gain the additional qualification of Bachelor of Arts.

Eligibility

Anyone who meets the entry requirements for both Engineering and Arts is eligible for the combined program.

Organisation

The BE BA program is administered by the School of Mechanical and Manufacturing Engineering.

Students should start discussing their program with representatives of the School and the Faculty of Arts and Social Sciences as soon as possible – preferably well before enrolment. Enquiries should be directed to the Executive Assistant to the Dean of the Faculty of Arts and Social Sciences.

Students should work out for themselves the arts program they would like to add to their chosen engineering plan. The Arts and Social Sciences Faculty Handbook describes the options, and the School of Mechanical and Manufacturing Engineering can supply sample plans showing what previous students have arranged.

There are no special rules on what to include in each year. Students should schedule the arts and engineering components to suit their preferences while meeting the constraints of timetables and prerequisites. The sample plans can help here too.

The Arts component must be approved by the Faculty of Arts and Social Sciences.

The final program and schedule must be approved by the School.

Rules

1. In addition to their chosen engineering plan, students must complete a major sequence approved arts plan containing at least 60 UoC of courses.

Mathematics majors are not usually permitted. BE BSc combined degrees are more appropriate for this.

2. There will be a testamur for each part of the combined degree program.
3. Students who complete the BE program first may proceed to graduation with the degree of Bachelor of Engineering in the usual way provided they have also completed 12 Units of Credit in General Education.

Concurrent Degree Programs

3710/3749
Bachelor of Engineering/Master of Biomedical Engineering

A Bachelor of Engineering degree in Mechanical Engineering and a Master of Biomedical Engineering degree (BE MBiomedE) can both be completed in five years of concurrent study. The engineering component is defined in a special Mechanical Engineering plan within the Bachelor of Engineering 3710 program. The biomedical component is defined by the Master of Biomedical Engineering program 3749. Both the engineering and biomedical components are described in the Graduate School of Biomedical Engineering section of this Handbook.

3710/8404
Bachelor of Engineering/Master of Commerce

A Bachelor of Engineering degree in Manufacturing Engineering and Management, or in Mechanical Engineering, and a Master of Commerce degree (BE MCom) can both be completed in five years of concurrent study. The engineering component is defined in a special Manufacturing Engineering and Management plan, or in a special Mechanical Engineering plan, within the Bachelor of Engineering 3710 program. Details are given below. The commerce component is defined by the Master of Commerce program 8404 which is described in the Faculty of Commerce and Economics Handbook.

There will be a testamur for each degree. The degree of Bachelor of Engineering will be awarded on the satisfactory completion of the four years of the engineering program. For assessment of Honours, the results from the Commerce courses in Year 4 will be used to replace the deleted engineering courses.

Admission Requirements

Admission to the Master of Commerce program will require a credit grade average by the end of Year 3.

Manufacturing Engineering and Management (BE MCom) Plan

Years 1, 2 and 3

Years 1, 2 and 3 of this plan correspond exactly to the standard single degree Manufacturing Engineering and Management plan.

<table>
<thead>
<tr>
<th>Year</th>
<th>Course Code</th>
<th>Course Title</th>
<th>HPW</th>
<th>UOC</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td>S1</td>
<td>S2</td>
</tr>
<tr>
<td>Year 4</td>
<td>ACCT5901</td>
<td>Accounting: a user perspective</td>
<td>3</td>
<td>6</td>
</tr>
<tr>
<td></td>
<td>ECON5103</td>
<td>Business Economics</td>
<td>3</td>
<td>6</td>
</tr>
<tr>
<td></td>
<td>IROB5700</td>
<td>Management, Work and Organisation</td>
<td>3</td>
<td>6</td>
</tr>
<tr>
<td></td>
<td>MANF4300</td>
<td>Design of Manufacturing Facilities 2</td>
<td>4</td>
<td>6</td>
</tr>
<tr>
<td></td>
<td>MANF4500</td>
<td>Computers in Manufacturing 2</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td></td>
<td>MANF4601</td>
<td>Computer Aided Production Management A</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td></td>
<td>MECH4001</td>
<td>Communications for Professional Engineers</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td></td>
<td>MECH4003</td>
<td>Thesis A</td>
<td>—</td>
<td>6</td>
</tr>
<tr>
<td></td>
<td>MECH4004</td>
<td>Thesis B</td>
<td>—</td>
<td>9</td>
</tr>
</tbody>
</table>

Technical Elective(s)

— 6

Technical Elective(s)

— 6

Mechanical Engineering (BE MCom) Plan

Years 1, 2 and 3

Years 1, 2 and 3 of this plan correspond exactly to the standard single degree Mechanical Engineering plan.

<table>
<thead>
<tr>
<th>Year</th>
<th>Course Code</th>
<th>Course Title</th>
<th>HPW</th>
<th>UOC</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td>S1</td>
<td>S2</td>
</tr>
<tr>
<td>Year 4</td>
<td>ACCT5901</td>
<td>Accounting: a user perspective</td>
<td>3</td>
<td>6</td>
</tr>
<tr>
<td></td>
<td>ECON5103</td>
<td>Business Economics</td>
<td>3</td>
<td>6</td>
</tr>
<tr>
<td></td>
<td>IROB5700</td>
<td>Management, Work and Organisation</td>
<td>3</td>
<td>6</td>
</tr>
<tr>
<td></td>
<td>MECH4001</td>
<td>Communications for Professional Engineers</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td></td>
<td>MECH4003</td>
<td>Thesis A</td>
<td>—</td>
<td>6</td>
</tr>
<tr>
<td></td>
<td>MECH4004</td>
<td>Thesis B</td>
<td>—</td>
<td>9</td>
</tr>
</tbody>
</table>

Technical Elective(s)

— 6

Technical Elective(s)

— 6

Years 5 for both Plans

For Year 5, students change to M Com program 8404 and study 48 UoC of courses, described in detail in the Faculty of Commerce and Economics Handbook, and briefly outlined as follows:

One Core Elective Commerce course (chosen from six).

Four Disciplinary Stream Elective Commerce courses forming an integrated sequence of studies.

Three Elective Commerce courses.
Postgraduate Study

Formal graduate coursework programs offered are program 5710 leading to the award of a Graduate Diploma and program 8710 leading to the award of the degree Master of Engineering Science. For more information about these programs, please contact Mrs Sharon Turnbull, Telephone [02] 93854085, Email: s.turnbull@unsw.edu.au.

Opportunities are provided for graduate research through program 2692 leading to the award of the degree Master of Engineering and program 1662 leading to the award of the degree Doctor of Philosophy. For more information about these degrees please contact Mrs Mary Rolfe, Telephone [02] 93855782, Email: mary.rolfe@unsw.edu.au or Prof Masud Behnia, Telephone [02] 93854253, Email: m_behnia@unsw.edu.au.

8710
Master of Engineering Science Program

Manufacturing Engineering (MEngSc) Plan
To satisfy the requirements for the degree students are required to complete 48 Units of Credit.

A Specialisation strand must be selected from the following list. Usually the maximum number of core courses listed should be completed by the student.

The remaining courses should be selected from the Elective courses list. At the discretion of the Head of School a 12 Units of Credit project, MANF9010, may be undertaken instead of two courses.

Specialisation Strands

1. Computer Integrated Manufacturing
   Staff Contact: A/Prof K Hoang
   Core courses:
   - MANF9340 Factory Automation 6
   - MANF9410 Total Quality Management 6
   - MANF9472 Production Planning and Control 6
   - MANF9560 Computer Integrated Manufacturing 6
   - MANF9543 CAD/CAM 6
   - MANF9544 Concurrent Product and Process Design 6
   Elective courses:
   - MANF9801 Economic Decisions in Industrial Management 6
   - MANF9400 Industrial Management 6
   - MECH9410 Finite Element Applications 6

2. Industrial Management
   Staff Contact: Dr B Kayis
   Core courses:
   - MANF9400 Industrial Management 6
   - MANF9410 Total Quality Management 6
   - MANF9420 Managing Manufacturing Operations 6
   - MANF9472 Production Planning and Control 6
   - MANF9471 Manufacturing Strategy 6
   - MANF9601 Economic Decisions in Industrial/Management 6
   Elective courses:
   - MANF9340 Factory Automation 6
   - MANF9543 CAD/CAM 6
   - MANF9544 Concurrent Product and Process Design 6
   - SESC9411 Principles of Ergonomics 6

3. Manufacturing Management (External A)
   Staff Contact: Prof H Kaebernick
   Note/s: This strand is available in Distance Delivery Mode in Singapore only. Contact School for details.

4. Manufacturing Management (External B)
   Staff Contact: Prof H Kaebernick
   Note/s: This strand is available in Distance Delivery Mode therefore the structure and delivery mode of this strand is different to those of the other strands. Students have to complete 8 courses with a total of 48 Units of Credit. For this program all core courses are compulsory. Not all elective courses are offered in any one year. Students may also select other Distance Learning elective courses offered by the Faculty on approval by the Head of School.
   Course descriptions for CVEN courses are listed in this handbook under the School of Civil and Environmental Engineering.

Core courses:
- MANF8340 Factory Automation 6
- MANF8471 Manufacturing Strategy 6
- MANF8420 Managing Manufacturing Operations 6
- MANF8455 Concurrent Product and Process Design 6
- MANF8560 Computer Integrated Manufacturing 6
- MANF8472 Production Planning and Control 6

Elective courses:
- CVEN8701 Engineering Economics and Financial Management 6
- CVEN8703 Quality and Quality Systems 6
- CVEN8706 Human Resources Management 6
- CVEN8710 Management of Risk 6
- CVEN8714 Resource Management 6
- CVEN8717 Marketing in Technology and Engineering 6
- CVEN8718 Strategic Management for Engineering 6
- CVEN8720 Problem Solving and Decision Making 6

Mechanical Engineering (MEngSc) Plan

Two options are available to students: a General option or a Specialisation strand option.

1) The General option is designed for graduates wishing to enhance their career prospects, complete further studies in a particular field of engineering, or to update their knowledge with advances in technology.
   - A combination of mechanical and management courses, which may be modelled to suit students' personal requirements, will add to their engineering knowledge and put them in line for a management position.
   - To satisfy the requirements for the degree, students are required to complete 48 Units of Credit. Each course is worth 6 Units of Credit and a project is worth 12 Units of Credit.
   - Courses can be selected from the current Mechanical and Manufacturing Engineering timetables.
   - At the discretion of the Head of School, a project, MECH9010, may replace two courses.

2) Specialisation strands within the Mechanical Engineering (MEngSc) Plan may be undertaken by taking selective courses in such areas as Aerospace Engineering, Computational Engineering, Mechanical Design, Mechatronic Engineering, Noise and Vibration and Refrigeration and Air Conditioning.
   - To satisfy the requirements for the degree with a specialisation, students are required to complete 48 Units of Credit. Each course is worth 6 Units of Credit and a project, MECH9010 or AERO9010, is worth 12 Units of Credit.
   - When specialising, usually the maximum number of core courses listed should be completed by the student.
   - The remaining courses, in the first instance, should be selected from the Elective courses list followed by any other courses from the current Mechanical and Manufacturing Engineering timetables. At the discretion of the Head of School, a project may replace two courses.
Specialisation Strands

1. Aerospace Engineering
   Staff Contact: Dr NEA Ahmed

   Core courses: UOC
   AER09105  Aerospace Vehicle Design and Manufacture  6
   AER09606  Aerodynamics  6

   Elective courses:
   AER09415  Finite Element Analysis and Applications for Aerospace Structures  6
   AER09543  CAD/CAM for Aerospace Structures  6
   AER09607  Flight Dynamics  6
   AER09705  Aerospace Propulsion  6

2. Computational Engineering
   (Computational Fluid Dynamics and Heat Transfer Strand)
   Staff Contact: Prof E Leonardi

   Notes: course descriptions for ANCE courses are listed in this handbook under the Centre for Advanced Numerical Computation in Engineering and Science.

   Core courses: UOC
   ANCE8001  Computational Mathematics  6
   ANCE8002  Supercomputing Techniques  6

   Elective courses:
   ANCE8101  Graphical Interfaces and Scientific Visualisation Techniques  6
   ANCE8102  Mesh Generation  6
   ANCE8105  Computational Fluid Dynamics or Computational Techniques for Fluid Dynamics  6
   MECH9610  Advanced Fluid Dynamics  6
   MECH9620  Computational Fluid Dynamics  6
   MECH9750  Industrial Applications of Heat Transfer  6

3. Computational Engineering
   (The Structural Analysis Strand)
   Staff Contact: A/Prof DW Kelly

   Notes: course descriptions for ANCE courses are listed in this handbook under the Centre for Advanced Numerical Computation in Engineering and Science.

   Core courses: UOC
   ANCE8001  Computational Mathematics  6
   ANCE8002  Supercomputing Techniques  6

   Elective courses:
   AER09415  Finite Element Analysis and Applications for Aerospace Structures  6
   AER09543  CAD/CAM for Aerospace Structures  6
   ANCE8101  Graphical Interfaces and Scientific Visualisation Techniques  6
   ANCE8102  Mesh Generation  6
   MECH9131  Advanced CAD Modelling and Applications  6
   MECH9310  Advanced Vibration Analysis  6
   MECH9600  Mechanics of Fracture and Fatigue  6
   MECH9410  Finite Element Applications  6

4. Mechanical Design
   Staff Contact: Mr AJ Barratt

   Core courses:
   MECH9120  Design Technology  6
   MECH9131  Advanced CAD Modelling and Applications  6
   MECH9150  Design and Maintenance of Components  6

5. Mechatronic Engineering
   Staff Contact: Dr RA Willgoss

   Core courses:
   MECH9201  Digital Logic Fundamentals for Mechanical Engineers  6
   MECH9202  Microprocessor Fundamentals for Mechanical Engineers  6
   MECH9211  Modelling and Control of Mechatronic Systems  6
   MECH9221  Industrial Robotics  6

   Elective course:
   MECH9222  Artificially Intelligent Machines  6

6. Noise and Vibration
   Staff Contact: A/Prof RB Randall

   Core courses:
   MECH9310  Advanced Vibration Analysis  6
   MECH9311  Fundamentals of Vibration  6
   MECH9312  Fundamentals of Noise and Vibration Measurement  6
   MECH9325  Fundamentals of Noise  6
   MECH9326  Advanced Noise  6

7. Refrigeration and Air Conditioning
   Staff Contact: Prof E Leonardi

   Core courses:
   MECH9751  Refrigeration and Air Conditioning 1  6
   MECH9752  Refrigeration and Air Conditioning 2  6
   MECH9753  Refrigeration and Air Conditioning Design 1  6
   MECH9754  Refrigeration and Air Conditioning Design 2  6

   Elective courses:
   MECH9325  Fundamentals of Noise  6
   MECH9326  Advanced Noise  6
   MECH9326  Advanced Fluid Dynamics  6
   MECH9720  Solar Thermal Energy Design  6
   MECH9730  Multiphase Flow  6
   MECH9740  Power Plant Engineering  6
   MECH9742  Power Production Assessment  6
   MECH9750  Industrial Applications of Heat Transfer  6
   MECH9757  Ambient Energy Air Conditioning  6
   MECH9761  Internal Combustion Engines 1  6

5710
Graduate Diploma Program

Manufacturing Engineering (Grad Dip) Plan

Mechanical Engineering (Grad Dip) Plan

The Graduate Diplomas are based on 36 units of credit of coursework only. Courses can be selected from the current Mechanical and Manufacturing Engineering postgraduate timetables.
Course Descriptions

Descriptions of all courses are presented in alphanumeric order within organisational units. For academic advice regarding a particular course consult with the contact for the course as listed. A guide to abbreviations and prefixes is included in the chapter Handbook Guide, appearing earlier in this book.

AERO3101
Aerospace Design 1A
Staff Contact: JR Page
UOC3 HPW3 WKS14 S1
Aerospace vehicle types, characteristics, size and performance. The special constraints involved in the design of an aerospace vehicle. Aerospace regulations and materials; quality control; introduction to computer design techniques. Design of typical thin wall structures; struts; joints and fasteners. ESDU data sheets and resource material. Design work in selected areas and reports.

AERO3102
Aerospace Design 1B
Staff Contact: JR Page
UOC3 HPW3 WKS14 S2
Prerequisite/s: AERO3101
Vehicle loads; thrust inertia, atmospheric flight (manoeuvre and gust), wings fuselage, empennage and controls. Material fatigue and degradation; safe life and fail safe design. Weight and balance, centre of gravity; applied forces and moments; static and dynamic equilibrium, vehicle trim. Landing gear. Vehicle systems. Interaction of production engineering and maintenance requirements. Design work in selected areas and reports.

AERO3400
Analysis of Aerospace Structures 1
Staff Contact: A/Prof DW Kelly
UOC3 HPW3 WKS14 S2
Prerequisite/s: MECH2411, MECH2412
Aerospace applications of plane frames and space structures. Open and closed section thin walled beams, Stresses due to torsion and shear in multicell tubes. Wing and fuselage structures, ribs and bulkheads. Deflections. Structural instability, buckling of perfect and imperfect columns, bending and buckling of thin flat plates. Introduction to composite materials, sandwich panels.

AERO3610
Aerodynamics and Propulsion
Staff Contact: Dr NEA Ahmed
UOC6 HPW6 WKS14 S2
Prerequisite/s: MECH2600, MECH2700
Inviscid conservation relations. Potential flow source, sink, doublet and point vortex; superposition with uniform flow. Airfoil formation and Kutta condition. Two dimensional incompressible flows around thin airfoils. Incompressible flow about wings of finite span. Experimental techniques. Introduction to propulsion systems; history, types, basic thrust, efficiency equations, propellors, rotors and fans.

AERO3620
Flight Dynamics and Systems
Staff Contact: JR Page
UOC3 HPW3 WKS14 S1
Prerequisite/s: MECH3230
Introduction to atmospheric and space environment. Aircraft performance in terms of drag, thrust and power. Minimum and maximum speeds, range and endurance. Rates of climb and energy height methods. Maneuvering and flight loads including maneuver and gust envelopes. Mission profiles including take-of and landing. Introductory longitudinal static stability; maneuver points and margins. Flight testing. Fluid, mechanical and electrical systems in aerospace vehicles; power, mass and information transfer; environment control. Flight control.

AERO4101
Aerospace Design 2A
Staff Contact: JR Page
UOC3 HPW3 WKS14 S1
Prerequisite/s: AERO3102
Project teams are formed to carry out the initial design of an aerospace vehicle within a simulated industrial environment. Work involves current design and analysis tools and use of experimental data. A lecture program supports this work. A satisfactory grade in this course is provisional pending successful completion of AERO4102.

AERO4102
Aerospace Design 2B
Staff Contact: JR Page
UOC3 HPW3 WKS14 S2
Prerequisite/s: AERO4101
Building on work in AERO4102, project teams complete their initial design study, produce a group report and an individual portfolio, and present their findings.

AERO4401
Analysis of Aerospace Structures 2A
Staff Contact: A/Prof DW Kelly
UOC3 HPW3 WKS14 S1
Prerequisite/s: AERO3400, MECH3400
Note/s: Excluded MECH4410, MECH9410
Finite element analysis of aerospace structures, including modelling, resource requirements and accuracy. Applications from linear and non-linear elasticity using commercial finite element programs. Fracture mechanics and fatigue including residual strength of cracked components, crack growth, arrest and damage tolerance.

AERO4402
Analysis of Aerospace Structures 2B
Staff Contact: A/Prof DW Kelly
UOC3 HPW3 WKS14 S2
Prerequisite/s: AERO4401
Note/s: Excluded MECH4410, MECH9410
Introduction to the dynamic response of aerospace structures. Aeroelasticity including control reversal, divergence and flutter. Analysis of bonded and bolted joints. Thermal stresses. Advanced topics including prediction of failure, and residual stresses.

AERO4610
Advanced Aerodynamics and Propulsion
Staff Contact: Dr NEA Ahmed
UOC6 HPW6 WKS14 S1
Prerequisite/s: AERO3610

AERO4620
Aerospace Vehicle Dynamics and Systems
Staff Contact: JR Page
UOC6 HPW6 WKS14 S2
Prerequisite/s: AERO3620
Space dynamics; exo-atmospheric vehicles, three body problem, orbit selection and prediction, tracking, maneuvering and rendezvous. Dynamics of space launchers; single stage and multi stage rockets, optimization and control. Dynamic stability and control of atmospheric and exo-atmospheric vehicles; dynamic response to the mission. Avionics and advanced aircraft systems; flight control, computer-aided vehicle management.
AER09105
Aerospace Vehicle Design and Manufacture
Staff Contact: JR Page, Dr NEA Ahmed
UoC6 HPW3
Design objectives and constraints: function, cost durability. Design process: configuration design, structural design, systems. Integration design. Production methods. Quality control: design manufacture, operation. Design development: prototyping, component and system testing (ground and flight), manufacture. The above topics will be dealt with in the context of workshops associated with an intensive design project.

AER09415
Finite Element Analysis and Applications for Aerospace Structures
Staff Contact: A/Prof DW Kelly
UoC6 HPW3
Theoretical foundations. Linear static and dynamic analysis. Non-linear material behaviour and geometrically non-linear behaviour. Validation of models. Project: Each student will undertake a project involving the finite element modelling of a structure and the analysis of its static and dynamic characteristics. A major finite element package will be used for the conduct of this project.

AER09543
CAD/CAM for Aerospace Structures
Staff Contact: JR Page, A/Prof K Hoang
UoC6 HPW3

AER09606
Aerodynamics
Staff Contact: Dr NEA Ahmed
UoC6 HPW3
Potential flow and wing theory. Low speed, inviscid and incompressible flow; high-speed viscous and compressible flow. Visualisation in the laboratory and the use of computer modelling techniques.

AER09607
Flight Dynamics
Staff Contact: JR Page
UoC6 HPW3

AER09705
Aerospace Propulsion
Staff Contact: Dr R Casey
UoC6 HPW3

MANF0420
Production Management
Staff Contact: Dr B Kayis
UoC6 HPW6 WKS14 S1
General principles of management: an overview of the basic ideas and issues of management including the functions and roles of a manager, strategic and operational planning and monitoring systems with an emphasis on production and operations management; classical and modern organisation theories; overview of human and cultural issues in organisations; issues of project management. Quantitative techniques for management: engineering economic analysis including the analysis of investment decisions under risk and uncertainty. Modern techniques of statistical quality control and its extensions to statistical process control. Project management and control using network analysis. Human and cultural aspects of management: motivation and leadership theory; organisational cultures; organisational change and development; TQM cultures and the ‘internal customer’.

MANF1130
Introduction to Manufacturing
Staff Contact: A/Prof P Mathew
UoC6 HPW7 WKS14 S2
Notes: Excluded MANF1100, MANF1110, MANF1112
Protective items (eg safety glasses, safety boots, overalls or dustcoat, etc) are required for the practical training in order to comply with the Occupational Health and Safety Act. Students must possess these items before commencing this course.

MANF3210
Product Manufacture
Staff Contact: A/Prof P Mathew
UoC6 HPW6 WKS14 S1
Prerequisite/s: MANF1120
Corequisite/s: MECH2100, MECH2411
Design for economic manufacture. Geometric analysis of manufacturing processes such as forming from liquid or solid and material removal. Introduction to non-metallic materials processing. Introduction to drawing techniques for engineering communication which includes freehand sketching and orthogonal projections. Use of computer graphics for modelling and production of detailed drawings of components. Elementary functional analysis of product design for manufacturing and performance. Practical training of approximately 33 hours will involve processes such as welding, fitting and machining as well as introduction to safety in a manufacturing environment.

MANF3300
Design of Manufacturing Facilities 1
Staff Contact: Dr AB Kayis
UoC6 HPW4 WKS14 S2
Corequisite/s: MANF3210, MANF3420, MANF3500, MATH2839
The design of workplaces including jigs and fixtures where operations such as assembly and measurement are performed by a human operator or robot. Documentation of manufacturing processes, characteristics of human operator and robots, workplace and methods design, measurement of workplace element characteristics.
MANF3420
Industrial Experimentation
Staff Contact: Dr KC Chan
UOCD HPW2 WKS14 S2
Prerequisite/s: MATH2839
Statistical design and analysis of experiments to investigate the quality of products and the performance of manufacturing processes. Experiments of comparison, classical correlation and regression analysis, multiple linear regression analysis, accelerated experiments, analysis of variance.

MANF3500
Computers In Manufacturing 1
Staff Contact: Prof H Kaebernick
UOCD HPW3 WKS14 S2
Prerequisite/s: ELEC0807, MANF1120, MECH1500
Selection and use of computer-controlled devices such as robots and machine tools in manufacturing systems; principles of numerical control and PLCs, NC machine tools, NC programming, CNC/AC/DNC computer controls, accuracy of NC machines, fundamentals and applications of robots.

MANF3601
Manufacturing Operations Analysis A
Staff Contact: Dr M Hasan
UOCD HPW3 WKS14 S1
Prerequisite/s: MATH2839, MECH1500
Principles and techniques of Operations Research and Analysis including linear and non-linear programming; basic queuing theory and stochastic processes; heuristic techniques; applications to manufacturing.

MANF3602
Manufacturing Operations Analysis B
Staff Contact: A/Prof RM Kerr
UOCD HPW3 WKS14 S2
Prerequisite/s: MANF3601
Introduction to simulation; use of simulation packages; experimental design in simulation. Simple data modelling and information systems design; running an information system in conjunction with a factory simulation model.

MANF4011
Analysis of Manufacturing Systems A
Staff Contact: Prof H Kaebernick
UOCD HPW2 WKS14 S1
Students will work in project teams to perform a complete manufacturing system design and analysis, involving activities such as: design for manufacture, process selection, tolerance optimisation, workplace design, factory layout, production control system, detailed budget.

MANF4012
Analysis of Manufacturing Systems B
Staff Contact: Prof H Kaebernick
UOCD HPW2 WKS14 S2
Prerequisite/s: MANF4011
Further project work, continuing from activities in MANF4011 Manufacturing Systems A.

MANF4300
Design of Manufacturing Facilities 2
Staff Contact: Dr KC Chan
UOCD HPW4
Corequisite/s: MANF3300
Introduction to plant layout design and materials handling system. Use of ergonomic design for man/machine tasks. Analysis and simulation of various types of manufacturing facilities.

MANF4430
Manager for Engineers
Staff Contact: Dr B Kayis
UOCD HPW6 WKS14 S1
General principles of management; overview of the basic ideas and issues of management; including the functions and roles of a manager, strategic and operational planning and monitoring systems with an emphasis on production and operations management; classical and modern organisation theories; overview of human and cultural issues in organisations; issues of project management. Quantitative techniques for management: engineering economic analysis including the analysis of investment decisions under risk and uncertainty. Modern techniques of statistical quality control and its extensions to statistical process control. Project management and control using network analysis. Human and cultural aspects of management: motivation and leadership theory; organisational cultures; organisational change and development; TQM cultures and the "internal customer".

MANF4440
Management of Manufacturing Systems
Staff Contact: A/Prof RM Kerr
UOCD HPW3 WKS14 S1
Prerequisite/s: MANF3420, MANF3602
Industry dynamics; Porters model, the value chain and forms of competitive advantage; matching manufacturing strategy to the market; core competencies and process positioning; focused manufacturing; vertical vs horizontal integration; supply chain management, global manufacturing and the virtual corporation; matching performance measures to strategy.

MANF4500
Computers in Manufacturing 2
Staff Contact: Prof H Kaebernick
UOCD HPW3 WKS14 S1
Prerequisite/s: MANF3500
Integration of the basic elements of manufacturing facilities into systems: selection of automation equipment, principles of group technology and cellular manufacturing, Flexible Manufacturing Cells, planning and layout of Flexible Manufacturing Systems, integration of CAD and CAM, computer integrated manufacturing, computer aided process planning.

MANF4601
Computer Aided Production Management A
Staff Contact: A/Prof RM Kerr
UOCD HPW3 WKS14 S1
Prerequisite/s: MANF3602
The dynamics of material flow through a manufacturing system; basic and advanced techniques of production planning and control and their realisation within a factory simulation model; matching different approaches to different types of manufacturing situations.

MANF4602
Computer Aided Production Management B
Staff Contact: Dr M Hasan
UOCD HPW3 WKS14 S2
Prerequisite/s: MANF4601
Use of decision support and knowledge based systems in production management; designing a production management database; types of integration and integrated decision making; implementation of these concepts with a factory simulation model.

MANF8340
Factory Automation
Staff Contact: A/Prof P Mathew, Prof H Kaebernick
UOCD HPW3 WKS14 SS
Note/s: Excluded MANF340
Elements of factory automation such as Flexible Manufacturing Cells and Systems, material handling and warehouse, assembly systems, automated quality control systems, sensors and data acquisition. Cellular manufacturing techniques and layout planning. Simulation and intelligence in manufacturing. Communication networks in a factory environment. Strategies for factory automation.

MANF8420
Managing Manufacturing Operations
Staff Contact: Dr B Kayis
UOCD HPW3 WKS14 SS
Managing manufacturing operations as a competitive weapon, strategic linkage of operations through quality, value added
MANF8471  Manufacturing Strategy  
Staff Contact: A/Prof RM Kerr  
UOC6 HPW3 WKS14 SS  

Relation of manufacturing strategy to business strategy, financial strategy and marketing strategy; Technology and process choice; process positioning. Capacity and location decisions; long-term capacity strategies, international capacity planning; planning facilities with a region. Global manufacturing and the virtual corporation. Focused manufacturing; continuous improvement and the experience curve. Strategic management of human resources; strategy implementation and change management; linking operational performance to manufacturing strategy.

MANF8472  Production Planning and Control  
Staff Contact: A/Prof RM Kerr  
UOC6 HPW3 WKS14 SS  
Note/s: Excluded GSOE9102  

Industry dynamics; Porter's Model; bases for competition and implications for Production Planning and Control. Dynamics of materials flow; role of inventory; effect of bottlenecks and process variability on materials flow. Planning levels and timescales; forecasting; aggregate planning; the Master Production Schedule. Manufacturing Resources planning and its limitations. Optimised Production Technology and synchronised manufacturing; Just-in-Time production; Kan-Ban systems; mixed model production; evolution towards JIT. Maintenance management; preventive and predictive maintenance; Total Productive Maintenance. Role of Information Technology in Production Planning and Control; decision support and expert systems as applied to planning and scheduling.

MANF8544  Concurrent Product and Process Design  
Staff Contact: Prof H Kaebernick  
UOC6 HPW3 WKS14 SS  
Note/s: Excluded MANF8544  


MANF8560  Computer Integrated Manufacturing  
Staff Contact: A/Prof K Hoang  
UOC6 HPW3 WKS14 SS  
Note/s: Excluded MANF8560  

Systems analysis, design and implementation of Computer Integrated Manufacturing (CIM). Components of CIM including Production Planning and Control, CAD in CIM, Computer-Aided Process Planning, integrated material handling. Shared CIM and AI in CIM will also be discussed.

MANF9000  Research Thesis Manufacturing Engineering and Management (Full time)  
Staff Contact: Prof M Behnia  

MANF9001  Research Thesis Manufacturing Engineering and Management (Part time)  
Staff Contact: Prof M Behnia  

MANF9010  Project  
Staff Contact: Prof H Kaebernick  
UOC12  
Note/s: The project must be completed in no more than two sessions

MANF9340  Factory Automation  
Staff Contact: Dr P Mathew  
UOC6 HPW3 WKS14 SS  
Note/s: Excluded MANF8340  

Elements of factory automation such as Flexible Manufacturing Cells and Systems, material handling and warehousing, assembly systems, automated quality control systems, sensors and data acquisition. Cellular manufacturing techniques and layout planning. Simulation and intelligent manufacturing, Communication networks in a factory environment. Strategies for factory automation.

MANF9400  Industrial Management  
Staff Contact: Dr M Hasan  
UOC6 HPW3 WKS14 SS  

Evolution of management thought, the planning process; nature of managerial decision making, organisational structures; managing organisational change, motivation, performance, satisfaction, interpersonal and organisational communication, use of management information systems.

MANF9410  Total Quality Management  
Staff Contact: Dr B Kayis  
UOC6 HPW3 WKS14 SS  

Quality control systems, quality assurance, planning for quality, total quality management (TQM) philosophy, implementation of TQM in service and manufacturing industries, national and international standards.

MANF9420  Managing Manufacturing Operations  
Staff Contact: Dr B Kayis  
UOC6 HPW3 WKS14 SS  
Note/s: Excluded MANF8420  

Managing manufacturing operations as a competitive weapon, strategic linkage of operations through quality, value added management, strategic quality management approach, International Human Resource Management, Technology Transfer, Strategic Management of Technology, Variation and its Causes, improvement strategies, productivity and its measurement, Taguchi techniques.

MANF9471  Manufacturing Strategy  
Staff Contact: A/Professor RM Kerr  
UOC6 HPW3 WKS14 SS  
Note/s: Excluded MANF8471  

Relation of manufacturing strategy to business strategy, financial strategy and marketing strategy; Technology and process choice; process positioning. Capacity and location decisions; long-term capacity strategies, international capacity planning; planning facilities with a region. Global manufacturing and the virtual corporation. Focused manufacturing; continuous improvement and the experience curve. Strategic management of human resources; strategy implementation and change management; linking operational performance to manufacturing strategy.

MANF9472  Production Planning and Control  
Staff Contact: A/Professor RM Kerr  
UOC6 HPW3 WKS14 SS  
Note/s: Excluded MANF8472  

Industry dynamics; Porter's Model; bases for competition and implications for Production Planning and Control. Dynamics of materials flow; role of inventory; effect of bottlenecks and process variability on materials flow. Planning levels and timescales; forecasting; aggregate planning; the Master Production Schedule. Manufacturing Resources planning and its limitations. Optimised Production Technology and synchronised manufacturing; Just-in-Time production; Kan-Ban systems; mixed model production; evolution towards JIT. Maintenance management; preventive and predictive maintenance; Total Productive Maintenance. Role of Information Technology in Production Planning and Control; decision support and expert systems as applied to planning and scheduling.
MANF9491
Special Topic In Manufacturing Engineering
Staff Contact: Prof H Kaebernick
UOC6 HPW3 WKS14 SS

MANF9492
Special Topic In Manufacturing Engineering
Staff Contact: Prof H Kaebernick
UOC6 HPW3 WKS14 SS

MANF9543
Computer Aided Design/Computer Aided Manufacture
Staff Contact: A/Prof K Hoang
UOC6 HPW3 WKS14 SS
Notes: Student numbers are limited due to computer availability. Preference will be given to CIM Program students. Students must contact the lecturer one week after enrolment to confirm enrolment.

Topics to be covered include: manufacturing systems; elements of CAM; computer process monitoring and control; production systems at the plant and operation levels; principles underlying the integration between a CAD/CAM package such as CATIA and a Manufacturing Management System such as Fourth Shift; applications to design and engineering processes.

MANF9544
Concurrent Product and Process Design
Staff Contact: Prof H Kaebernick
UOC6 HPW3 WKS14 SS
Notes: Excluded MANF8544
Life-cycle design of products, principles of design of products, processes and manufacturing systems, design for quality, design for manufacture, design for assembly, organisational aspects of concurrent engineering.

MANF9560
Computer Integrated Manufacturing
Staff Contact: A/Prof K Hoang
UOC6 HPW3 WKS14 SS
Prerequisite/s: MANF9543
Note/s: Excluded MANF8560
Systems analysis and design of computer integrated manufacturing, including flexible manufacturing systems and automated factories. Communication protocols.

MANF9601
Economic Decisions In Industrial Management
Staff Contact: Dr M Hasan
UOC6 HPW3 WKS14 SS
Concept of economic analyses. Cost concepts; interest and interest formulae. Methods for economy studies; present worth, annual worth, payback period and rate of return; comparing alternative investments; depreciation methods, effect of income taxes, inflation; replacement analysis; capital budgeting; break-even and sensitivity analyses; economic decision making under risk and uncertainty; evaluation of projects in public sector.

MECH0130
Engineering Drawing and Solid Modelling
Staff Contact: AJ Barratt
UOC3 HPW3 WKS14 S1
Notes: This is a servicing subject taught within programs offered by other schools and faculties
Communication of form and layout of real world objects, solid modelling of objects. Engineering drawing layouts, orthogonal projections, dimensioning, tolerancing and standard drawing symbols, principles of detail design drawings and assembly drawings. Use of computer graphics and production of drawings.

MECH0330
Engineering Mechanics
Staff Contact: Dr SS Leong
UOC4 HPW4 WKS14 S2
Prerequisite/s: As for MECH1300 Engineering Mechanics 1
Note/s: Excluded MECH1300 This is a servicing subject taught within courses offered by other schools and faculties

MECH0440
Engineering Statics
Staff Contact: Dr SS Leong
UOC3 HPW3 WKS14 S2
Prerequisite/s: As for MECH1300 Engineering Mechanics 1
Note/s: Excluded MECH0330, MECH1300

MECH1120
Design and the Engineering Profession
Staff Contact: A/Prof RB Frost
UOC3 HPW3 WKS14 S1
To introduce the engineering profession; to assess abilities in written expression, to develop a consciousness of the importance of written, pictorial and oral expression in engineering life and to begin to develop these skills; to begin to develop an awareness of the professional attitude. Introduction to engineering hardware and components; geometry, function, manufacture and reasons for various configurations. The design process, problem identification, search for solution concepts, nontechnical considerations in design, decision techniques, detail.

MECH1300
Engineering Mechanics 1
Staff Contact: A/Prof RAJ Ford
UOC6 HPW4 WKS14 S1S2
Prerequisite/s: As for MECH1300 Engineering Mechanics 1
Note/s: Excluded MECH0330

MECH1400
Mechanics of Solids 1
Staff Contact: A/Prof R Randall
UOC6 HPW4 WKS14 S1S2
Corequisite/s: MATH1131 or MATH1141
Note/s: Excluded MECH0430
Resultants and equilibrium in three-dimensions; stress and strain; internal forces; stresses, deformation and strain energy due to axial loading, bending and torsion; helical springs.

MECH1500
Computing 1M
Staff Contact: Dr MJ Tordon
UOC3 HPW3 WKS14 S1
Introduction: history, applications, hardware, software, a model of a computer system, editors, operating systems. Networking and the internet. Program design and development: programming objectives, data structures, algorithms, symbolic names, translation of algorithms, steps in programming, programming styles, errors and debugging. Data: data types, declarations, input output, file control. Programming constructs: arithmetic expressions, assignments, relational and logical expressions, selection. Application in sorting, word processing, graphics and plotting, simultaneous linear algebraic equations.
MECH2101
Machine Design A
Staff Contact: A/Prof RB Frost
UOC3 HPW3 WKS14 S1
Prerequisite/s: MANF1120, MECH1130, MECH1140
Corequisite/s: MECH1120
Selection and specification of materials and manufacturing processes for engineering items. Communication by means of engineering drawing (including tolerances) of manufacturing information for simple components structures and assemblies. Application of standards and trade literature to design.

MECH2102
Machine Design B
Staff Contact: A/Prof RB Frost
UOC3 HPW3 WKS14 S2
Prerequisite/s: MECH1120, MECH2101
Corequisite/s: MECH2411
Design of common engineering components and systems. Simple design-and-build project to meet a published specification and to demonstrate achieved performance.

MECH2300
Engineering Mechanics 2
Staff Contact: Prof KP Byrne
UOC3 HPW3 WKS14 S1S2
Prerequisite/s: MATH1231 or MATH1241, MECH1300
Note/s: Excluded MECH2320
Kinetics of systems of particles; steady mass flow. Plane kinematics and kinetics of rigid bodies:moment of inertia; motion relative to translating and rotating frames of reference; equations of motion: work and energy, impulse and momentum. Virtual work for static and dynamic systems. Engineering applications.

MECH2411
Mechanics of Solids 2A
Staff Contact: Dr HL Stark
UOC3 HPW3 WKS14 S1S2
Prerequisite/s: MATH1231 or MATH1241, MECH1300
Corequisite/s: MECH1400
Note/s: Excluded MECH2401
Revision of Statics. The variation with orientation of stress at a point in 2D, Mohr's circle. The variation with orientation of stress at a point in 3D given one principal stress. The variation with orientation of strain at a point, Mohr's circle, strain gauges. The relationships between stress and strain during linear elastic deformation. The interdependence of elastic moduli. The variation with orientation of stress at a point in the general 3D case. Octahedral stresses. Strain energy stored in a linearly elastic body resulting from volume change and from distortion.Yield criteria. Fatigue, stress concentrations, Miner's rule. Material properties and testing.

MECH2412
Mechanics of Solids 2B
Staff Contact: Dr HL Stark
UOC3 HPW3 WKS14 S2
Prerequisite/s: MECH2411
Note/s: Excluded MECH2402

MECH2601
Fluid Mechanics and Thermodynamics A
Staff Contact: Prof GL Morrison
UOC6 HPW4 WKS14 S1
Prerequisite/s: MATH1131 or MATH1141, PHYS1918

MECH2602
Fluid Mechanics and Thermodynamics B
Staff Contact: Prof GL Morrison
UOC6 HPW4 WKS14 S2
Prerequisite/s: MECH2601

MECH3000
Professional Responsibilities
Staff Contact: A/Prof RB Frost
UOC3 HPW3 WKS14 S2
Professional ethics, responsibility, the environment, liability and intellectual property. Written communication and oral reporting.

MECH3091
Co-operative Training A
Staff Contact: Dr J Katupitiya
UOC24 S1
Prerequisite/s: Completion of Year 3
Co-op scholars are required to do a 25 week period of industrial training in Session 1 of their Year 4. The location of the training is at the site of one of the sponsors of scholarships for that year. At the end of the training, they are required to submit a report on the training, which is evaluated by their academic mentor, and normally make a presentation on this topic at the company to company representatives and the academic mentor.

MECH3092
Co-operative Training B
Staff Contact: Dr J Katupitiya
UOC24 S2
Prerequisite/s: Completion of Year 3
Co-op scholars are required to do a 25 week period of industrial training in Session 2 of their Year 4. The location of the training is at the site of one of the sponsors of scholarships for that year. At the end of the training, they are required to submit a report on the training, which is evaluated by their academic mentor, and normally make a presentation on this topic at the company to company representatives and the academic mentor.

MECH3101
Machine Systems Design A
Staff Contact: AJ Barratt
UOC3 HPW3 WKS14 S1
Prerequisite/s: MECH2100, MECH2320, MECH2412
Corequisite/s: MECH3400
Mathematical modelling for design applications. Force flow through components and assemblies. Dynamically loaded bolted connections and welded joint design. Design of more engineering components and systems.

MECH3102
Machine Systems Design B
Staff Contact: AJ Barratt
UOC3 HPW3 WKS14 S2
Prerequisite/s: MECH3101
Corequisite/s: MECH3300
Design of mechanical power transmission systems. Major design project involving broad engineering aspects, concurrent design and the interaction with other group members.

MECH3202
Microprocessor Control
Staff Contact: Dr J Katupitiya
UOC3 HPW3 WKS14 S2
Prerequisite/s: ELEC0807
Microprocessor architecture; introduction to microprocessor programming in assembler and high level languages and specific
aspects of programming of a single board (chip) microcomputer; programming concepts. Instruction sets and addressing modes; instruction timing; interrupts. Laboratory complement to lectures based on the use of single board computers.

MECH3203
Engineering Experimentation A
Staff Contact: Dr MJ Tordon
UC3 HPW2 WKS14 S1
Prerequisite/s: ELEC0807, MECH2411, MECH2600, MECH2700
Scientific method, engineering method; experimental program; report writing; error analysis; principles of transducers; selection of instruments.

MECH3204
Engineering Experimentation B
Staff Contact: Dr MJ Tordon
UC3 HPW2 WKS14 S2
Prerequisite/s: ELEC0807, MECH2411, MECH2600, MECH2700
Dynamic response of instruments; signal processing; digital data acquisition; interfacing transducers to computers; computer control of experiments; smart transducers.

MECH3211
Linear Systems Analysis
Staff Contact: A/Prof JE Baker
UC3 HPW3 WKS14 S2
Prerequisite/s: MATH2009, MECH1300
Models of physical systems: differential equations for physical systems including mechanical; electrical, hydraulic, thermal and pneumatic systems; linearisation. System analysis techniques: solution by Laplace transform method. Transfer functions and block diagrams. System response: response of first and second order systems to impulse step, ramp, sinusoidal and periodic inputs; higher order system response; system stability, applications.

MECH3212
Principles of Control
Staff Contact: Dr RA Willgoss
UC3 HPW3 WKS14 S2
Prerequisite/s: MECH3211
Introduction to modern systems analysis. Review of modelling, simulation and non-linear systems. Stability criteria; use of Root Locus and Bode for system analysis and modification. The matrix exponential and state space notation. The transfer matrix. Pole and state feedback, controllability and observability. Use of MATLAB as a simulation environment.

MECH3300
Engineering Mechanics 3
Staff Contact: A/Prof JE Baker
UC3 HPW3 WKS14 S2
Prerequisite/s: MATH2009, MECH2300 or MECH2320

MECH3330
Vibration Analysis
Staff Contact: A/Prof RAJ Ford
UC3 HPW3 WKS14 S2
Prerequisite/s: MATH2009, MECH2300 or MECH2320
Note/s: Excluded MECH2310, MECH3310, MECH9311

MECH3400
Mechanics of Solids 3
Staff Contact: Prof EJ Hahn
UC3 HPW3 WKS14 S1
Prerequisite/s: MATH2009, MECH2411
Deflections of beams and structures. Introduction to theory of elasticity; stress, strain, torsion. Membrane analogy. Finite element stress analysis. Basic concepts, statically indeterminate beams and structures stiffness method; bar; triangular and rectangular finite elements.

MECH3520
Programming and Numerical Methods
Staff Contact: Dr I Maclaine-Cross
UC3 HPW3 WKS14 S1
Prerequisite/s: MATH2009, MECH1500
Note/s: Excluded MANF3800, MECH3800
Programming language features essential to complex engineering calculations. Logic, control, arrays, functions and subroutines in FORTRAN. Application of numerical methods to solve non-linear equations, linear and non-linear systems, differencing schemes, ordinary and partial differential equations in mechanical engineering applications.

MECH3530
Computing Applications in Mechanical Systems
Staff Contact: Dr J Katupitiya
UC3 HPW3 WKS14 S1
Prerequisite/s: MECH1500
Note/s: Excluded MECH3510
Development of programming skills in the C++ language for applications in Mechanical Engineering. Object Oriented Programming for developing software models of mechanical systems such as open kinematic chains. Development of user machine interfaces for instrumentation, interfacing and measurement. Interrupt service routines and introduction to real-time programming. Development of C++ routines for integration with MATLAB for data acquisition.

MECH3601
Thermofluid System Design
Staff Contact: Prof GL Morrison
UC3 HPW3 WKS14 S1
Prerequisite/s: MECH2600, MECH2700

MECH3602
Advanced Thermodynamics
Staff Contact: Prof M Behnia
UC3 HPW3 WKS14 S2
Prerequisite/s: MECH2600, MECH2700
Utilisation of energy, availability - open and closed systems; generalised thermodynamic relations; kinetic theory of gases; non-reactive ideal gas mixtures. Combustion, chemical equilibrium, chemical kinetics and emission control. Compressible flow.

MECH4001
Communications for Professional Engineers
Staff Contact: A/Prof JE Baker
UC3 HPW3 WKS14 S2
Prerequisite/s: MECH3000
Corequisite/s: MECH4003
Note/s: Corequisites may be adjusted for some mid-course entry plans
MECH4003
Thesis A
Staff Contact: Dr M Chowdhury
UOC6 WK514 S1S2
Note/s: Excluded MECH4000
To be taken in the last second session required for the completion of all requirements for the award of the degree. This course, together with MECH4004 Thesis B, which is to be taken in the following session, requires each student to demonstrate managerial, technical and professional skills in planning and executing an approved engineering project within a stipulated time limit. Each student is also required to report on their project work at a thesis conference which is organised under MECH4001 Communications for Professional Engineers. Each student is guided by a supervisor, but successfully planning, executing and reporting on the project is the sole responsibility of each student. Thesis A does not require the submission of a thesis document. A satisfactory grade in this course is provisional pending successful completion of MECH4004.

MECH4004
Thesis B
Staff Contact: Dr M Chowdhury
UOC9 WK514 S1S2
Prerequisite/s: MECH4003
Corequisite/s: MECH4001
Note/s: Excluded MECH4000
To be taken in the last session required for the completion of all requirements for the award of the degree, i.e. in the immediately following that in which MECH4003 Thesis A is taken. This course, together with MECH4003 Thesis A, requires each student to demonstrate managerial, technical and professional skills in planning, executing and reporting on an approved engineering project within a stipulated time limit. Each student is also required to report on their project work at a thesis conference which is organised under MECH4001 Communications for Professional Engineers. The project, on which each student works, will be a direct continuation of the project on which that student worked in MECH4003 Thesis A. Each student is guided by a supervisor, but successfully completing the project, writing the thesis and submitting two bound copies by specified deadlines are the sole responsibility of each student.

MECH4223
Machine Condition Monitoring
Staff Contact: A/Prof RB Randall
UOC6 HPW3 WKS14 SS
Prerequisite/s: MECH3200, MECH3212
Sensors and transducer interfacing to computers. Vibration signatures of faults in rotating and reciprocating machines; detection and diagnosis of faults; characterisation of signatures; prediction of service life and maintenance procedures. Project on measuring a parameter indicating possible failure.

MECH4300
Mechanics of Manipulators
Staff Contact: A/Prof JE Baker
UOC6 HPW3 WKS14 SS
Prerequisite/s: MECH3300
Three-dimensional kinematics and kinetics of a particle and a rigid body: coordinate transformations, finite and infinitesimal rigid-body motion, Eulerian angles, motion composition, angular acceleration, relative motion, momentum and inertia, work-energy principle, equations of motion, impulse, and screw motor notation. Application to systems of rigid bodies. Spatial linkage analysis.

MECH9000
Research Thesis Mechanical Engineering (Full time)
Staff Contact: Prof M Behnia

MECH9001
Research Thesis Mechanical Engineering (Part time)
Staff Contact: Prof M Behnia

MECH9120
Design Technology
Staff Contact: A/Prof RB Frost
UOC6 HPW3 WKS14 SS
Prerequisite/s: MECH2100 or equivalent
Note/s: Excluded MECH4120
Aspects of mechanical engineering technology which form the basis for machinery design including: performance matching of systems and components; hydraulic components and circuits for power and control; fluid couplings and torque converters; power circulation in multi-path machinery; driveline logic and synthesis opportunities; steering systems for tracked and wheeled vehicles; manual and automatic transmissions.

MECH9131
Advanced CAD Modelling and Applications
Staff Contact: AJ Barratt
UOC6 HPW3 WK514 SS
Note/s: Excluded MECH4131. Quota restrictions apply
Development of CAD modelling systems, 2D and 3D, wire frame, surface representation and solids. Advanced modelling techniques of complex geometry, surfaces, Boolean operations and solids manipulation. Programming and database interfacing in a CAD environment. Development of engineering based applications using these facilities.

MECH4300
Advanced Digital Logic
Staff Contact: Dr J Katupitiya
UOC3 HPW3 WKS14 S1
Prerequisite/s: ELEC0807
Review of number theory; boolean algebra; basic properties; representation of logical statements; positive and negative truth logic. Use of circuit diagrams as a basic tool for design, construction and debugging of problems in logic; mixed symbology. Advanced digital logic techniques; interfacing of digital inputs and outputs in a microprocessor based system. Laboratory complement to lectures based on design-and-build projects which include design, construction and debugging.

MECH4221
Industrial Robotics
Staff Contact: Dr RA Willgoss
UOC3 HPW3 WKS14 S1
Prerequisite/s: MECH9200, MECH3212
Automation types; introduction to industrial robots; end effectors. Robotic history, populations and main use; laboratory and PC environments. Kinematics of multidegree of freedom systems; simulation with open systems software. Safety standards; design of installations. Anatomy of an industrial robot as an intelligent machine; robot languages; work cell design. Projects.

MECH4000
Prerequisite/s: U0C3 HPW3 WKS14 S1
Staff Contact: Dr RA Willgoss
UOC6 WK514 S1S2
Note/s: Excluded MECH4000
To be taken in the last second session required for the completion of all requirements for the award of the degree. This course, together with MECH4004 Thesis B, which is to be taken in the following session, requires each student to demonstrate managerial, technical and professional skills in planning and executing an approved engineering project within a stipulated time limit. Each student is also required to report on their project work at a thesis conference which is organised under MECH4001 Communications for Professional Engineers. Each student is guided by a supervisor, but successfully planning, executing and reporting on the project is the sole responsibility of each student. Thesis A does not require the submission of a thesis document. A satisfactory grade in this course is provisional pending successful completion of MECH4004.

MECH4004
Prerequisite/s: U0C3 HPW3 WKS14 S1S2
Staff Contact: Dr M Chowdhury
UOC9 WK514 S1S2
To be taken in the last session required for the completion of all requirements for the award of the degree, i.e. in the immediately following that in which MECH4003 Thesis A is taken. This course, together with MECH4003 Thesis A, requires each student to demonstrate managerial, technical and professional skills in planning, executing and reporting on an approved engineering project within a stipulated time limit. Each student is also required to report on their project work at a thesis conference which is organised under MECH4001 Communications for Professional Engineers. The project, on which each student works, will be a direct continuation of the project on which that student worked in MECH4003 Thesis A. Each student is guided by a supervisor, but successfully completing the project, writing the thesis and submitting two bound copies by specified deadlines are the sole responsibility of each student.

MECH9000
Research Thesis Mechanical Engineering (Full time)
Staff Contact: Prof M Behnia

MECH9001
Research Thesis Mechanical Engineering (Part time)
Staff Contact: Prof M Behnia

MECH9120
Design Technology
Staff Contact: A/Prof RB Frost
UOC6 HPW3 WKS14 SS
Prerequisite/s: MECH2100 or equivalent
Note/s: Excluded MECH4120
Aspects of mechanical engineering technology which form the basis for machinery design including: performance matching of systems and components; hydraulic components and circuits for power and control; fluid couplings and torque converters; power circulation in multi-path machinery; driveline logic and synthesis opportunities; steering systems for tracked and wheeled vehicles; manual and automatic transmissions.

MECH9131
Advanced CAD Modelling and Applications
Staff Contact: AJ Barratt
UOC6 HPW3 WK514 SS
Note/s: Excluded MECH4131. Quota restrictions apply
Development of CAD modelling systems, 2D and 3D, wire frame, surface representation and solids. Advanced modelling techniques of complex geometry, surfaces, Boolean operations and solids manipulation. Programming and database interfacing in a CAD environment. Development of engineering based applications using these facilities.

MECH4223
Machine Condition Monitoring
Staff Contact: A/Prof RB Randall
UOC6 HPW3 WKS14 SS
Prerequisite/s: MECH3200, MECH3212
Sensors and transducer interfacing to computers. Vibration signatures of faults in rotating and reciprocating machines; detection and diagnosis of faults; characterisation of signatures; prediction of service life and maintenance procedures. Project on measuring a parameter indicating possible failure.

MECH4300
Mechanics of Manipulators
Staff Contact: A/Prof JE Baker
UOC6 HPW3 WKS14 SS
Prerequisite/s: MECH3300
Three-dimensional kinematics and kinetics of a particle and a rigid body: coordinate transformations, finite and infinitesimal rigid-body motion, Eulerian angles, motion composition, angular acceleration, relative motion, momentum and inertia, work-energy principle, equations of motion, impulse, and screw motor notation. Application to systems of rigid bodies. Spatial linkage analysis.

MECH9000
Research Thesis Mechanical Engineering (Full time)
Staff Contact: Prof M Behnia

MECH9001
Research Thesis Mechanical Engineering (Part time)
Staff Contact: Prof M Behnia

MECH9120
Design Technology
Staff Contact: A/Prof RB Frost
UOC6 HPW3 WKS14 SS
Prerequisite/s: MECH2100 or equivalent
Note/s: Excluded MECH4120
Aspects of mechanical engineering technology which form the basis for machinery design including: performance matching of systems and components; hydraulic components and circuits for power and control; fluid couplings and torque converters; power circulation in multi-path machinery; driveline logic and synthesis opportunities; steering systems for tracked and wheeled vehicles; manual and automatic transmissions.

MECH9131
Advanced CAD Modelling and Applications
Staff Contact: AJ Barratt
UOC6 HPW3 WK514 SS
Note/s: Excluded MECH4131. Quota restrictions apply
Development of CAD modelling systems, 2D and 3D, wire frame, surface representation and solids. Advanced modelling techniques of complex geometry, surfaces, Boolean operations and solids manipulation. Programming and database interfacing in a CAD environment. Development of engineering based applications using these facilities.
MECH9202
Microprocessor Fundamentals for Mechanical Engineers
Staff Contact: Dr MJ Tordon
UOC6 HPW3 WKS14 SS
Prerequisite/s: MECH9201 or equivalent
Note/s: Excluded COMP9221, ELEC4432, ELEC9406, ELEC4351 and equivalent


MECH9203
Industrial Applications of Microprocessors
Staff Contact: Dr RA Willgoss
UOC6 HPW3 WKS14 SS
Prerequisite/s: MECH9202 or equivalent
Note/s: Excluded ELEC4432, ELEC9406, ELEC4351 and equivalent


MECH9204
Elements of Industrial Automation
Staff Contact: Dr RA Willgoss
UOC6 HPW3 WKS14 SS

An introductory overview of the elements of Industrial Automation systems and the factors governing their use in industry.

MECH9205
The Analysis and Use of Integrated CAD/CAM Systems
Staff Contact: Dr RA Willgoss
UOC6 HPW3 WKS14 SS
Prerequisite/s: MECH9204


MECH9211
Modelling and Control of Mechatronic Systems
Staff Contact: Dr J Katupitiya
UOC6 HPW3 WKS14 SS
Prerequisite/s: MECH9212 or equivalent

Development of modelling techniques and design of controllers using digital computers, with special emphasis on digital control systems for motion control. Typical examples of mechatronic systems.

MECH9212
Control and Modelling of Mechanical Systems 2
Staff Contact: Dr RA Willgoss
UOC6 HPW3 WKS14 SS
Prerequisite/s: MECH9211 or equivalent

Development of modelling techniques using both digital and analogue computation, with special emphasis on the representation of non-linearities. Typical examples of mechanical systems.

MECH9221
Industrial Robotics
Staff Contact: Dr RA Willgoss
UOC6 HPW3 WKS14 SS

MECH9222
Artificially Intelligent Machines
Staff Contact: Dr RA Willgoss
UOC6 HPW3 WKS14 SS

The principles of operation of machines into which limited powers of decision making have been delegated. The grouping of intelligent machines. Cognition; sensor technology; parsing; information representation; convolutions; software and hardware environments.

MECH9301
Advanced Mechanism Analysis and Synthesis 1
Staff Contact: A/Prof JE Baker
UOC6 HPW3 WKS14 SS
Prerequisite/s: Assumed knowledge MECH2300 or MECH2320 or equivalent
Note/s: Excluded MECH4301

Algebraic displacement, velocity and acceleration analyses of simple and complex planar mechanisms. Instantaneous kinematics: centroids; inflection and Bresse circles; acceleration centre; Euler-Savary equation; cubic of stationary curvature; centring point curve. Coupler curves and their properties; curve cognates. Constraint and freedom; mobility; velocity closure of a loop; special configurations; singularities.

MECH9302
Advanced Mechanism Analysis and Synthesis 2
Staff Contact: A/Prof JE Baker
UOC6 HPW3 WKS14 SS
Prerequisite/s: Assumed knowledge MECH2300 or MECH2320 or equivalent

A selection of topics from Planar mechanisms: kinematic analysis of complex mechanisms; kinematic analysis; kinematic geometry; precision position synthesis. Cams: basic and common curves; equations of motion; development of profile; determination of system geometry and mechanical properties; noise, wear, backlash and manufacture. Spatial linkages: structural analysis; closure equations; screw system algebra.

MECH9310
Advanced Vibration Analysis
Staff Contact: A/Prof RB Randall
UOC6 HPW3 WKS14 SS
Prerequisite/s: Assumed knowledge MECH3310 or MECH3330 or MECH9311 or equivalent
Note/s: Excluded MECH4310

Introduction to experimental vibration analysis using Fast Fourier Transform (FFT) techniques. Typical sources of vibration in machines. Analysis of continuous systems via classical and finite element techniques. Experimental modal analysis. Torsional vibrations, including geared shaft systems.

MECH9311
Fundamentals of Vibration
Staff Contact: A/Prof RAJ Ford
UOC6 HPW3 WKS14 SS
Prerequisite/s: Assumed knowledge MECH2300 or MECH2320, MATH2009 or equivalent
Note/s: Excluded MECH3310 and MECH3330


MECH9312
Fundamentals of Noise and Vibration Measurement
Staff Contact: Dr JM Challen
UOC6 HPW3 WKS14 SS

MECH9323
Environmental Noise
Staff Contact: Prof KP Byrne
UOC6 HPW3 WK514 SS
Prerequisite/s: MECH9325 or equivalent

MECH9324
Building Acoustics
Staff Contact: Prof KP Byrne
UOC6 HPW3 WK514 SS
Prerequisite/s: MECH9325 or equivalent
Room acoustics viewed from modal and energy aspects. Absorption and transmission performance of building elements such as carpets, windows and walls. Relationship between laboratory and field performance measurements. Noise problems associated with building services.

MECH9325
Fundamentals of Noise
Staff Contact: Dr JM Challen
UOC6 HPW3 WK514 SS
Note/s: Excluded MECH4321

MECH9326
Advanced Noise
Staff Contact: Dr JM Challen
UOC6 HPW3 WK514 SS
Prerequisite/s: MECH4321 or MECH9325
Note/s: Excluded MECH4322
The Helmholtz resonator. Transmission line formulae for one dimensional plane wave calculations. Development of the three dimensional acoustic wave equation. Applications of the three dimensional form of the acoustic wave equation in rectangular coordinates, including transmission of plane waves at oblique incidence between media, waves in rectangular ducts, standing waves in enclosures. Applications of the three dimensional wave equation in cylindrical and spherical coordinates. Basic structural-acoustic interaction.

MECH9361
Hydrodynamic Lubrication Theory and Design
Staff Contact: Prof EJ Hahn
UOC6 HPW3 WK514 SS
Note/s: Excluded MECH4361
Types of hydrodynamic bearings and bearing operation; properties of lubricants; theory of steady state hydrodynamic lubrication; hydrostatic and squeeze film lubrication applied to slider and journal bearings; bearing design with side leakage; thermal balance. Journal bearing dynamics; instability analysis. Elastohydrodynamic lubrication. Bearing materials; friction and wear. Grease lubrication.

MECH9400
Mechanics of Fracture and Fatigue
Staff Contact: Dr K Zamari
UOC6 HPW3 WK514 SS
Note/s: Excluded MECH4400

MECH9410
Finite Element Applications
Staff Contact: A/Prof DW Kelly
UOC6 HPW3 WK514 SS
Note/s: Excluded MECH4410

MECH9440
Plasticity Theory and Applications
Staff Contact: A/Prof CV Madhusudana
UOC6 HPW3 WK514 SS
Prerequisite/s: MECH3400 or equivalent
Note/s: Excluded MECH4440
Analysis of stress, strain, strain rate; plastic strain stress relations with description of experimental verification. Application of plasticity theory to a selection of problems including metal working processes such as extrusion and rolling and metallic friction and wear. Limit analysis.

MECH9610
Advanced Fluid Dynamics
Staff Contact: Prof KP Byrne
UOC6 HPW3 WK514 SS
Prerequisite/s: MECH3600 or equivalent
Note/s: Excluded MECH4600, MECH4610, MECH4710, MECH9710

MECH9620
Computational Fluid Dynamics
Staff Contact: Prof KP Byrne
UOC6 HPW3 WK514 SS
Prerequisite/s: Assumed
Note/s: Excluded MECH4610, MECH4620

MECH9690
Special Fluid Mechanics Elective
UOC6 HPW3 WK514 SS
This subject is variable in content in order to allow the presentation of material of particular interest and merit by a visiting expert in a field not otherwise covered.

MECH9710
Numerical Fluid Dynamics and Heat Transfer
Staff Contact: Prof KP Byrne
UOC6 HPW3 WK514 SS
Prerequisite/s: Assumed knowledge MECH3520, MECH3800 or equivalent
Note/s: Excluded MECH4710
MECH9720
Solar Thermal Energy Design
Staff Contact: Prof GL Morrison
UOC6 HPW3 WKS14 SS
Note/s: Excluded MECH4720 and equivalent

MECH9730
Two Phase Flow and Heat Transfer
Staff Contact: Prof M Behnia
UOC6 HPW3 WKS14 SS
Prerequisite/s: Assumed knowledge MECH3701 or equivalent
Note/s: Excluded MECH4730

MECH9740
Power Plant Engineering
Staff Contact: Prof M Behnia
UOC6 HPW3 WKS14 SS
Prerequisite/s: Assumed knowledge MECH2600 and MECH2700 or equivalent
Note/s: Excluded MECH4740

MECH9742
Power Production Assessment
Staff Contact: Prof M Behnia
UOC6 HPW3 WKS14 SS
Prerequisite/s: Assumed knowledge MECH3600 and MECH3701 or equivalent
Components of hydro, coal and nuclear fuel power station designs. Economics of power production. Operation and maintenance costs. Efficiency and heat balance calculations of thermal power stations. Comparison of electrical energy production costs of different power stations.

MECH9750
Industrial Applications of Heat Transfer
Staff Contact: Prof M Behnia
UOC6 HPW3 WKS14 SS
Prerequisite/s: MECH3702 or equivalent

MECH9751
Refrigeration and Air Conditioning 1
Staff Contact: Prof E Leonardi
UOC6 HPW3 WKS14 SS
Note/s: Excluded MECH4751

MECH9752
Refrigeration and Air Conditioning 2
Staff Contact: Prof E Leonardi
UOC6 HPW3 WKS14 SS
Prerequisite/s: Assumed knowledge MECH9751 or equivalent
Note/s: Candidates wishing to specialise in Refrigeration and Air Conditioning should select this

MECH9753
Refrigeration and Air Conditioning Design 1
Staff Contact: Dr IL Maclaine-cross
UOC6 HPW3 WKS14 SS
Prerequisite/s: Assumed knowledge MECH9730, MECH9751, MECH9752 or equivalent
Design of refrigeration equipment compressors; throttling devices; condensers; evaporators. Cooling towers: evaporative condensers; air conditioning coils. Piping systems. Air ducts. Steam raising and water heating equipment.

MECH9754
Refrigeration and Air Conditioning Design 2
Staff Contact: Dr IL Maclaine-cross
UOC6 HPW3 WKS14 SS
Prerequisite/s: MECH9753 or equivalent
Generators and absorbers for absorption systems. Calculation of transient heating and cooling loads. Air conditioning systems. Load analysis and system capability.

MECH9755
Refrigeration and Air Conditioning Applications
Staff Contact: Prof E Leonardi
UOC6 HPW3 WKS14 SS
Industrial, commercial and domestic applications of refrigeration and air conditioning. Refrigeration technology. The science and technology of foods. Building design and construction.

MECH9756
Refrigeration and Air Conditioning Experimentation
Staff Contact: Prof E Leonardi
UOC6 HPW3 WKS14 SS
Prerequisite/s: MECH9751, MECH9752
Corequisite/s: MECH9753, MECH9754
Performance testing and system evaluation of multistage R22 brine system, R12 forced draft cooler system and dual duct air conditioning plant. Instrumentation, data acquisition and control of refrigeration plant. Use of calorimeter rooms for testing and rating of equipment. Transient performance characteristics of direct expansion coil and system, under different ambient conditions. Group project involving the designing, building, commissioning, instrumenting and testing of refrigeration and air conditioning equipment.
MECH9757
Ambient Energy Air Conditioning
Staff Contact: Dr IL Maclaine-cross
UOC6 HPW3 WKS14 SS
Prerequisite/s: Assumed knowledge MECH3701 or equivalent

MECH9761
Internal Combustion Engines 1
Staff Contact: Prof BE Milton
UOC6 HPW3 WKS14 SS
Note/s: Excluded MECH4700

MECH9762
Internal Combustion Engines 2
Staff Contact: Prof BE Milton
UOC6 HPW3 WKS14 SS
Prerequisite/s: MECH9761 or equivalent

MECH9790
Special Thermodynamics Elective
Staff Contact: Prof E Leonardi
UOC6 HPW3 WKS14 SS
This course is variable in content in order to allow the presentation of material of particular interest and merit by a visiting expert in a field not otherwise covered.

MECH9800
Ordinary Differential Equations in Mechanical Engineering
Staff Contact: A/Prof JE Baker
UOC6 HPW3 WKS14 SS
Solutions and their meaning, integration constants, linearity; special methods of solution; integration factors; variation of parameters; Euler, higher order linear equations; physical origins of ordinary differential equations and linear systems; linearisation of engineering problems; stability of engineering systems.

MECH9920
Special Topic in Mechanical Engineering
Staff Contact: A/Prof RB Randall
UOC6 HPW3 WKS14 SS
MECH9930
Special Topic in Mechanical Engineering
Staff Contact: A/Prof RB Randall
UOC6 HPW3 WKS14 SS
These syllabi change to allow presentation of a special topic of current interest particularly by visitors with recognised expertise in the topic.

NAV3100
Principles of Ship Design
Staff Contact: PJ Helmore
UOC3 HPW3 S2
Prerequisite/s: NAVL3601
Corequisite/s: NAVL3602

NAV3110
Ship Practice
Staff Contact: PJ Helmore
UOC3 HPW3 S1
Corequisite/s: NAVL3601

NAV3400
Ship Structures 1
Staff Contact: Dr M Chowdhury
UOC3 HPW3 S1
Prerequisite/s: MATH2039, MATS9520, MECH2412
Corequisite/s: MECH3400

NAV3601
Ship Hydromechanics A
Staff Contact: A/Prof LJ Doctors
UOC3 HPW3 S1
Prerequisite/s: MATH2039, MECH2300, MECH2600
Basic concepts and integration methods. Hydrostatic particulars and approximate formulae. Intact stability, KN data and righting arm, stability at small and large angles of heel, free-surface effects, the wall-sided formula. Kinematics of irrotational flow and equations of motion for an incompressible fluid. Stream function and use of distributed singularities to generate arbitrary body shapes.

NAV3602
Ship Hydromechanics B
Staff Contact: A/Prof LJ Doctors
UOC6 HPW6 S2
Prerequisite/s: NAVL3601
Corequisite/s: MECH3330
NAVL3700
Ship Propulsion
Staff Contact: PJ Helmore
UOC3 S2 HPW3
Prerequisite/s: NAVL3601
Co-requisite/s: NAVL3602
Propeller and waterjet terminology, theories of action, interaction with the hull, cavitation, propeller, waterjet and engine data, practical details and drawing, strength, estimation of polar moment of inertia and entrained water.

NAVL4101
Design of High-speed Craft
Staff Contact: A/Prof LJ Doctors
UOC3 HPW3 S1
Prerequisite/s: NAVL3100, NAVL3602
Practical design and layout of modern high-speed vessels. Principal characteristics of monohulls and catamarans in terms of, passenger accommodation, vehicles, and cargo handling. Impact of safety considerations and classification society rules. Hydrodynamics, resistance, propulsion and motions specific to monohulls, catamarans, hydrofoils and hovercraft.

NAVL4102
Design of Yachts
Staff Contact: A/Prof LJ Doctors
UOC3 HPW3 S2
Prerequisite/s: NAVL3100, NAVL3602
Co-requisite/s: NAVL4402

NAVL4111
Ship Design Project A
Staff Contact: A/Prof LJ Doctors
UOC3 HPW3 S1
Prerequisite/s: NAVL3700
Co-requisite/s: NAVL4101, NAVL4710
Each student is required to perform the following design tasks for a vessel of their choice and submit the results: 1. Rationale, specification, weights, inboard profile. 2. Power, capacities, freeboard, trim, stability, stern gear. 3. Sectional area curve, lines plan, preliminary midship section.

NAVL4112
Ship Design Project B
Staff Contact: A/Prof LJ Doctors
UOC3 HPW3 S2
Prerequisite/s: NAVL4111
Co-requisite/s: NAVL4102, NAVL4720
Each student is required to perform the following design tasks for a vessel of their choice and submit the results: 4. Hydrostatics, stability and subdivision analysis. 5. Powering, propeller, systems - schematic drawing, detailed capacities. 6. Section modulus calculation, bulkhead, midship section, module concept. 7. Final weights, capacity drawing, operational data and evaluation. 8. Specification.
Mining Engineering offers one of the most diverse ranges of career paths, very high salary levels and excellent opportunities for career progression. This is because it is a global profession that encompasses a wide range of activities involving technology, people, equipment, financial resources, community and government.

Mining Engineering is concerned with the safe, economic and environmentally responsible recovery, processing and marketing of mineral resources from the earth. Mining Engineering degree programs include elements from a number of other disciplines such as geology, metallurgy, commerce, economics and management. This means that graduates possessing knowledge of mining processes within this framework are very versatile and can progress rapidly both within the mining industry and in those sections affiliated to the industry.

Career opportunities exist in areas such as mine production, mine management, engineering design and technology, computer software development, geotechnical engineering, environmental engineering, corporate management, merchant banking, consulting (mine design financial evaluation, feasibility studies, geotechnical design environmental assessment) civil tunnelling, quarrying risk management, project management, education and training, Government (inspectors, policy formulation, administration).

This spectrum of career paths provides male and female graduates with the flexibility to work in and move between a diverse range of environments and locations: national and international, country and city, surface or underground, office or field.

Upon graduating, many mining engineers spend between 1 and 3 years gaining work experience at minesites and may then elect to gain their statutory Mine Managers qualifications.

Initially in charge of a small section of a mine, they take increasingly responsible positions, managing mines with between 300–400 employees and annual turnovers of more that $100 million. They can then progress to the management of larger or more diverse mines and mining complexes, reaching the top levels of mining industry management.

In recognition of the rapid career progression available to mining engineers in the commercial and management sectors, a combined Bachelor of Mining Engineering/Master of Commerce program is offered at UNSW. Some students completing this program are recruited directly into the commercial sector; others progress up through the management levels of major mining companies.

As in other areas of Engineering and Science there has been a rapid change in technology applied to the Mining Industry. This has meant that today mining operations are much safer and more automated with a much less "manual" component associated with the day-to-day operation of a mine. There is a demand for graduates with computer skills to be involved in the design of complex mine planning systems, the development of remote controlled mining systems and the economic evaluation of mining operations. Throughout the course, academic staff through research and close industry involvement promote the application of new technologies to all areas of mining. The availability of the combined BE/BSc in Computer Science presents an opportunity for students with a strong computing interests to become more involved in the development and application of computing technology to the design and management of mining systems.

Mining engineering is an international profession with Australia's major rhining companies operating in South East Asia, Africa, South and North America and Europe, and our graduates have the opportunity to travel in their work if they so desire. Mining Engineering graduates are trained to be versatile, adaptable and responsive to change in a physically and mentally challenging career.

The School also offers formal postgraduate programs including a Graduate Certificate, a Graduate Diploma and a Master of Engineering Science, plus ongoing professional development short courses.
Undergraduate Study

Program Outlines

The School offers a 4 year full-time program in Mining Engineering leading to the award of the degree of Bachelor of Engineering at Pass or Honours level. A five-year combined degree program is also available in Civil Engineering, in Science, in Arts and in a fast track Master of Commerce degree is also available to students who have maintained at least a credit average in their first three years of the Mining Engineering Program.

After graduation, mining engineers who choose to develop careers in production management, will be required to gain further practical experience before obtaining a Mine Manager’s Certificate of Competency, in either Coal or Metalliferous Mining. These statutory certificates of competency are issued by the State Department of Industrial Relations, which in the case of New South Wales coal mining comes under the Coal Mines Regulation Act No. 67, 1982, and for metalliferous mining under the Mines Inspection Act No. 75, 1901, as amended.

Arrangements have been made with the Universities of Newcastle and Tasmania for students who have completed a specified program at these institutions to be admitted with advanced standing to Year 3 of the Mining Engineering degree program at the University of New South Wales.

Students or graduates of other engineering disciplines may also be given suitable advanced standing for conversion to Mining Engineering.

3140
Bachelor of Engineering

BE

Year 1 of the course is similar to that of several other Engineering programs and Year 2 includes those courses which are of common relevance to the Engineering disciplines. Year 3 is largely devoted to basic mining courses and Year 4 provides advanced instruction in courses essential to all mining engineers. In addition, the fourth year offers a range of elective courses, allowing students to supplement their studies with a minor specialisation. An important fourth year requirement is for students to undertake personal research or a study project in mining or minerals engineering on which they are required to submit a thesis for examination. A number of general education courses are also prescribed for the last three years.

Some courses in Years 3 and 4 of the program will be conducted at the School's residential Minesite Teaching Unit located at Wyee Coal Mine. This provides a unique opportunity for students to gain immediate practical insight into the application of theoretical concepts. For the award of Honours at the conclusion of the full-time course, students will need to have distinguished themselves in the formal work, in other assignments as directed by the Head of School, and in the final year project.

In the undergraduate program it is compulsory for students to gain practical experience in the mining industry during successive long recesses. A minimum of 100 days needs to be completed before graduation. The School assists students as much as possible in securing suitable vacation employment.

### Year 1

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>HPW</th>
<th>UOC</th>
</tr>
</thead>
<tbody>
<tr>
<td>MATH1131</td>
<td>Maths 1A</td>
<td>6</td>
<td>0</td>
</tr>
<tr>
<td>MATH1231</td>
<td>Maths 1B</td>
<td>0</td>
<td>6</td>
</tr>
<tr>
<td>PHYS1169</td>
<td>Physics 1A</td>
<td>6</td>
<td>0</td>
</tr>
<tr>
<td>PHYS2920</td>
<td>Electronics</td>
<td>0</td>
<td>3</td>
</tr>
</tbody>
</table>

### Year 2

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>HPW</th>
<th>UOC</th>
</tr>
</thead>
<tbody>
<tr>
<td>MATH2029</td>
<td>Engineering Mathematics 1</td>
<td>6</td>
<td>0</td>
</tr>
<tr>
<td>MATH2039</td>
<td>Engineering Mathematics 2</td>
<td>0</td>
<td>6</td>
</tr>
<tr>
<td>MATH2839</td>
<td>Statistics</td>
<td>0</td>
<td>3</td>
</tr>
<tr>
<td>GEOL5211</td>
<td>Geology for Mining Engineers</td>
<td>0</td>
<td>3</td>
</tr>
<tr>
<td>MINE2010</td>
<td>Mining Engineering Practice 2A</td>
<td>2</td>
<td>0</td>
</tr>
<tr>
<td>MINE2020</td>
<td>Mining Engineering Practice 2B</td>
<td>0</td>
<td>2</td>
</tr>
<tr>
<td>GMAT0441</td>
<td>Surveying for Engineers</td>
<td>0</td>
<td>3</td>
</tr>
<tr>
<td>ELEC0809</td>
<td>Electric Power Engineering</td>
<td>3</td>
<td>0</td>
</tr>
<tr>
<td>MINE2030</td>
<td>Fluid Mechanics and Thermodynamics</td>
<td>0</td>
<td>4</td>
</tr>
<tr>
<td>MATS9421</td>
<td>Materials for Mining Engineers</td>
<td>4</td>
<td>0</td>
</tr>
<tr>
<td>MINE2040</td>
<td>Stress Analysis 2</td>
<td>3</td>
<td>0</td>
</tr>
</tbody>
</table>

### Year 3

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>HPW</th>
<th>UOC</th>
</tr>
</thead>
<tbody>
<tr>
<td>MINE3010</td>
<td>Mining Geomechanics 1</td>
<td>0</td>
<td>6</td>
</tr>
<tr>
<td>MINE3020</td>
<td>Mining Methods</td>
<td>7</td>
<td>0</td>
</tr>
<tr>
<td>GEOL5311</td>
<td>Geology for Mining Engineers</td>
<td>3</td>
<td>0</td>
</tr>
<tr>
<td>GMAT0580</td>
<td>Mining Surveying</td>
<td>3</td>
<td>0</td>
</tr>
<tr>
<td>MINE3030</td>
<td>Mining Engineering Practice 3A</td>
<td>0</td>
<td>4</td>
</tr>
<tr>
<td>MINE3040</td>
<td>Mine Ventilation</td>
<td>0</td>
<td>4</td>
</tr>
<tr>
<td>MINE3050</td>
<td>Minerals Engineering Processes</td>
<td>3</td>
<td>0</td>
</tr>
<tr>
<td>MINE3060</td>
<td>Excavation Engineering</td>
<td>0</td>
<td>6</td>
</tr>
</tbody>
</table>

### Year 4

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>HPW</th>
<th>UOC</th>
</tr>
</thead>
<tbody>
<tr>
<td>MINE4010</td>
<td>Mine Planning and Design</td>
<td>0</td>
<td>8</td>
</tr>
<tr>
<td>MINE4020</td>
<td>Mining Geomechanics 2</td>
<td>4</td>
<td>0</td>
</tr>
<tr>
<td>MINE4030</td>
<td>Mining Engineering Practice 4A</td>
<td>6</td>
<td>0</td>
</tr>
<tr>
<td>MINE4040</td>
<td>Mining Engineering Practice 4B</td>
<td>5</td>
<td>0</td>
</tr>
<tr>
<td>MINE4050</td>
<td>Mining Engineering Practice 4C</td>
<td>0</td>
<td>6</td>
</tr>
<tr>
<td>MINE4060</td>
<td>Minerals Industry Project A</td>
<td>3</td>
<td>0</td>
</tr>
<tr>
<td>MINE4070</td>
<td>Minerals Industry Project B</td>
<td>0</td>
<td>6</td>
</tr>
</tbody>
</table>

### BE(Mining Engineering)/MCom Fasttrack Program

Students who have maintained at least a Credit average over the first 3 years of the Mining Engineering Program may elect to join this program at the end of year 3. After completing the fourth year as shown below, a student is eligible to graduate at the end of year 4 with a BE in Mining Engineering.

To complete the requirements of the MCom, an additional 8 UOC subjects are selected from the MCom program with the provision for gaining a single major or a double major. This specialisation will determine the Commerce Core Elective in year 4.
Some electives may be offered only every two years.

Course Core Elective

MINE4010 Mine Planning and Design 0 8 12
MINE4020 Mining Geomechanics 2 4 0 6
MINE4030 Mining Engineering Practice 4A 6 0 6
MINE4070 Minerals Industry Project B 0 6 6
Total 16 17 48

3142 BE(Mining)/BSc

Commencing in 2000 a combined BE(Mining Engineering)/BSc(Science) degree will be offered. This option is available to students wishing to supplement their Mining Engineering degree with courses from the Faculty of Science and Technology and BSSM. The minimum time to complete this combination is 5 years. The selection of specialisations in the Science component are quite flexible. However, it is important that students discuss their interests with the relevant course authorities as programs may need to be individually tailored to suit each student. Also students must undertake the BSc in accordance with the requirements for the award of a BSc degree. There may be restrictions on course availability due to timetabling constraints.

A more structured program is available in the BE(Mining)/BSc(Computer Science) program. This combination is an excellent choice for students who have a strong computing interest. Details of this program are available from the School of Mining Engineering.

Please note that there will be a minimum UAI requirement for entry to the combined BE/BSc degree. Please contact the School of Mining Engineering for more information.

Postgraduate Study

A number of coursework Masters degrees and Graduate Diplomas are available through the School of Mining Engineering. In addition, the School offers the research degrees of Doctor of Philosophy PhD in Mining Engineering 1050 and Master of Engineering ME in Mining Engineering 2180. The research degrees may also be undertaken externally by staff employed full time in the industry over a longer duration.

Program Outlines

8055

Mining Engineering
Master of Engineering Science

MEngSc

The Master of Engineering Science in Mining Engineering will be awarded after successful completion 48 Units of Credit points of coursework, either full time or part time. A majority of the courses will be offered as modules over a short period to permit mineral industry personnel to attend on a part-time basis. Please note that some electives may be offered only every two years.

3144 BE(Mining)/BA

Commencing in 2000 a combined BE(Mining Engineering)/BA degree will be offered. A wide range of options are available in this 5 year combined degree. The Bachelor of Arts degree must be completed in accordance with the requirements for the award of a BA. Students interested in this combined degree must discuss their planned program with the individual Course Authorities. There may be restrictions on course availability due to timetabling constraints.

Please note that there will be a minimum UAI requirement for entry to the combined BE/BA degree. Please contact the School of Mining Engineering for more information.

3146 BE(Civil) BE(Mining) in Civil Engineering and Mining Engineering – Full-time Course

Students enrol in the Bachelor of Engineering in Civil Engineering Program 3620 which is administered by the School of Civil Engineering. The first three and a half years of the combined degree program are therefore identical to course 3620. After completing 7 Sessions of this program, students may apply to enter the Bachelor of Engineering in Mining Engineering Program 3146 which is administered by the School of Mining Engineering and aim to complete the mining requirements in 3 additional Sessions.

Students considering this option should discuss the above arrangements with the relevant Course Authorities.

Master of Engineering Science (Mining Geomechanics)

Course 8055.1000

Core Courses

MINE8110 Mining Processes and Systems
MINE8120 Hazard Identification, Risk and Safety Management In Mining
MINE8140 Mining Geomechanic
MINE8760 Mine Geology and Geophysics for Mining Operations

Elective Courses

Select 4 6UC courses from the following list:

MINE8130 Technology Management in Mining
MINE8710 Mine Slope Stability
MINE8720 Advanced Rock Mechanics
MINE8730 Mechanised Excavation Engineering
MINE8740 Blasting and Rock Fragmentation
MINE8750 Advanced Soil Mechanics and Mine Fill Technology

Master of Engineering Science (Mining Industry Management)

Course 8055.2000

Core Courses:

MINE8110 Mining Processes and Systems
MINE8120 Hazard Identification, Risk and Safety Management in Mining
ENGINEERING

MINE8210 Management Systems - Projects, Processes, Contracts and Contractors
MINE8220 Mine Feasibility, Planning and Project Evaluation

Elective Courses:
Select 4 from the following List of 6UC Electives

MINE8130 Technology Management in Mining
MINE8230 Mine Sampling, Grade Control and Reserves Definition
MINE8770 Mining Law
MINE8780 Environmental Management for the Mining Industry
MINE8790 Advanced Mineral Economics and Commodity Marketing
GBAT9104 Management of Innovation and Technical Change
GBAT9106 Information Systems Management
GBAT9112 Managing Occupational Health and Safety
IROB5690 Strategic People Management

Graduate Diploma

5040
Mining Engineering
Graduate Diploma

GradDip
The Graduate Diploma program in Mining Engineering serves two purposes. It can provide a professional introduction to the mining industry for graduates in Science and Technology or Engineering and as a qualifying course for entry to the Master of Engineering Science or Masters by Research programs.

The Graduate Diploma will be awarded after successful completion 36 Units of Credit points of coursework, either full time or part time. A majority of the courses will be offered as modules over a short period to permit mineral industry personnel to attend on a part-time basis. Please note that some electives may be offered only every two years.

The level of the Graduate Diploma is designed to be equivalent to a four-year Honours degree.

Core Courses:
MINE8110 Mining Processes and Systems
MINE8120 Hazard Identification, Risk and Safety Management

Elective Courses:
Select 2 from the following List of 6 Units of Credit Courses

1 course to be undertaken in Session 1 and 1 in Session 2.

MINE8130 Technology Management in Mining
MINE8140 Mining Geomechanics
MINE8210 Management Systems - Projects, Processes, Contracts, Contractors
MINE8220 Mine Feasibility, Planning and Project Evaluation
MINE8230 Mine Sampling, Grade Control and Reserves Definition
MINE8710 Mine Slope Stability
MINE8720 Advanced Rock Mechanics

Graduate Certificate in Mining Engineering

Commencing in 2000 the School of Mining Engineering will offer a Graduate Certificate in Mining Engineering to allow a more flexible entry mode for applicants who have limited tertiary qualifications. Admission will be considered on an individual basis and will be based on level of experience within the mining industry. Students may be eligible to upgrade to a Graduate Diploma depending upon satisfactory academic progress. This usually requires maintaining at least a credit average in each course attempted. Please note that some electives may be offered only every two years.

Students will be required to complete two core courses plus 2 electives.

Core Courses:
MINE8110 Mining Processes and Systems
MINE8120 Hazard Identification, Risk and Safety Management in Mining

Elective Courses:
Select 2 from the following List of 6 Units of Credit Courses

1 course to be undertaken in Session 1 and 1 in Session 2.

MINE8130 Technology Management in Mining
MINE8140 Mining Geomechanics
MINE8210 Management Systems - Projects, Processes, Contracts, Contractors
MINE8220 Mine Feasibility, Planning and Project Evaluation
MINE8230 Mine Sampling, Grade Control and Reserves Definition
MINE8710 Mine Slope Stability
MINE8720 Advanced Rock Mechanics
MINE8730 Mechanised Excavation Engineering
MINE8740 Blasting and Rock Fragmentation
MINE8750 Advanced Soil Mechanics and Mine Fill Technology
MINE8760 Mine Geology and Geophysics for Mining Operations
MINE8770 Mining Law
MINE8780 Environmental Management for the Mining Industry
MINE8790 Advanced Mineral Economics and Commodity Marketing
GBAT9104 Management of Innovation and Technical Change
GBAT9106 Information Systems Management
GBAT9112 Managing Occupational Health and Safety
IROB5690 Strategic People Management
Course Descriptions

Descriptions of all courses are presented in an alphanumerical order within organisational units. For academic advice regarding a particular course consult with the contact for the course as listed. A guide to abbreviations and prefixes is included in the chapter Hand-Book Guide, appearing earlier in this book.

MINE1010
Applied Mechanics
Staff Contact: Dr JO Watson
Statics: definition of force; free body diagrams; static equilibrium of rigid body; statical equivalence of systems of forces; centre of mass, centroid, centre of pressure; friction: clutch, screwjack, belt drive. Kinematics: rectilinear and angular motion; motion in a plane; relative displacement, velocity and acceleration; gear trains and linkages. Dynamics: equations of motion for particle and rigid body; work and energy; impulse, momentum and impact.

MINE1020
Stress Analysis 1
Staff Contact: Dr JO Watson
Prerequisite/s: MINE1010
Structures: forces and stresses in pin jointed frames; bending moment, shear force in beams; stress due to bending of beams; deflection of beams; buckling of struts; stress due to torsion of shafts; combined axial and bending stress; stress in thin walled pressure vessels. Stress and strain: definition of stress in three dimensions; stress transformation in two dimensions; principal stresses in two dimensions. Mohr’s circle of stress; definition of strain in three dimensions; strain-displacement relations in two dimensions; Mohr’s circle of strain; principal strains in two dimensions; electrical and mechanical methods for measurement of strain; isotropic elasticity.

MINE1030
Mining Engineering Practice 1A
Staff Contact: Professor JM Galvin
Note/s: Visits to mines and related undertakings are a requirement of this course

MINE1040
Mining Engineering Practice 1B
Staff Contact: Dr PC Hagan
Note/s: Visits to mines and related undertakings are a requirement of this course
Major mining project to promote understanding of the operation of a producing mining operation. Writing and presentation of reports, resumes. Analysis of experimental data. Presentation of graphs and figures. Oral presentation styles. Communications. Computer graphic presentation packages.

MINE2010
Mining Engineering Practice 2A
Staff Contact: Dr PC Hagan
Prerequisite/s: MINE1030, MINE1040
Note/s: Visits to mines and related undertakings are a requirement of this course
Exploration. Development of mines, infrastructure requirements; environmental assessment. Ore body parameters for surface and underground mines; stratified and non-stratified deposits; mine layout for surface and underground operations; underground access; introduction of techniques of rock breakage and support for coal and metal mines; processing of minerals; disposal of overburden and rejects rehabilitation. Engineering hydrology, sources of mine water, forecasting water inflows, drainage.

MINE2020
Mining Engineering Practice 2B
Staff Contact: Dr PC Hagan
Prerequisite/s: MINE1030
Note/s: Visits to mines and related undertakings are a requirement of this course
This subject allows the student to extend the knowledge gained in MINE2010 and practically apply it to site and case studies under the guidance of a course leader.

MINE2030
Fluid Mechanics and Thermodynamics
Staff Contact: Dr JO Watson
Prerequisite/s: MATH1131, MATH1132, MINE1020,

MINE2040
Stress Analysis 2
Staff Contact: Dr JO Watson
Prerequisite/s: MINE1020
Structures: shear stresses in beams; bending moment and shear force in continuous beams; slope-deflection equations and fixed end moments; stiffness matrix and generalised nodal force vector; computer programs for analysis of continuous beams. Stress and strain: stress transformation and principal stresses in three dimensions; strain-displacement relations in three dimensions; stress and strain in thick walled tubes under pressure; stresses around circular tunnel; anisotropic elasticity; the equivalent continuum; yield criteria; the stress space; strain hardening and softening; flow rules; viscoplasticity.

MINE3010
Mining Geomechanics 1
Staff Contact: Prof BK Hebblewhite
Prerequisite/s: MATH1131, MATH1132, MINE2040
Rock mass, rock material and discontinuities: Geomechanical properties of discontinuities: orientation, spacing, persistence, roughness, aperture, filling. Rock mass classification. Rock strength and deformability: concepts and definitions, strength tests, deformability tests by static and dynamic methods, influence of time. Strength criteria for isotropic and anisotropic rock material, shear behaviour of discontinuities, behaviour of rock masses containing discontinuities. Pre-mining state of stress and its measurement. Laboratory experiments. Soil description and classification; engineering behaviour of soils; basic definitions in soil mechanics, effective stress concept; shear strength of soils, soil permeability, flow of water in soils, consolidation, stresses in soil from external loading; design of shallow foundations, compaction, compaction control, pavement and haul-road design, lateral earth pressures, soil slope stability, expansive and dispersive soils, filter design.

MINE3020
Mining Methods
Staff Contact: A/Prof D Laurence
Prerequisite/s: MINE2010, MINE2020, GEOL5211
Geology, mineralogy and physical characteristics of mineral deposits. Mineralisation inventory: maps and sections. Determination of...

MINE3030
Mining Engineering Practice 3A
Staff Contact: Dr CR Daly
Prerequisite/s: PHYS2820, ELEC0089

MINE3040
Mine Safety Engineering
Staff Contact: A/Prof D Laurence
Prerequisite/s: MINE0210, MINE0220

MINE3040
Mine Ventilation and Environment
Staff Contact: D Chalmers
Prerequisite/s: MINE2010, MINE2020, MINE2030
Mine ventilation: practice in mines, forces causing airflow, resistance of workings and distribution of mine air, network analysis, fans and their operation, auxiliary ventilation, economic size of airways; ventilation surveys. Mine environment: mine gases; hazards, occurrence, detection, monitoring and control, airborne dust; physiological effects, sampling, measurement and analysis, sources and control, mine climate; physiological effects, air cooling power, factors affecting mine climate and control. Ventilation planning: airflow requirements based on pollutant gas, airborne dust and heat.

MINE3050
Minerals Engineering Processes
Staff Contact: School of Mining Engineering Office

MINE3060
Excavation Engineering
Staff Contact: Dr PC Hagan

MINE4010
Mine Planning and Design
Staff Contact: A/Prof D Laurence
Prerequisite/s: MINE3020

MINE4020
Mining Geomechanics 2
Staff Contact: Prof BK Hebblewhite
Prerequisite/s: MINE3010

MINE4030
Mining Engineering Practice 4A
Staff Contact: D Chalmers
Prerequisite/s: MINE3020

MINE4060
Minerals Engineering Processes
Staff Contact: School of Mining Engineering Office
MINE4040
Mining Engineering Practice 4B
Staff Contact: Dr P Hagan
Prerequisite/s: MINE3020

MINE4050
Mining Engineering Practice 4C
Staff Contact: Prof JM Gavin
Prerequisite/s: MINE3020
An appreciation of the laws relating to coal and metal mining practice and to safety, health and environment in mining. The numerous sections of society with which mining engineers may interact and their diverse expectations; the potential for divided loyalty, mistrust and conflict. The consequences of mining engineers being employed as professionals; codes of ethics and their effectiveness; scepticism about the attitude of limited responsibility. Possible future controls of the profession and industry. One of the following: (a) The potential impact of an international policy of sustainable development on the mineral industry and how it may be implemented; or (b) a systematic process of decision making, illustrated by assessment procedures for major projects and raising the issue of who would be involved; or (c) how responsible people outside the mineral industry see key problems associated with the industry in Australia. The subject will be taught via tutorials and a mini-project.

MINE4060
Minerals Industry Project A
Staff Contact: Dr CR Daly
Prerequisite/s: MINE3020
Candidates are required to submit a preliminary report on their proposed thesis topic on a mining, minerals engineering or other topic approved by the Head of School. The work may take the form of an engineering analysis, experimental investigation, theoretical study or design project. A series of seminars presented by invited speakers from within the university, other research establishments and selected industrial operations, covering special topics of current interest.

MINE4070
Minerals Industry Project B
Staff Contact: Dr CR Daly
Prerequisite/s: MINE4060
Candidates are required to submit a dissertation or thesis and make a presentation on a mining, minerals engineering or other topic approved by the Head of School. The work may take the form of an engineering analysis, experimental investigation, theoretical study or design project. Candidates may be required to present themselves for oral examination on the subject of their submission.

MINE4080
Mine Simulation and Modelling
Staff Contact: Dr CR Daly

MINE4081
Mineral Process Technology
Staff Contact: School of Mining Engineering Office
Prerequisite/s: MINE3050

MINE4082
Computational Methods in Geomechanics
Staff Contact: Dr JO Watson
Prerequisite/s: MINE3010
Corequisite/s: MINE4020
Boundary value problems: review of strategies for solution, and limitations of analytical methods; finite differences. Finite elements: variational principle and finite elements for Poisson's equations; global and elemental stiffness matrices and equivalent nodal force vectors; matrix assembly and equation solution; variational principle and finite elements for elasticity; constant strain triangular element, isoparametric elements; design of meshes, error estimates; adaptive mesh refinement; computer program for elastic analysis of plain strain; elastoplasticity, elasto-viscoplasticity. Boundary elements: fundamental solution and integral equations for Poisson's equation; isoparametric boundary elements; construction and solution of discrete systems of equations; direct boundary element method for elasticity; design of meshes; computer programs for elastic analysis of strain.

MINE8110
Mining Processes and Systems
Staff Contact: School of Mining Engineering Office
All generic mining methods will be reviewed and analysed to identify the fundamental drivers which influence the performance of a mining operation based on each method. Mining operations are made up of a complex and inter-related number of key processes and systems. Appropriate and efficient mine design, planning and operations is dependent on understanding and optimising these processes and systems. Components of a generic mining operation to be considered will include: rock breakage, materials transport, grade/quality control and economic sensitivity, ground stability, mine environment and environmental impact. In each component, process and/or system, the critical economic sensitivities will be identified, together with the safety implications and management strategies.

MINE8120
Hazard Identification, Risk and Safety Management In Mining
Staff Contact: School of Mining Engineering Office
The course includes the following: safety management; hazard and risk analyses; safety hazard identification, management techniques, safety audits; statistics; HAZOP management and maintenance of change risk analysis; cost benefit analysis; attitudes to safety in mining; effective training; accident and injury report/recovery; ergonomics and safety engineering; prevention of traumatic injury; work stress; environmental factors; monitoring and protection; personal protective equipment; safety policies and programs; action plans. A generic approach to loss control within mining operations will be reviewed together with identification of management strategies to deal with such losses. This will extend from simple hazard control management to full catastrophic management planning. The course will draw on experience and techniques applied in non-mining industries in addition to a practical focus on mining risk management taught by specialist safety management personnel.

MINE8130
Technology Management In Mining
Staff Contact: School of Mining Engineering Office
The course addresses the role of technology in the mining process. Sensitivity of the mine profitability and performance is addressed with respect to different levels of technology in each stage of the mining operation. Appropriate specification of technology; capital justification and cost benefit analyses; performance monitoring; technology audits; training requirements and effectiveness; ergonomic factors and occupational health and safety implications of technology changes relative to skill levels.
MINE8140
Mining Geomechanics
Staff Contact: Prof BK Hebblewhite
The course will provide an introduction to the full range of potential geomechanics issues which form part of, or impact on a mining operation, from resource evaluation, mine design to daily operations. This will cover both coal and metalliferous operations. The course content will include the following components: site investigation, rock mass classification, rock fragmentation, caving prediction and control, slope stability, diggability and rippability, role and application of reinforcement systems, geotechnical instrumentation, stress analysis and stability evaluation around complex excavations, ground control management and environmental geomechanics.

MINE8210
Management Systems - Projects, Processes, Contracts, Contractors.
Staff Contact: Prof BK Hebblewhite
Different aspects of mining operations require different management approaches. This course provides applied management theory and practices in each area of project, process, contracts and contractor management. In each case, examples and case studies are linked to mining operations. The course works through a typical mining system to identify the embedded sub-projects and processes which are inherent to the mining system and demonstrates the role and benefits of applying different management techniques. Managing contracts, including on-going contractor management both at the construction and ongoing operational stage of a mine is addressed in the course.

MINE8220
Mine Feasibility, Planning and Project Evaluation
Staff Contact: School of Mining Engineering Office
This course addresses the process of mine feasibility planning and project evaluation commencing from the resource assessment stage. This subject covers the use of geostatistical techniques to assess a mineral resource, the estimation of recoverable reserves, ore and waste selection and grade control. Further topics include: feasibility study components, mine planning methodologies and scheduling techniques, mine cost structures, introduction to accounting, financial statements, financial theory in relation to project evaluation, evaluation techniques, project financing, cost of capital, revenue assumptions, cost assumptions, risk analysis and studies, institutional and corporate perspectives on project evaluation, introduction to financial modelling, review of cases for financial modelling, practical exercises in financial modelling, intra-project evaluation, comprehensive financial model case study, valuation reports and published assessments.

MINE8230
Mine Sampling, Grade Control and Reserves Definition
Staff Contact: School of Mining Engineering Office
This course will provide a full coverage of the theory and practice of sampling solid and particulate materials, based on Pierre Gy's theoretical research as modified by Francis Pitard and Francois Bongarcon. It will cover subsampling and sample preparation for laboratory analysis, as well as the need for and means of establishing and monitoring a quality assurance/quality control program for laboratory analytical techniques. The geostatistics coverage will include variography, grade interpolation and average grade determination and will lead into cut-off grade determination, reserves definition and ore body modelling. The interaction of mining method and reserves definition will be reviewed. Case histories will illustrate grade control and reserves definition problems and practices. Management topics will include maintaining the integrity of the database and involving and motivating the workforce.

MINE8710
Mine Slope Stability
Staff Contact: Prof BK Hebblewhite
This course will deal with the major topics of engineering geology and groundwater controls on surface mining slope stability in the form of discontinuities, variable materials and pore pressures; effect of excavation method and scheduling in pit stability; the fundamental basis of stability analysis; advantages and disadvantages of a range of mathematical models; remedial measures that can be taken to stabilise slopes; pit slope design in the context of overall mine planning. In addition to dealing with the underlying principles, the course may involve workshops and field inspections so that the participants gain hands-on experience of practical cases.

MINE8720
Advanced Rock Mechanics
Staff Contact: Prof BK Hebblewhite
This subject will expand on components of the MINE Mining Geomechanics subject to providing a more comprehensive and theoretical understanding of the engineering principles involved, together with practical mining industry application. Specific areas covered in this course include: stress analysis, advanced computational methods, rock mass behaviour and failure criteria, time-dependent rock characteristics under load, ground support - rock mass interaction, support systems, foundation engineering and geotechnical instrumentation.

MINE8730
Mechanised Excavation Engineering
Staff Contact: Dr PC Hagan
The course will address a range of rock cutting and mechanised rock excavation techniques applied in the mining industry. Fundamental engineering excavation mechanics will include: principles of coal and rock cutting mechanics; the performance of picks and free rolling cutters; cutting tool interaction; the design of cutting arrays for machine mining and tunneling; impact breakage of rock; drill bit design and breakage mechanics; cutting tool materials and the effects of wear; methods of assessing rock cuttability; water jet cutting and water jet assisted drilling and cutting. Applications including full face and partial mining machines, drilling technologies and tunnel boring machines will be reviewed.

MINE8740
Blasting and Rock Fragmentation
Staff Contact: D Chalmers
The course will address the mechanics and practical applications and current technologies in rock fragmentation; theories of rock breakage and fragmentation; rock mass properties; structure and discontinuities and their impact on blast behaviour. Blasting theories and types of explosives and blast initiation procedures; blast designs for both underground and surface mining applications; blast hazard management; blast vibration and impact on structures and mining excavations; state-of-the-art blasting practices and technologies; and alternatives to conventional blasting for rock fragmentation.

MINE8750
Advanced Soil Mechanics and Mine Fill Technology
Staff Contact: Dr JO Watson
Geotechnical properties of soil and unconsolidated technology
geotechnical properties of soil and unconsolidated materials and weak rocks for mining applications. Issues covered include: assessment of the stability, design and stabilisation of soil slopes and the influence of geology and groundwater, use of soils and weak materials for mine pavements, foundation design, soil dynamics and design for dynamic loading, consolidation, laboratory and site investigation techniques and soil liquefaction. Mine fill technology as an integral part of mining methods - fill properties, use of cemented and rock fill, paste fill technology, rock-fill interaction, fill transport and placement, fill economics, post-mining underground stowage.
MINE8760
Mine Geology and Geophysics for Mining Operations
Staff Contact: School of Mining Engineering Office
This course addresses the essential interaction between the disciplines of geology and mining engineering in the geotechnical field, embracing engineering geology, structural geology and applied geophysics. The impact of engineering geological rock mass properties and structural features on mining operations is evaluated, together with likely variability of these parameters and the degree and confidence with which they can be predicted and projected ahead of the mining process. Modern geophysical techniques including 2D and 3D seismic, microseismics, tomography, electromagnetic imaging techniques, radar and down-hole survey methods are reviewed in the context of their ability to provide reliable information to assist with mine planning and operational decision-making. Effective communication systems for the geologist - engineering interface are also addressed, together with the integral role of such geological information in the planning and operations of a modern efficient mining operation.

MINE8770
Mining Law
Staff Contact: A/Prof D Laurence
The course provides a comparison between different legislative philosophies from the fully prescriptive to the totally enabling perspective. The roles of specialist mining law and regulation, in addition to common law, including occupational health and safety - duty of care legislation is reviewed. Other topics to be covered with this course include: definitions of minerals and mining; common law; ownership; Aboriginal land rights; miners rights and claims; exploration titles; production titles; private land/Crown land; administrative processes; environmental protection and royalties. Topics will be illustrated by reference to case histories.

MINE8780
Environmental Management for the Mining Industry
Staff Contact: A/Prof D Laurence
Topics addressed are: environmental regulation as a constraint on business operations; environmental planning and management as a component of overall business planning; financial costs and benefits of environmental management and their timing; environmental risks and uncertainty; integrated design strategies; emission control technologies; formal environmental impact assessment procedures, including public submissions and hearings; lease and license conditions; compliance with planning and pollution control legislation; developing and using environmental operations manuals; in-house environmental training programs; corporate environmental audit procedures; liaison with public and community groups; particular environmental applications in mining, oil, manufacturing, petrochemical, civil engineering and infrastructure, building and construction, coastal management and other industries; environmental issues and concerns in Asia-Pacific nations and the region as a whole.

MINE8790
Advanced Mineral Economics and Commodity Marketing
Staff Contact: Dr PC Hagan
Commodities: supply and demand; business cycles; exchange rates; metal and coal markets and hedging; long-term contracts and the spot market; commodity pricing. Project financing including: joint ventures; types of capital; company financial statements and reporting requirements; feasibility studies and mine evaluation; determination of cut-off grades; project sensitivities to grades/quality and pricing. Marketing as applied to the mineral industry; sources and types of market-related information; particular international market characteristics; political, social and economic; trade barriers; cartels, regional and sub-regional economic groups; marketing to Asia; buyer behaviour, private and government sectors; design, conduct and analysis of surveys of overseas markets for mineral products; factors related to particular mineral commodities. The recognition of export opportunities; stages in the development of a market strategy; market decision-making under conditions of uncertainty; the relationship between corporate and marketing strategy for mineral products; value added mineral products and export marketing; sources of assistance for export marketing.
School of Petroleum Engineering

Director:
Professor WV Pinczewski

Petroleum Engineering is a specialised engineering discipline which prepares graduates for a career in the oil and natural gas industries. Its related operations apply physical, mathematical and engineering principles to identify and solve problems associated with exploration, exploitation, drilling, production and all the related economic and management problems associated with recovery of hydrocarbons and geothermal energy from deep beneath the earth's surface.

The School of Petroleum Engineering offers both undergraduate and postgraduate programs as well as open learning programs on the Internet leading to the award of a graduate diploma degree in Petroleum Engineering.

The undergraduate program for the award of a Bachelor of Engineering in (Petroleum Engineering), B.E. Pet.Eng (Hons) requires four years of full-time study. This degree is fully accredited and recognized internationally. The School also offers a combined, fast track, undergraduate programs leading to the award of the degree of Bachelor of Engineering (Petroleum Engineering)/Master of Commerce, B.E. Pet.Eng / M.Comm, which requires an additional year of full-time study after satisfactory completion of the Petroleum Engineering program.

Entry is normally into Year 1 of the program. Students who satisfy the requirements of other full-time Engineering degree programs at the University of New South Wales or any other Australia tertiary institution may be admitted into Year 2 or Year 3 of the undergraduate Petroleum Engineering program. These students will need to complete an appropriately modified Year 2 or Year 3 of the program as the case demands. The same requirements apply to students from accredited tertiary institutions in other countries. The award of Honours in the Petroleum Engineering program requires students to have distinguished themselves in the formal work, as well as in related assignments and industrial training periods as directed by the Director of Undergraduate Studies of the School.

The postgraduate degrees by research lead towards the award of the degrees of Master of Engineering (Petroleum Engineering), M.E. Pet.Eng. and Doctor of Engineering (Petroleum Engineering), Ph.D Pet.Eng. Students in these programs perform leading-edge research in an area related to the science or engineering of petroleum or geothermal resource development.
3045
Petroleum Engineering - Full Time Program (Hons)

Bachelor of Engineering (Petroleum)
BE (Petroleum)

This program extends over four years and students study full-time during the day for twenty-eight weeks of each year (excluding examinations and recess periods).

Successful completion of the BE degree program is accepted by the Institution of Engineers Australia, and the Institution of Chemical Engineers as sufficient academic qualification for corporate membership.

The Director of Undergraduate Studies may approve various program patterns involving full-time or part-time studies.

The Combined degree BE Pet.Eng/M.Comm is also available (see below):

### Stage 1

<table>
<thead>
<tr>
<th>COURSE TITLE</th>
<th>HPW</th>
<th>UOC</th>
</tr>
</thead>
<tbody>
<tr>
<td>PTRL 1010 Introduction to the Petroleum Industry</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>PTRL 1011 Reservoir Rock Properties and Fluid Flow</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>PTRL 1012 Reservoir Fluid Properties</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>GEOL 5321 Reservoir Geology &amp; Geophysics</td>
<td>6</td>
<td>6</td>
</tr>
<tr>
<td>COMP 1011 Computing 1A</td>
<td>6</td>
<td>6</td>
</tr>
<tr>
<td>MECH 0130 Engineering Drawing &amp; Solid Modeling</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>CHEM 1011 Fundamentals of Chemistry 1A</td>
<td>6</td>
<td>6</td>
</tr>
<tr>
<td>PHYS 1169 Physics 1 (for Chemical and Mechanical Engineers)</td>
<td>6</td>
<td>6</td>
</tr>
<tr>
<td>MATH 1131 Math 1A or</td>
<td>6</td>
<td>6</td>
</tr>
<tr>
<td>MATH 1141 Higher Math 1A</td>
<td>6</td>
<td>6</td>
</tr>
<tr>
<td>MATH 1231 Math 1B or</td>
<td>6</td>
<td>6</td>
</tr>
<tr>
<td>MATH 1241 Higher Math 1B</td>
<td>6</td>
<td>6</td>
</tr>
<tr>
<td>Total HPW Session 1</td>
<td>24</td>
<td></td>
</tr>
<tr>
<td>HPW Session 2</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Units Session 1</td>
<td>24</td>
<td></td>
</tr>
<tr>
<td>Units Session 2</td>
<td>24</td>
<td></td>
</tr>
</tbody>
</table>

### Stage 2

<table>
<thead>
<tr>
<th>COURSE TITLE</th>
<th>HPW</th>
<th>UOC</th>
</tr>
</thead>
<tbody>
<tr>
<td>PTRL 2010 Communic. Skills &amp; Business Prac.</td>
<td>6</td>
<td>6</td>
</tr>
<tr>
<td>for Engineers (M)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>PTRL 2011 Petroleum Thermodynamics</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>PTRL 2012 Formation Evaluation 1</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>PTRL 2013 Rock and Fluid Properties Laboratory</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>CVEN 1023 Statics</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>CVEN 0636 Properties of Materials</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>MATH 2020 Mathematics 2A</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>MATH 2030 Mathematics 2B</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>MATH 2899 Applied Statistics CE</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>CEIC 2110 Material and Energy Balances</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>CEIC 2120 Flow of Fluids</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>CEIC 2130 Heat Transfer</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>CHEN 2140 Mass Transfer</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>General Education</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>Total HPW Session 1</td>
<td>22</td>
<td></td>
</tr>
<tr>
<td>HPW Session 2</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Units Session 1</td>
<td>22</td>
<td></td>
</tr>
<tr>
<td>Units Session 2</td>
<td>24</td>
<td></td>
</tr>
</tbody>
</table>

### Stage 3

<table>
<thead>
<tr>
<th>COURSE TITLE</th>
<th>HPW</th>
<th>UOC</th>
</tr>
</thead>
<tbody>
<tr>
<td>PTRL 3010 Reservoir Engineering</td>
<td>6</td>
<td>6</td>
</tr>
<tr>
<td>PTRL 3011 Formation Evaluation 2</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>PTRL 3012 Well Testing</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>PTRL 3013 Reservoir Characterisation</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>PTRL 3014 Field Development Geology</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>PTRL 3015 Petroleum Production Engineering</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>PTRL 3016 Well Drilling Equipment &amp; Operations</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>Total HPW Session 1</td>
<td>22</td>
<td></td>
</tr>
<tr>
<td>HPW Session 2</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Units Session 1</td>
<td>22</td>
<td></td>
</tr>
<tr>
<td>Units Session 2</td>
<td>24</td>
<td></td>
</tr>
</tbody>
</table>

Electives:
- LAWS 2361 Environmental Law or                    | 4   | 8   |
- LAWS 2031 Occupational Health & Safety Law (M)    | 4   | 8   |
- GEOL5412 Special Topics in Petroleum Geoscience   | 6   | 8   |

Total HPW Session 1                                 | 18  |     |
HPW Session 2                                       |     |     |
Units Session 1                                     | 16  |     |
Units Session 2                                     | 24  |     |

Note/s:
- Total number of Units of Credit (UOC): 192
- UOC Management oriented (M): 54 = 28.1%
- UOC outside faculty: 59 = 30.7%

5031
Petroleum Engineering Full Time / Part Time
Internal / External

Petroleum Engineering GradDip

Program is also offered in open learning.

<table>
<thead>
<tr>
<th>COURSE TITLE</th>
<th>UOC</th>
</tr>
</thead>
<tbody>
<tr>
<td>CORE</td>
<td></td>
</tr>
<tr>
<td>GEOL5031** Introduction to Petroleum Geology</td>
<td>3</td>
</tr>
<tr>
<td>GEOL5312** Petroleum Geology &amp; Geophysics</td>
<td>3</td>
</tr>
<tr>
<td>PTRL5007 / 6007* Reservoir Engineering</td>
<td>6</td>
</tr>
<tr>
<td>PTRL5009 / 6009* Well Drilling Equipment &amp; Operations</td>
<td>6</td>
</tr>
<tr>
<td>PTRL5016 / 6016* Well Completions &amp; Stimulation</td>
<td>6</td>
</tr>
<tr>
<td>PTRL5022 / 6022* Drilling Systems Design &amp; Optimisation</td>
<td>6</td>
</tr>
<tr>
<td>PTRL5107 / 6107* Formation Evaluation</td>
<td>6</td>
</tr>
<tr>
<td>ELECTIVE</td>
<td></td>
</tr>
<tr>
<td>CVEN8706* / 9706 Human Resources Management</td>
<td>6</td>
</tr>
<tr>
<td>CVEN8707* / 9707 Contracts Management</td>
<td>6</td>
</tr>
<tr>
<td>CVEN8710* / 9710 Management of Risk</td>
<td>6</td>
</tr>
<tr>
<td>CVEN8714* / 9714 Resource Management</td>
<td>6</td>
</tr>
<tr>
<td>CVEN8888* / 9888 Environmental Management</td>
<td>6</td>
</tr>
<tr>
<td>GEOL9151* Petroleum Geology</td>
<td>6</td>
</tr>
<tr>
<td>GEOL9152* Petroleum Geophysics</td>
<td>6</td>
</tr>
<tr>
<td>PTRL5001 / 6001* Fluid Dynamics in Porous Media</td>
<td>6</td>
</tr>
<tr>
<td>PTRL5003 / 6003* Well Pressure Testing</td>
<td>6</td>
</tr>
<tr>
<td>PTRL5004 / 6004* Numerical Reservoir Simulation</td>
<td>6</td>
</tr>
<tr>
<td>PTRL5005 / 6008* Petroleum Production Economics</td>
<td>6</td>
</tr>
<tr>
<td>PTRL5012 / 6012* Drilling Mud - Formulation,</td>
<td>6</td>
</tr>
<tr>
<td>Selection &amp; Maintenance</td>
<td></td>
</tr>
</tbody>
</table>
To qualify for a GradDip in Petroleum Engineering, candidates will have to pass a minimum of 24 Units of Credit. The final composition of the proposed program will require Head of School or nominee's approval.

To qualify for a MEngSc in Petroleum Engineering, candidates will have to pass a minimum of 48 Units of Credit. The final composition of the proposed program will require Head of School or nominee's approval.

To qualify for a Graduate Certificate (Petroleum Engineering), candidates will have to pass a minimum of 36 Units of Credit. The final composition of the proposed program will require Head of School or nominee's approval.

**Combined Degree**

**Bachelor of Engineering (Petroleum) / Master Commerce**

**BE (Petroleum) / MCom**

<table>
<thead>
<tr>
<th>Stage 4 modified</th>
<th>HPW</th>
<th>UOC</th>
</tr>
</thead>
<tbody>
<tr>
<td>PTRL 4008 Integrated Field</td>
<td>S1</td>
<td>S1</td>
</tr>
<tr>
<td>PTRL 4009 Integrated Economics Project (M)</td>
<td>S2</td>
<td>S2</td>
</tr>
<tr>
<td>PTRL 4013 Well Completion &amp; Stimulation</td>
<td></td>
<td></td>
</tr>
<tr>
<td>PTRL 4014 Drilling System Design &amp; Optimisation</td>
<td></td>
<td></td>
</tr>
<tr>
<td>PTRL 4015 Numerical Reservoir Simulation</td>
<td></td>
<td></td>
</tr>
<tr>
<td>PTRL 4016 Natural Gas Engineering</td>
<td></td>
<td></td>
</tr>
<tr>
<td>LAWS 3410 Environmental Law</td>
<td></td>
<td></td>
</tr>
<tr>
<td>ECON 5103 Business Economics (M)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>ACCT 5901 Accounting: A User Perspective (M)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Stage 5**

<table>
<thead>
<tr>
<th>HPW</th>
<th>UOC</th>
</tr>
</thead>
<tbody>
<tr>
<td>HPW Session 1</td>
<td>6</td>
</tr>
<tr>
<td>HPW Session 2</td>
<td>6</td>
</tr>
<tr>
<td>Units Session 1</td>
<td>6</td>
</tr>
<tr>
<td>Units Session 2</td>
<td>6</td>
</tr>
</tbody>
</table>

**Note/s:** 3 hours/week/elective

**Open Learning Programs**

**7335**

**Petroleum Engineering Part Time External (Open-Learning Program)**

**Petroleum Engineering Graduate Certificate (Petroleum Engineering)**

This program is designed to cater for upstream oil and gas personnel who, although working as Petroleum Engineers, have no formal qualifications in Petroleum Engineering; or personnel with a formal Petroleum Engineering background but interested in expanding their knowledge base to allow them to operate more effectively in interdisciplinary teams.

**Course Title UOC**

**Core**

- GEOL9151 Petroleum Geology
- PTRL6016 Well Completions & Stimulation

**Elective**

- CVEN8710 Management of Risk
- CVEN8888 Environmental Management
- PTRL6009 Well Drilling Equipment & Operations
- PTRL6012 Drilling Mud – Formulation, Selection & Maintenance
- PTRL6022 Drilling Systems Design & Optimisation
- PTRL6025 Well Control & Blowout Prevention
- PTRL6027 Casing Design & Cementing
- PTRL6028 Practical Aspects of Well Planning & Drilling Cost Estimates
- PTRL6029 Directional, Horizontal & Multilateral Drilling
- PTRL6030 Advanced Recovery Methods
- PTRL6107 Formation Evaluation

To qualify for a MEngSc in Petroleum Engineering, candidates will have to pass a minimum of 24 Units of Credit. The final composition of the proposed program will require Head of School or nominee's approval.
Course Descriptions

Descriptions of all courses are presented in alphanumeric order within organisational units. For academic advice regarding a particular course consult with the contact for the course as listed. A guide to abbreviations and prefixes is included in the chapter Handbook Guide, appearing earlier in this book.

PTRL1010
Introduction to the Petroleum Industry
Staff Contact: Dr HA Salisch
UOC3 HPW3 WKS14


Unit4: The economics of the upstream oil and gas industry in Australia. The international oil and gas industry. Supply and demand for oil and gas in Australia. Imports of oil and gas. The importance of oil and gas to the Australian Government. Australian oil and gas fields and projects.

PTRL1011
Reservoir Rock Properties and Fluid Flow
Staff Contact: Dr PM Wong
UOC3 HPW3 WKS14
Prerequisite/s: PTRL1010

PTRL1012
Reservoir Fluid Properties
Staff Contact: Dr PM Wong
UOC3 HPW3 WKS14
Prerequisite/s: PTRL1010

PTRL2010
Communication Skills and Business Practices for Engineers
Staff Contact: G Allinson
UOC6 HPW1 WKS14
Communication skills. Preparation of resume. Background research for interviews and guidelines for conduct during interviews. Preparation of written reports and memorandums for maximum audience impact. Impromptu and prepared oral presentation skills. Business Practices. Joint Ventures, contracts, company structures, types of interest, stockmarket terminology and activities, acreage and reserves acquisition, farmins, company annual reports, company special reports, oil and gas marketing, reserves reporting, relations with Governments and partners.

PTRL2011
Petroleum Thermodynamics
Staff Contact: Prof WV Pinczewski
UOC3 HPW3 WKS14
Corequisite/s: CEIC2130, CHEN2140

PTRL2012
Formation Evaluation 1
Staff Contact: Dr HA Salisch
UOC3 HPW3 WKS14
Prerequisite/s: PTRL1011, PTRL1012

PTRL2013
Rock and Fluid Properties Laboratory
Staff Contact: A/Prof SS Rahman
UOC3 HPW3 WKS14
Prerequisite/s: PTRL1011, PTRL1012
An integrated reservoir engineering and formation evaluation laboratory incorporating experiments in porosity, permeability, capillary pressure, resistivity of reservoir rocks and PVT properties of crude oil.

PTRL3010
Reservoir Engineering
Staff Contact: Prof WV Pinczewski
UOC6 HPW6 WKS14
Prerequisite/s: PTRL1011, PTRL1012, GEOL5321, CEIC2110, CEIC2120, CHEN2140

PTRL3011
Formation Evaluation 2
Staff Contact: Dr HA Salisch
UOC3 HPW3 WKS14
Prerequisite/s: PTRL1012
Corequisite/s: PTRL3014

PTRL3012
Well Testing
Staff Contact: Prof WV Pinczewski
UOC3 HPW3 WKS14
Prerequisite/s: PTRL3010, MATH2030
Reservoir Characterisation

Staff Contact: Dr PM Wong
UOC3 HPW3 WKS14
Prequisite/s: MATH2999, PTRL3011, PTRL3014


Field Development Geology

Staff Contact: Dr HA Salisch, Mr D Tamhane
UOC3 HPW3 WKS14
Prequisite/s: GEOI5201, PTRL1010


Petroleum Production Engineering

Staff Contact: Dr F. Akgun
UOC3 HPW3 WKS14
Prequisite/s: PTRL1011, PTRL1012, PTRL2011, CEIC2102, PTRL3010


Well Drilling Equipment and Operations

Staff Contact: A/Prof SS Rahman
UOC3 HPW3 WKS14
Prequisite/s: PTRL1010, PTRL1011

Introduction to physical processes involved in drilling oil and gas wells. Rotary drilling rigs for both land and offshore operation. Drilling equipment including rig powering and transmission, hoisting, rotary systems, BOP equipment and hookup, drill pipes and collars. Drilling fluid circulating systems which includes pumps, mud tanks, mud mixtures and mud cleaners. Rig sizing and selection, special marine equipment, well planning including formation pressure prediction, pressure control and casing setting depth design. Drilling cost estimates.

Drilling Fluids and Cementing

Staff Contact: A/Prof SS Rahman
UOC3 HPW3 WKS14
Prequisite/s: PTRL2013, PTRL3016
Corequisite/s: PTRL3018

Introduction to the basic functions and properties of drilling fluids and cement slurries. Composition and related properties of drilling fluids and cement slurries. Types of equipment and methods used in cementing operations. Drilling fluid displacement and replacement of cement slurries. Drilling hydraulics.

Drilling and Production Laboratory

Staff Contact: A/Prof SS Rahman
UOC3 HPW3 WKS14
Prequisite/s: PTRL3016
Corequisite/s: PTRL3017

The laboratory includes measurement and control of the basic properties of drilling fluids (density, viscosity, filtration, lubricity and electrochemical properties) and cement slurries (density, viscosity, filtration, thickening time and mechanical properties). The objectives of this laboratory are to demonstrate the processes involved in drilling and cementing operations, introduce laboratory techniques which are used to select and optimise drilling fluids and cement slurry and to develop interest in experimentation.

Petroleum Project Evaluation

Staff Contact: G Allinson
UOC3 HPW3 WKS14
Prequisite/s: All Year 2 courses

Cash flow analysis (definitions, cash flow and profit, cash flow and taxation, cash flow and production sharing contracts, incorporating inflation, fiscal drag, real and nominal cash flows). Economic indicators (net present value, internal rate of return, payback, capital productivity index). Incremental investment analysis (accelerating production, lease/buy economics).

Fiscal analysis (structure of petroleum fiscal regimes, severity and efficiency, incremental fiscal effects).

Australian fiscal regimes – Crude oil levy regime (structure, detailed cash flow modelling, severity, efficiency, incremental effects, effect on exploration and development in Australia).

Australian fiscal regimes – Resource Rent Tax regime (structure, detailed cash flow modelling, severity, efficiency, incremental effects, effect on exploration and development in Australia).

Risk Analysis and Management

Staff Contact: G Allinson
UOC3 HPW3 WKS14
Prequisite/s: PTRL3019

Expected value, decision trees, value of information, sensitivity analysis, probability analysis, Monte Carlo simulation, portfolio analysis, risk and the selection of discount rate.

Risk Management (what is risk, other nomenclature, risk management definition and measurement, identifying goals, identifying risks, funding losses, controlling risk, case study).

Design Project for Petroleum Engineers

Staff Contact: Dr HA Salisch
UOC16 HPW3 WKS14
Prequisite/s: All Year 2 courses

The design project covers all aspects of the design of processing facilities for a potentially viable oil/gas field from conceptual design and environmental impact statement preparation through to a detailed design of processing facilities. Major emphasis is placed on the preparation of piping and instrumentation diagrams. Other topics include control schemes, a HAZOP analysis, equipment layout, main power and material requirements, and project schedule and economics.

Integrated Field Development Project

Staff Contact: G Allinson
UOC6 HPW6 WKS14
Prequisite/s: All Year 3 courses

In this course, the students decide the style of construction and optimise the development design of a hypothetical, but representative crude oil discovery offshore Australia. This relies not only on understanding the different possibilities for constructing the field, but also on making cost estimates of key components of the construction.
PTRL4009
Integrated Economics Project
Staff Contact: G Allinson
UOC4 HPW4 WKS14
Prerequisite/s: All Year 3 courses

An integral part of the optimisation of the development design of an oil or gas field is the development of a cash flow model which incorporates the terms of the Australian fiscal regime under which the field would operate. The model is used to help select the optimum development from an economic/commercial standpoint.

Finally the students carry out a valuation of the field and make a bid to acquire an interest in it.

PTRL4010
Integrated Reservoir Description Project
Staff Contact: G Allinson
UOC12 HPW6 WKS14
Prerequisite/s: PTRL4009

This course gives the opportunity for the students to carry out the complete description of a hypothetical but representative discovery of crude oil offshore Australia. The objective is to describe the reservoir and derive a reservoir model of the discovery. The main tasks include geological and geophysical analysis based on basin and field evaluations, determination of reservoir parameters based on formation evaluation and reservoir mapping at different levels of confidence. Risk analysis and probability assessments will be a key aspect of the project.

PTRL 4011
Integrated Reservoir Analysis & Drilling Project
Staff Contact: G Allinson
UOC6 HPW4 WKS14
Prerequisite/s: PTRL4010

This course is a continuation of PTRL4010. Based on the results of the reservoir description, the students estimate the oil-in-place and the reserves in the discovery at proven, probable and possible levels of confidence. They assess the likely production performance of individual wells and make a preliminary forecast of production over the life of the field. Finally, the students decide where to locate an appraisal well in the field, choose the type of well and design how it will be drilled.

PTRL 4012
Integrated Field Development & Economics Project
Staff Contact: G Allinson
UOC10 HPW10 WKS14
Prerequisite/s: PTRL4011

In this course, the students decide the style of construction and optimise the development design of a hypothetical, but representative crude oil discovery offshore Australia. This relies not only on understanding the different possibilities for constructing the field, but also on making cost estimates of key components of the construction. An integral part of the optimisation is the development of a cash flow model which incorporates the terms of the Australian fiscal regime under which the field would operate. The model is used to help select the optimum development from an economic/commercial standpoint.

Finally the students carry out a valuation of the field and make a bid to acquire an interest in it.

PTRL4013
Well Completion and Stimulation
Staff Contact: AProf SS Rahman
UOC3 HPW3 WKS14
Prerequisite/s: PTRL2013, PTRL3018, PTRL3016


PTRL 4014
Drilling System Design and Optimisation
Staff Contact: AProf SS Rahman
UOC3 HPW3 WKS14
Prerequisite/s: PTRL3016, PTRL3018


PTRL 4015
Numerical Reservoir Simulation
Staff Contact: Prof WV Pinczewski
UOC3 HPW3 WKS14
Prerequisite/s: MATH2030, PTRL3010


PTRL 4016
Natural Gas Engineering
Staff Contact: Dr HA Salisch
UOC3 HPW3 WKS14
Prerequisite/s: PTRL3010

**Graduate School of Biomedical Engineering**

**Head of School**
Associate Professor BK Milthorpe

The Graduate School of Biomedical Engineering is an interdisciplinary unit which promotes and coordinates biomedical engineering studies and research being conducted by various Schools and Departments within the University and its teaching hospitals. Biomedical Engineering is the application of engineering techniques and analysis to problem solving in medicine and the biological sciences. The engineering disciplines embraced within the scope of Biomedical Engineering include: Electrical Engineering, Mechanical Engineering, Computer Engineering and Chemical Engineering. Biomedical Engineering provides a direct input to enhancing the quality and scope of health care through the application of engineering analysis to biological systems and introducing engineering principles to medical and surgical interventions.

The Graduate School of Biomedical Engineering, in conjunction with the School of Mechanical and Manufacturing Engineering, the School of Electrical Engineering and Telecommunications, the School of Computer Science and Engineering and the School of Chemical Engineering and Industrial Chemistry offers concurrent courses in Mechanical Engineering/Biomedical Engineering 3683 Electrical Engineering/Biomedical Engineering 3727 Computer Engineering/Biomedical Engineering 3728 Chemical Engineering/Biomedical Engineering 3048 and in Telecommunication Engineering/Biomedical Engineering 3723. The concurrent courses allow the completion of a Bachelor of Engineering and a Master of Biomedical Engineering within a 5 year period.

Formal graduate courses in Biomedical Engineering are offered. These are: the Master of Biomedical Engineering 8660, the Master of Engineering Science in Biomedical Engineering 8665, and the Graduate Diploma in Biomedical Engineering 5445. Opportunities are provided for graduate research leading to the award of the degrees of Master of Science 2795, Master of Engineering 2675 and Doctor of Philosophy 1710.

**Concurrent Degree Programs**

The concurrent degree programs are specifically designed for undergraduate students wishing to pursue a career in Biomedical Engineering. These programs allow students to enter an integrated course which provides both the prerequisite engineering education and the specialist Biomedical Engineering training.

Students are expected to perform at a credit level average or better in their first three years to be permitted to progress to the Masters component of a concurrent degree program. Students who at the end of Year 3, do not satisfy the requirements for progression to the Masters component may complete the Bachelor of Engineering.

At the completion of the Bachelor of Engineering, students may enrol in the Graduate Diploma in Biomedical Engineering with advanced standing for biomedical subjects previously completed.

Students may elect at any time to revert to the BE in Mechanical Engineering, the BE in Electrical Engineering or the BE in Computer Engineering as appropriate. If, once entering a concurrent degree program, students wish to revert to the normal BE programs they will need to satisfy the requirements for the BE as set out in the relevant sections of this handbook. Since the concurrent degree programs introduce subjects additional to those in the BE, the student reverting to the normal BE program will require an additional year to achieve a BE after completing years 3 or 4 of the concurrent degree program.

**Professional Recognition**

The Institution of Engineers, Australia, recognises the Bachelor of Engineering components of the BE/MBiomedE courses as meeting the examination requirements for admission to graduate and corporate membership. In addition, examination requirements are met for membership of the Institution's College of Biomedical Engineering and either the College of Electrical or Mechanical Engineering. The degrees are accorded substantial or complete recognition by overseas engineering institutions.
Undergraduate Study

Course Outlines

3048
Chemical Engineering/Biomedical Engineering Full-time Program

Bachelor of Engineering Master of Biomedical Engineering
BE MBiomedE

Program 3048 is a concurrent BE in Chemical Engineering and Master of Biomedical Engineering. The program outline is given below.

<table>
<thead>
<tr>
<th>Year</th>
<th>Course Code</th>
<th>Course Title</th>
<th>HPW</th>
<th>UOC</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Year 1</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>BIOM1001</td>
<td>Professional Biomedical Studies</td>
<td>2</td>
<td>0</td>
<td>3</td>
</tr>
<tr>
<td>BIOM9010</td>
<td>Biomedical Engineering Practice</td>
<td>0</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>CEIC1020</td>
<td>Intro to Chem Eng</td>
<td>0</td>
<td>6</td>
<td>6</td>
</tr>
<tr>
<td>CHEM1001</td>
<td>Fundamentals of Chem 1A</td>
<td>6</td>
<td>0</td>
<td>6</td>
</tr>
<tr>
<td>CHEM1021</td>
<td>Chemistry 1B</td>
<td>0</td>
<td>6</td>
<td>6</td>
</tr>
<tr>
<td>MATH1131</td>
<td>Mathematics 1A or</td>
<td>6</td>
<td>0</td>
<td>6</td>
</tr>
<tr>
<td>MATH1141</td>
<td>Higher Mathematics 1A</td>
<td>6</td>
<td>0</td>
<td>6</td>
</tr>
<tr>
<td>MATH1231</td>
<td>Mathematics 1B or</td>
<td>0</td>
<td>6</td>
<td>6</td>
</tr>
<tr>
<td>MATH1241</td>
<td>Higher Mathematics 1B</td>
<td>0</td>
<td>6</td>
<td>6</td>
</tr>
<tr>
<td>MECH1030</td>
<td>Eng Drawing and Solid Modelling</td>
<td>3</td>
<td>0</td>
<td>3</td>
</tr>
<tr>
<td>PHYS1169</td>
<td>Engineering Physics</td>
<td>6</td>
<td>0</td>
<td>6</td>
</tr>
<tr>
<td>General Education</td>
<td></td>
<td>0</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td><strong>Total HPW Session 1</strong></td>
<td></td>
<td>23</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Total HPW Session 2</strong></td>
<td></td>
<td>22</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Total UOC</strong></td>
<td></td>
<td>48</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

| **Year 2** | | | | |
| CEIC2011 | Instrumental Analysis-Theory | 3 | 0 | 3 |
| CEIC2012 | Instrumental Analysis-Practice | 0 | 3 | 3 |
| CEIC2020 | Computing | 3 | 0 | 3 |
| CEIC2110 | Material & Energy Balances | 3 | 0 | 3 |
| CEIC2120 | Fluid Flow | 3 | 0 | 3 |
| CEIC2130 | Heat Transfer | 0 | 3 | 3 |
| CHEN2050 | Chem Eng Practice 1 | 0 | 3 | 3 |
| CHEN2061 | Intro to Process Chem 1 | 6 | 0 | 6 |
| CHEN2062 | Intro to Process Chem 2 | 0 | 3 | 3 |
| CHEN2140 | Mass Transfer | 0 | 3 | 3 |
| ELEC0809 | Electrical Engineering 1C | 2 | 0 | 3 |
| MATH2020 | Engineering Mathematics 2A | 2 | 0 | 3 |
| MATH2030 | Engineering Mathematics 2B | 2 | 0 | 3 |
| BIOM9xxx | Biomedical Engineering Electives | 0 | 3 | 6 |
| **Total HPW Session 1** | | 22 | | |
| **Total HPW Session 2** | | 20 | | |
| **Total UOC** | | 48 | | |

| **Year 3** | | | | |
| BIOM9420 | Clinical Laboratory Science | 3 | 0 | 6 |
| BIOT3100 | Fermentation Processes | 0 | 3 | 3 |
| CEIC3070 | Process Control | 0 | 4 | 4 |
| CEIC3100 | Reaction Engineering | 0 | 3 | 4 |
| CEIC3110 | Thermodynamics | 3 | 0 | 3 |
| CHEN3021 | Syst Modelling & Analysis | 2 | 0 | 3 |
| CHEN3022 | Process Modelling and Optimisation | 0 | 3 | 3 |
| CHEN3031 | Adv Transport Phenomena | 0 | 3 | 3 |
| CHEN3041 | Particle & Separation Processes | 6 | 0 | 6 |
| CHEN3065 | Plant Equipment & Design | 0 | 4 | 4 |
| CHEN3080 | Chem Eng Practice 2 | 3 | 0 | 3 |
| MATH2899 | Applied Statistics CE | 0 | 3 | 3 |
| General Education | | 2 | 0 | 3 |
| **Total HPW Session 1** | | 19 | | |
| **Total HPW Session 2** | | 23 | | |
| **Total UOC** | | 48 | | |

| **Year 4** | | | | |
| BIOM9930 | Research Project A | 0 | 3 | 6 |
| BIOM9940 | Biomedical Electives (3) | 6 | 3 | 18 |
| CEIC4130 | Plant Operation | 0 | 3 | 3 |
| CHEN3067 | Process Design & Econ. A | 3 | 0 | 3 |
| CHEN3068 | Process Design & Econ. B | 0 | 3 | 3 |
| CHEN4104 | Professional Elective | 3 | 0 | 3 |
| PHPH2101 | Physiology 1A | 6 | 0 | 6 |
| PHPH2201 | Physiology 1B | 0 | 6 | 6 |
| **Total HPW Session 1** | | 18 | | |
| **Total HPW Session 2** | | 18 | | |
| **Total UOC** | | 48 | | |

| **Total HPW Session 1** | | 16 | | |
| **Total HPW Session 2** | | 12 | | |
| **Total UOC** | | 48 | | |

Biomedical Engineering Electives

In Years 4 and 5 electives from the list below need to be selected.
All Biomedical Engineering Electives are at the graduate level.

| Preferred Electives | | | | |
| BIOM9311 | Mass Transfer in Medicine | 3 | 6 |
| BIOM9332 | Biocompatibility | 3 | 6 |
| BIOM9321 | Physiological Fluid Mechanics | 3 | 6 |
| BIOM9613 | Medical Instrumentation | 3 | 6 |
| BIOM9440 | Biomedical Practical Measurement | 3 | 6 |
| Other Electives | | | | |
| BIOM9027 | Medical Imaging | 3 | 6 |
| BIOM9060 | Biomedical System Analysis | 3 | 6 |
| BIOM9450 | Clinical Information Systems | 3 | 6 |
| BIOM9601 | Biomedical Applications of Microprocessors | 3 | 6 |
| BIOM9602 | Biomedical Applications of Microprocessors | 3 | 6 |
| BIOM9541 | Mechanics of the Human Body | 3 | 6 |
| BIOM9551 | Biomechanics of Physical Rehabilitation | 3 | 6 |
| BIOM9621 | Biological Signal Analysis | 3 | 6 |
| BIOM9701 | Dynamics of the Cardiovascular System | 3 | 6 |
### Bachelor of Engineering Master of Biomedical Engineering BE MBiomedE

Program 3683 is a concurrent BE in Mechanical Engineering and Master of Biomedical Engineering. The program outline is given below.

#### Year 1

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>HPW UOC</th>
</tr>
</thead>
<tbody>
<tr>
<td>BIOM1001</td>
<td>Professional Biomedical Studies</td>
<td>S1 2</td>
</tr>
<tr>
<td>BIOM9010</td>
<td>Biomedical Engineering Practice</td>
<td>S2 3</td>
</tr>
<tr>
<td>CHEM1817</td>
<td>Chemistry 1ME</td>
<td></td>
</tr>
<tr>
<td>MANF1130</td>
<td>Intro to Manufacturing</td>
<td>0 7</td>
</tr>
<tr>
<td>MATH1131</td>
<td>Mathematics 1A or</td>
<td></td>
</tr>
<tr>
<td>MATH1141</td>
<td>Higher Mathematics 1A</td>
<td>0 6</td>
</tr>
<tr>
<td>MATH1231</td>
<td>Mathematics 1B or</td>
<td></td>
</tr>
<tr>
<td>MATH1241</td>
<td>Higher Mathematics 1B</td>
<td>0 6</td>
</tr>
<tr>
<td>MECH1120</td>
<td>Design &amp; Engineering Profession</td>
<td>0 3</td>
</tr>
<tr>
<td>MECH1300</td>
<td>Engineering Mechanics 1</td>
<td>4 0</td>
</tr>
<tr>
<td>MECH1400</td>
<td>Mechanics of Solids 1</td>
<td>0 4</td>
</tr>
<tr>
<td>PHYS1169</td>
<td>Physics 1CME</td>
<td>0 6</td>
</tr>
<tr>
<td><strong>Total HPW Session 1</strong></td>
<td></td>
<td>21</td>
</tr>
<tr>
<td><strong>Total HPW Session 2</strong></td>
<td></td>
<td>22</td>
</tr>
<tr>
<td><strong>Total UOC</strong></td>
<td></td>
<td>48</td>
</tr>
</tbody>
</table>

#### Year 2

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>HPW UOC</th>
</tr>
</thead>
<tbody>
<tr>
<td>BIOM9420</td>
<td>Clinical Laboratory Science</td>
<td>3 0</td>
</tr>
<tr>
<td>ELEC0807</td>
<td>Electrical Engineering 1E</td>
<td>0 4</td>
</tr>
<tr>
<td>MATH2029</td>
<td>Engineering Mathematics 2A</td>
<td>0 6</td>
</tr>
<tr>
<td>MATH2039</td>
<td>Engineering Mathematics 2B</td>
<td>0 3</td>
</tr>
<tr>
<td>MATH2839</td>
<td>Statistics SM</td>
<td>0 3</td>
</tr>
<tr>
<td>MATS9520</td>
<td>Engineering Materials</td>
<td>0 3</td>
</tr>
<tr>
<td>MECH1500</td>
<td>Computing 1M</td>
<td>3 0</td>
</tr>
<tr>
<td>MECH2411</td>
<td>Mechanics of Solids 2A</td>
<td>3 0</td>
</tr>
<tr>
<td>MECH2412</td>
<td>Mechanics of Solids 2B</td>
<td>0 3</td>
</tr>
<tr>
<td>MECH2501</td>
<td>Fluid Mechanics &amp; Thermodynamics A</td>
<td>4 0</td>
</tr>
<tr>
<td>MECH2602</td>
<td>Fluid Mechanics &amp; Thermodynamics B</td>
<td>0 4</td>
</tr>
<tr>
<td><strong>Total HPW Session 1</strong></td>
<td></td>
<td>19</td>
</tr>
<tr>
<td><strong>Total HPW Session 2</strong></td>
<td></td>
<td>20</td>
</tr>
<tr>
<td><strong>Total UOC</strong></td>
<td></td>
<td>48</td>
</tr>
</tbody>
</table>

#### Year 3

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>HPW UOC</th>
</tr>
</thead>
<tbody>
<tr>
<td>ANAT2511</td>
<td>Fundamentals of Anatomy</td>
<td>0 6</td>
</tr>
<tr>
<td>BIOM613</td>
<td>Medical Instrumentation</td>
<td>3 0</td>
</tr>
<tr>
<td>MECH2101</td>
<td>Machine Design A</td>
<td>3 0</td>
</tr>
<tr>
<td>MECH2102</td>
<td>Machine Design B</td>
<td>0 3</td>
</tr>
<tr>
<td>MECH2300</td>
<td>Engineering Mechanics 2</td>
<td>3 0</td>
</tr>
<tr>
<td>MECH3203</td>
<td>Engineering Experiment'n A</td>
<td>2 0</td>
</tr>
<tr>
<td>MECH3204</td>
<td>Engineering Experiment'n B</td>
<td>0 2</td>
</tr>
<tr>
<td>MECH3211</td>
<td>Linear Systems Analysis</td>
<td>3 0</td>
</tr>
<tr>
<td>MECH3212</td>
<td>Principles of Control</td>
<td>0 3</td>
</tr>
<tr>
<td>MECH3300</td>
<td>Engineering Mechanics 3</td>
<td>0 3</td>
</tr>
<tr>
<td>MECH3310</td>
<td>Vibration Analysis</td>
<td>0 3</td>
</tr>
<tr>
<td>MECH35xx</td>
<td>Computing elective</td>
<td>3 0</td>
</tr>
<tr>
<td>MECH3601</td>
<td>Thermofluid System Design</td>
<td>3 0</td>
</tr>
<tr>
<td>MECH3602</td>
<td>Advanced Thermodynamics</td>
<td>0 3</td>
</tr>
<tr>
<td><strong>Total HPW Session 1</strong></td>
<td></td>
<td>20</td>
</tr>
<tr>
<td><strong>Total HPW Session 2</strong></td>
<td></td>
<td>23</td>
</tr>
<tr>
<td><strong>Total UOC</strong></td>
<td></td>
<td>48</td>
</tr>
</tbody>
</table>

#### Year 4

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>HPW UOC</th>
</tr>
</thead>
<tbody>
<tr>
<td>BIOM5001</td>
<td>Thesis part A</td>
<td>4 0</td>
</tr>
<tr>
<td>BIOM5002</td>
<td>Thesis part B</td>
<td>0 6</td>
</tr>
<tr>
<td>MECH3000</td>
<td>Professional Responsibilities</td>
<td>0 3</td>
</tr>
<tr>
<td>MECH3101</td>
<td>Machine Systems Design A</td>
<td>3 0</td>
</tr>
<tr>
<td>MECH3102</td>
<td>Machine Systems Design B</td>
<td>0 3</td>
</tr>
<tr>
<td>MECH3400</td>
<td>Mechanics of Solids 3</td>
<td>3 0</td>
</tr>
<tr>
<td>MECH4001</td>
<td>Communication for Professional Engineers</td>
<td>0 3</td>
</tr>
<tr>
<td>PHPH2101</td>
<td>Physiology 1A</td>
<td>6 0</td>
</tr>
<tr>
<td>PHPH2201</td>
<td>Physiology 1B</td>
<td>0 6</td>
</tr>
<tr>
<td><strong>Total UOC</strong></td>
<td></td>
<td>48</td>
</tr>
</tbody>
</table>

#### Mechanical Engineering Technical Electives

Electives to be made available are decided on the basis of demand and Staff availability. Students should check with the School of Mechanical and Manufacturing Engineering for list of available courses. Subjects will be drawn from those electives listed in the BE Mechanical Engineering (3680) program in this handbook (see Mechanical and Manufacturing Engineering entry).

#### Biomedical Engineering Electives

In Years 4 and 5 electives from the list below need to be selected. All Biomedical Engineering Electives are at the graduate level.

**Preferred Electives**

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>HPW UOC</th>
</tr>
</thead>
<tbody>
<tr>
<td>BIOM9321</td>
<td>Physiological Fluid Mechanics</td>
<td>3 6</td>
</tr>
<tr>
<td>BIOM9541</td>
<td>Mechanics of the Human Body</td>
<td>3 6</td>
</tr>
<tr>
<td>BIOM9551</td>
<td>Biomechanics of Physical Rehabilitation</td>
<td>3 6</td>
</tr>
<tr>
<td>BIOM9651</td>
<td>Mechanical Properties of Biomaterials</td>
<td>3 6</td>
</tr>
</tbody>
</table>

**Other Electives**

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>HPW UOC</th>
</tr>
</thead>
<tbody>
<tr>
<td>ANAT3131</td>
<td>Functional Anatomy 1</td>
<td>6 6</td>
</tr>
<tr>
<td>ANAT3141</td>
<td>Functional Anatomy 2</td>
<td>6 6</td>
</tr>
<tr>
<td>BIOM9027</td>
<td>Medical Imaging</td>
<td>3 6</td>
</tr>
<tr>
<td>BIOM9060</td>
<td>Biomedical Systems Analysis</td>
<td>3 6</td>
</tr>
<tr>
<td>BIOM9311</td>
<td>Mass Transfer in Medicine</td>
<td>3 6</td>
</tr>
<tr>
<td>BIOM9450</td>
<td>Clinical Information Systems</td>
<td>3 6</td>
</tr>
<tr>
<td>BIOM9601</td>
<td>Biomedical Applications of Microprocessors 1</td>
<td>3 6</td>
</tr>
<tr>
<td>BIOM9621</td>
<td>Biological Systems Analysis</td>
<td>3 6</td>
</tr>
<tr>
<td>BIOM9701</td>
<td>Dynamics of the Cardiovascular System</td>
<td>3 6</td>
</tr>
</tbody>
</table>
### 3723

**Telecommunication Engineering/Biomedical Engineering Full-time Program**

Bachelor of Engineering Master of Biomedical Engineering BE MBiomedE

Program 3723 is a concurrent BE in Telecommunication Engineering and Master of Biomedical Engineering. The program outline is given below.

<table>
<thead>
<tr>
<th>HPW</th>
<th>UOC</th>
</tr>
</thead>
<tbody>
<tr>
<td>S1</td>
<td>S2</td>
</tr>
<tr>
<td>BIOM1001  Professional Biomedical Studies</td>
<td>2</td>
</tr>
<tr>
<td>BIOM9010  Biomedical Engineering Practice</td>
<td>0</td>
</tr>
<tr>
<td>CHEM1007  Chemistry 1ME</td>
<td>0</td>
</tr>
<tr>
<td>COMP1011  Computing 1A</td>
<td>0</td>
</tr>
<tr>
<td>ELEC1011  Electrical Engineering 1</td>
<td>6</td>
</tr>
<tr>
<td>MATH1090  Discrete Mathematics</td>
<td>3</td>
</tr>
<tr>
<td>MATH1131  Mathematics 1A or</td>
<td>6</td>
</tr>
<tr>
<td>MATH1141  Higher Mathematics 1A</td>
<td>6</td>
</tr>
<tr>
<td>MATH1231  Mathematics 1B or</td>
<td>0</td>
</tr>
<tr>
<td>MATH1241  Higher Mathematics 1B</td>
<td>0</td>
</tr>
<tr>
<td>PHYS1131  Higher Physics 1A</td>
<td>6</td>
</tr>
<tr>
<td>PHYS1231  Higher Physics 1B</td>
<td>0</td>
</tr>
<tr>
<td>Total HPW Session 1</td>
<td>23</td>
</tr>
<tr>
<td>Total HPW Session 2</td>
<td>23</td>
</tr>
<tr>
<td>Total UOC</td>
<td>48</td>
</tr>
</tbody>
</table>

**Year 2**

<table>
<thead>
<tr>
<th>HPW</th>
<th>UOC</th>
</tr>
</thead>
<tbody>
<tr>
<td>S1</td>
<td>S2</td>
</tr>
<tr>
<td>BIOM9420  Clinical Laboratory Science</td>
<td>3</td>
</tr>
<tr>
<td>COMP1021  Computing 1B</td>
<td>6</td>
</tr>
<tr>
<td>ELEC1041  Digital Circuits</td>
<td>0</td>
</tr>
<tr>
<td>ELEC2031  Circuits and Systems</td>
<td>3</td>
</tr>
<tr>
<td>ELEC2042  Real Time Instrumentation</td>
<td>0</td>
</tr>
<tr>
<td>MATH2011  Several Variable Calculus</td>
<td>4</td>
</tr>
<tr>
<td>MATH2509  Linear Algebra for Engineers</td>
<td>0</td>
</tr>
<tr>
<td>MATH2620  Higher Complex Analysis</td>
<td>0</td>
</tr>
<tr>
<td>MATH2859  Probability, Statistics &amp; Information</td>
<td>3</td>
</tr>
<tr>
<td>TELE3018  Data Networks 1</td>
<td>0</td>
</tr>
<tr>
<td>Total HPW Session 1</td>
<td>19</td>
</tr>
<tr>
<td>Total HPW Session 2</td>
<td>21.5</td>
</tr>
<tr>
<td>Total UOC</td>
<td>48</td>
</tr>
</tbody>
</table>

**Year 3**

<table>
<thead>
<tr>
<th>HPW</th>
<th>UOC</th>
</tr>
</thead>
<tbody>
<tr>
<td>S1</td>
<td>S2</td>
</tr>
<tr>
<td>BIOM9410  Regulatory Requirements of Biomedical Technology</td>
<td>0</td>
</tr>
<tr>
<td>BIOM9xxx  Biomedical Elective</td>
<td>3</td>
</tr>
<tr>
<td>ELEC3004  Signal Processing &amp; Transform Methods</td>
<td>5</td>
</tr>
<tr>
<td>ELEC3006  Electronics A</td>
<td>6</td>
</tr>
<tr>
<td>ELEC3017  Electrical Engineering Design</td>
<td>0</td>
</tr>
<tr>
<td>ELECxxx  Elective List A</td>
<td>0</td>
</tr>
<tr>
<td>TELE3013  Telecomm. Systems 1</td>
<td>0</td>
</tr>
<tr>
<td>TELE4352  Data Networks 2</td>
<td>4</td>
</tr>
<tr>
<td>Total HPW Session 1</td>
<td>18</td>
</tr>
<tr>
<td>Total HPW Session 2</td>
<td>18</td>
</tr>
<tr>
<td>Total UOC</td>
<td>48</td>
</tr>
</tbody>
</table>

**Year 4**

<table>
<thead>
<tr>
<th>HPW</th>
<th>UOC</th>
</tr>
</thead>
<tbody>
<tr>
<td>S1</td>
<td>S2</td>
</tr>
<tr>
<td>BIOM5910  Thesis Part A</td>
<td>0</td>
</tr>
<tr>
<td>BIOM9430  Electromedical Standards</td>
<td>3</td>
</tr>
<tr>
<td>ELEC2041  Microprocessors &amp; Interfacing</td>
<td>4</td>
</tr>
<tr>
<td>ELEC4010  Introduction to Management for Electrical Engineers</td>
<td>4</td>
</tr>
<tr>
<td>ELEC4011  Ethics &amp; Elec Eng Practice</td>
<td>0</td>
</tr>
<tr>
<td>PHPH2101  Physiology 1A</td>
<td>6</td>
</tr>
<tr>
<td>PHPH2201  Physiology 1B</td>
<td>0</td>
</tr>
<tr>
<td>TELE3010  Network Management</td>
<td>0</td>
</tr>
<tr>
<td>TELE4352  General Education</td>
<td>2</td>
</tr>
<tr>
<td>Total HPW Session 1</td>
<td>19</td>
</tr>
<tr>
<td>Total HPW Session 2</td>
<td>25</td>
</tr>
<tr>
<td>Total UOC</td>
<td>48</td>
</tr>
</tbody>
</table>

Program 3727 is a concurrent BE in Electrical Engineering and Master of Biomedical Engineering. The program outline is given below.

<table>
<thead>
<tr>
<th>HPW</th>
<th>UOC</th>
</tr>
</thead>
<tbody>
<tr>
<td>S1</td>
<td>S2</td>
</tr>
<tr>
<td>BIOM9101  Professional Biomedical Studies</td>
<td>2</td>
</tr>
<tr>
<td>BIOM9001  Biomedical Engineering Practice</td>
<td>0</td>
</tr>
<tr>
<td>CHEM1007  Chemistry 1ME</td>
<td>0</td>
</tr>
<tr>
<td>COMP1011  Computing 1A</td>
<td>0</td>
</tr>
<tr>
<td>ELEC1011  Electrical Engineering 1</td>
<td>6</td>
</tr>
<tr>
<td>ELEC4010  Electrical Engineering 1</td>
<td>6</td>
</tr>
<tr>
<td>MATH1090  Discrete Mathematics</td>
<td>3</td>
</tr>
</tbody>
</table>

### Biomedical Engineering Electives

#### Preferred Electives

- BIOM9027  Medical Imaging  | 3 | 6 |
- BIOM9060  Biomedical Systems Analysis  | 3 | 6 |

#### Other Electives

- ANAT2511  Fundamentals of Anatomy  | 6 | 6 |
- BIOM9311  Mass Transfer in Medicine  | 3 | 6 |
- BIOM9332  Biocompatibility  | 3 | 6 |
- BIOM9440  Biomedical Practical Measurement  | 3 | 6 |
- BIOM9450  Clinical Information Systems  | 3 | 6 |
- BIOM9510  Introductory Biomechanics  | 3 | 6 |
- BIOM9601  Biomedical Applications of Microprocessors  | 3 | 6 |
- BIOM9701  Dynamics of the Cardiovascular System  | 3 | 6 |

### Electrical Engineering Electives

#### List A Electives

- COMP2011  Data Organisation  | 3 | 6 |
- ELEC2042  Real Time Instrumentation  | 6 | 6 |
- ELEC3014  Systems and Control 1  | 6 | 6 |
- ELEC3016  Electronics B  | 6 | 6 |
- ELEC3041  Real Time Engineering  | 6 | 6 |
- MATH3141  Numerical and Mathematical Methods  | 6 | 6 |

#### Telecommunication Engineering Electives

- ELEC4042  Signal Processing 2  | 6 | 6 |
- ELEC4333  Communication Systems  | 6 | 6 |
- ELEC4482  Biomedical Instrumentation, Measurement and Design  | 6 | 6 |
- TELE4313  Optical Communications  | 6 | 6 |
- TELE4323  Digital Modulation and Coding  | 6 | 6 |
- TELE4343  Source Coding & Compression  | 6 | 6 |
- TELE4352  Data Networks 2  | 6 | 6 |
- TELE4353  Mobile & Satellite Comm Systems  | 6 | 6 |

### 3727

**Electrical Engineering/Biomedical Engineering Full-time Program**

Bachelor of Engineering Master of Biomedical Engineering BE MBiomedE

Program 3727 is a concurrent BE in Electrical Engineering and Master of Biomedical Engineering. The program outline is given below.

<table>
<thead>
<tr>
<th>HPW</th>
<th>UOC</th>
</tr>
</thead>
<tbody>
<tr>
<td>S1</td>
<td>S2</td>
</tr>
<tr>
<td>BIOM5911  Thesis Part B</td>
<td>8</td>
</tr>
<tr>
<td>BIOM9913  Masters Project or 2 Biomedical Electives</td>
<td>0</td>
</tr>
<tr>
<td>BIOM9xxx  Biomedical Elective (3)</td>
<td>6</td>
</tr>
<tr>
<td>TELExxx  Telecomm Elective</td>
<td>0</td>
</tr>
<tr>
<td>TELE4363  Telecomm Systems 2</td>
<td>4</td>
</tr>
<tr>
<td>Total HPW Session 1</td>
<td>18</td>
</tr>
<tr>
<td>Total HPW Session 2</td>
<td>13</td>
</tr>
<tr>
<td>Total UOC</td>
<td>48</td>
</tr>
<tr>
<td>Biomedical Engineering Electives</td>
<td>Preferred Electives</td>
</tr>
<tr>
<td>---------------------------------</td>
<td>---------------------</td>
</tr>
<tr>
<td>BIOM5027 Medical Imaging</td>
<td>3</td>
</tr>
<tr>
<td>BIOM5060 Biomedical Systems Analysis</td>
<td>3</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Other Electives</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>ANAT2511 Fundamentals of Anatomy</td>
<td>6</td>
</tr>
<tr>
<td>BIOM5311 Mass Transfer in Medicine</td>
<td>3</td>
</tr>
<tr>
<td>BIOM5332 Biocompatibility</td>
<td>3</td>
</tr>
<tr>
<td>BIOM5440 Biomedical Practical Measurement</td>
<td>3</td>
</tr>
<tr>
<td>BIOM5450 Clinical Information Systems</td>
<td>3</td>
</tr>
<tr>
<td>BIOM5950 Introductory Biomechanics</td>
<td>3</td>
</tr>
<tr>
<td>BIOM5961 Biomedical Applications of Microprocessors</td>
<td>3</td>
</tr>
<tr>
<td>BIOM5971 Dynamics of the Cardiovascular System</td>
<td>3</td>
</tr>
<tr>
<td>ELEC3942 Signal Processing 2: Advanced Techniques</td>
<td>4</td>
</tr>
<tr>
<td>ELEC5970 Digital Image Processing Systems</td>
<td>3</td>
</tr>
<tr>
<td>ELEC5940 Human Movement Control Systems</td>
<td>3</td>
</tr>
<tr>
<td>ELEC59407 Cybernetic Engineering</td>
<td>3</td>
</tr>
<tr>
<td>ELEC59412 Biological Signal Analysis</td>
<td>3</td>
</tr>
<tr>
<td>ELEC59416 Non-linear Systems and Simulation</td>
<td>3</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Electrical Engineering Electives</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>ELEC3014 Systems and Control 1</td>
<td></td>
</tr>
<tr>
<td>ELEC3015 Electrical Energy 2</td>
<td></td>
</tr>
<tr>
<td>ELEC3016 Electronics B</td>
<td></td>
</tr>
<tr>
<td>ELEC3041 Real Time Engineering</td>
<td></td>
</tr>
<tr>
<td>MATH3141 Numerical and Mathematical Methods</td>
<td></td>
</tr>
<tr>
<td>COMP2011 Data Organisation</td>
<td></td>
</tr>
<tr>
<td>TELE3013 Telecommunications Systems 1</td>
<td></td>
</tr>
<tr>
<td>TELE3018 Data Networks 1</td>
<td></td>
</tr>
</tbody>
</table>

| Year 3 |  |
| BIOM9410 Regulatory Requirements of Biomedical Technology | 0 | 3 | 6 |
| ELEC2041 Microprocessors & Interfacing | 4 | 0 | 6 |
| ELEC2042 Real Time Instrumentation | 0 | 3 | 3 |
| ELEC3004 Signal Processing & Transform Methods | 5 | 0 | 6 |
| ELEC3006 Electronics A | 6 | 0 | 6 |
| ELEC3017 Electrical Engineering Design | 0 | 5 | 6 |
| ELEC4010 Introduction to Management for Electrical Engineers | 4 | 0 | 3 |
| ELEC4011 Ethics & Elec Eng Practice | 0 | 4 | 3 |
| ELECxxxx Elec Eng Elective A | 0 | 5 | 6 |
| General Education | 2 | 0 | 3 |
| Total HPW Session 1 | 19 |
| Total HPW Session 2 | 20 |
| Total UOC | 48 |

| Year 4 |  |
| BIOM5910 Thesis Part A | 0 | 8 | 6 |
| BIOM9430 Electromedical Standards | 3 | 0 | 6 |
| BIOM9xxx Biomedical Elective | 3 | 0 | 6 |
| ELEC3005 Electrical Energy 1 | 5 | 0 | 6 |
| ELEC4433 Biomedical, Instrumentation, Measurement and Design | 0 | 4 | 6 |
| ELECxxxx Elec Eng Elective A | 0 | 4 | 6 |
| PHPH2101 Physiology 1A | 6 | 0 | 6 |
| PHPH2201 Physiology 1B | 0 | 6 | 6 |
| Total HPW Session 1 | 17 |
| Total HPW Session 2 | 22 |
| Total UOC | 48 |

| Year 5 |  |
| BIOM5911 Thesis Part B | 8 | 0 | 6 |
| BIOM9913 Masters Project or 2 Biomedical Electives | 0 | 6 | 12 |
| BIOMxxxx Biomedical Elective (3) | 6 | 3 | 18 |
| ELECxxxx Elec Eng Elective A | 0 | 4 | 6 |
| ELECxxxx Elec Eng Elective | 4 | 0 | 6 |
| Total HPW Session 1 | 18 |
| Total HPW Session 2 | 13 |
| Total UOC | 48 |
3728
Computer Engineering/Biomedical Engineering – Full-time Program

Bachelor of Engineering Master of Biomedical Engineering
BE MBiomedE

Program 3728 is a concurrent BE in Computer Engineering and Master of Biomedical Engineering. The program outline is given below.

<table>
<thead>
<tr>
<th>Year</th>
<th>HPW</th>
<th>UOC</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>S1</td>
<td>S2</td>
</tr>
<tr>
<td>Year 1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>BIOM1001</td>
<td>Professional Biomedical Studies</td>
<td>2</td>
</tr>
<tr>
<td>BIOM9010</td>
<td>Biomedical Engineering Practice</td>
<td>0</td>
</tr>
<tr>
<td>CHEM1807</td>
<td>Chemistry 1ME</td>
<td>0</td>
</tr>
<tr>
<td>COMP1011</td>
<td>Computing 1A</td>
<td>6</td>
</tr>
<tr>
<td>COMP1021</td>
<td>Computing 1B</td>
<td>0</td>
</tr>
<tr>
<td>MATH1090</td>
<td>Discrete Mathematics</td>
<td>3</td>
</tr>
<tr>
<td>MATH1131</td>
<td>Mathematics 1A or Mathematics 1B</td>
<td>6</td>
</tr>
<tr>
<td>MATH1231</td>
<td>Mathematics 1B or Mathematics 1B</td>
<td>0</td>
</tr>
<tr>
<td>PHYS1131</td>
<td>Higher Physics 1A</td>
<td>6</td>
</tr>
<tr>
<td>PHYS1231</td>
<td>Higher Physics 1B</td>
<td>0</td>
</tr>
<tr>
<td>Total HPW Session 1</td>
<td>23</td>
<td></td>
</tr>
<tr>
<td>Total HPW Session 2</td>
<td>23</td>
<td></td>
</tr>
<tr>
<td>Total UOC</td>
<td>48</td>
<td></td>
</tr>
</tbody>
</table>

| Year 2 |     |     |
|        |     |     |
| ACCT9003 | Accounting Fundamentals | 3 | 0 | 3 |
| ANAT2511 | Fundamentals of Anatomy | 0 | 6 | 6 |
| BIOM9420 | Clinical Laboratory Science | 3 | 0 | 6 |
| COMP2011 | Data Organisation | 6 | 0 | 6 |
| COMP2021 | Digital Systems Structures | 6 | 0 | 6 |
| COMP3111 | Software Engineering | 0 | 6 | 6 |
| ELEC1011 | Electrical Engineering 1 | 0 | 6 | 6 |
| MATH2510 | Real Analysis or | 3 | 0 | 3 |
| MATH2610 | Higher Real Analysis | 3 | 0 | 3 |
| MATH2520 | Complex Analysis or | 0 | 3 | 3 |
| MATH2620 | Higher Complex Analysis | 0 | 3 | 3 |
| Total HPW Session 1 | 21 |     |
| Total HPW Session 2 | 23 |     |
| Total UOC | 48 |     |

| Year 3 |     |     |
|        |     |     |
| BIOM9027 | Medical Imaging | 0 | 3 | 6 |
| COMP2221 | Microprocessors and Embedded Systems | 0 | 6 | 6 |
| COMP3211 | Computer Architecture | 0 | 6 | 6 |
| COMP3221 | Operating Systems | 6 | 0 | 6 |
| ELEC2031 | Circuits and Systems | 3 | 3 | 6 |
| MATH2509 | Linear Algebra for Engineers or | 0 | 3 | 3 |
| COMP3120 | Introduction to Algorithms | 0 | 3 | 3 |
| MATH2859 | Probability, Statistics & Information | 3 | 0 | 3 |
| TELE3013 | Telecommunication Systems | 5 | 0 | 6 |
| Electives List A | 6 | 0 | 6 |
| Total HPW Session 1 | 23 |     |
| Total HPW Session 2 | 21 |     |
| Total UOC | 48 |     |

| Year 4 |     |     |
|        |     |     |
| BIOM5910 | Thesis A | 0 | 3 | 3 |
| BIOM9xxx | Biomedical Electives (2) | 6 | 0 | 12 |
| COMP3710 | Software Project Management | 0 | 3 | 3 |
| COMP4920 | Professional Issues & Ethics | 0 | 3 | 3 |

Total HPW Session 1 23
Total HPW Session 2 21
Total UOC 48

Total UOC 48

Year 5

|        |      |      |
|        |      |      |
| BIOM5911 | Thesis B and C | 15 | 0 | 15 |
| BIOM9410 | Regulatory Requirements of Biomedical Technology | 0 | 3 | 6 |
| BIOM9913 | Masters Project or 2 Biomedical Electives | 0 | 6 | 12 |
| BIOM9xxx | Biomedical Elective | 0 | 3 | 6 |
| COMP3720 | Total Quality Management | 3 | 0 | 3 |
| COMPxxx | Computer Eng Elective | 3 | 0 | 6 |

Total HPW Session 1 21
Total HPW Session 2 12
Total UOC 48

Biomedical Engineering Electives

Preferred Electives

|        |      |      |
|        |      |      |
| BIOM9440 | Biomedical Practical Measurement | 3 | 6 |
| BIOM9913 | Medical Instrumentation | 3 | 6 |
| ELEC4483 | Biomedical Instrumentation | 3 | 6 |

Other Electives

|        |      |      |
|        |      |      |
| BIOM9060 | Biomedical System Analysis | 3 | 6 |
| BIOM9311 | Mass Transfer in Medicine | 3 | 6 |
| BIOM9332 | Biocompatibility | 3 | 6 |
| BIOM9450 | Clinical Information Systems | 3 | 6 |
| BIOM9510 | Introductory Biomechanics | 3 | 6 |
| BIOM9621 | Biological Signal Analysis | 3 | 6 |
| BIOM9701 | Dynamics of the Cardiovascular System | 3 | 6 |
| ELEC9342 | Signal Processing 2: Advanced Techniques | 3 | 6 |
| ELEC9370 | Digital Image Processing Systems | 3 | 6 |
| ELEC9405 | Human Movement Control Systems | 3 | 6 |
| ELEC9407 | Cybernetic Engineering | 3 | 6 |
| ELEC9416 | Non-linear Systems and Simulations | 3 | 6 |

Computer Engineering Electives

All non-core COMP3xxx and COMP4xxx subjects are allowable as a Computer Engineering elective.

|        |      |      |
|        |      |      |
| ELEC4042 | Signal Processing 2 | 3 | 6 |
| ELEC4053 | Systems and Control 3 | 3 | 6 |
| ELEC4503 | Electronics 4 | 3 | 6 |
| ELEC4522 | Microelectronics Design & Technology | 3 | 6 |
| ELEC4532 | Integrated Digital Systems | 3 | 6 |
| ELEC4540 | Applied Photovoltaics | 3 | 6 |
| TELE4313 | Optical Communications | 3 | 6 |
| TELE4323 | Digital Modulation and Coding | 3 | 6 |
| TELE4333 | Communication Systems 2 | 3 | 6 |
| TELE4343 | Source Coding & Compression | 3 | 6 |
| ELEC4351 | Data Communication and Computer Networks | 3 | 6 |
| ELEC4352 | Data Networks 2 | 3 | 6 |
| ELEC4353 | Mobile & Satellite Comm Systems | 3 | 6 |

Elective List A

|        |      |      |
|        |      |      |
| ELEC3014 | Systems and Control 1 | 3 | 6 |
| ELEC3016 | Electronics B | 3 | 6 |
| ELEC3041 | Real Time Engineering | 3 | 6 |
| MATH3141 | Numerical and Mathematical Methods | 3 | 6 |
| COMP2011 | Data Organisation | 3 | 6 |
Postgraduate Study

Formal graduate programs in Biomedical Engineering are offered. These are: the Master of Biomedical Engineering 8660, the Master of Engineering Science in Biomedical Engineering 8665, and the Graduate Diploma in Biomedical Engineering 5445.

Opportunities are provided for graduate research leading to the award of the degrees of Master of Science 2795, Master of Engineering 2675 and Doctor of Philosophy 1710.

Course Work Programs

8660
Master of Biomedical Engineering

MBiomedE

The MBiomedE degree program is designed to cater for students with either a medical/biological science or engineering/physical science background.

Initially, students with a medical/biological science background study basic engineering subjects such as mathematics, mechanics, electronics and computing, whilst students with a non-medical background take courses in physiology, anatomy, pathology and biochemistry. Later, both groups choose electives from biomechanics, biophysics, biomaterials, medical instrumentation and mass transfer in medicine, as well as undertaking a research project.

This degree is primarily obtained through course work but may include an optional project report conducted in either a hospital or other institution. The course of study offers scope for original research into the application of engineering principles and technology to medical problems. Candidates must complete a program totaling 72 UOC, 48 of which must be for the study of subjects at graduate level. A minimum of 48 units must be from subjects offered by the Graduate School of Biomedical Engineering (i.e. BIOM9xxx subjects).

Period of candidature: The normal period is four academic sessions (full-time) or six academic sessions (part-time) from the date of enrolment. The maximum period of candidature is eight academic sessions (full-time) and ten academic sessions (part-time). In special cases extensions may be granted. A candidate is not permitted to continue in the course if the unit value of the subjects failed totals more than 18.

Strand A subjects are directed to candidates with an engineering/physical sciences background and Strand B to those with a medical/biological sciences background. Selection of subjects is not limited to those listed below. Relevant subjects from other areas may be undertaken subject to the approval of the Head of School. There is an optional 12 unit project.

Session 1

NotesUOC

Strand A Subjects, Engineering/Physical Sciences Candidates
ANAT2511 Fundamentals of Anatomy HR 6
PHPB101 Physiology 1A HR 6
PHPB2201 Physiology 1B HR 6

Strand B Subjects, Medical/Life Sciences Candidates
BIOM9040 Analogue Electronics for Biomedical Engineers 6
BIOM9101 Mathematical Modelling for Biomedical Engineers 6
BIOM9501 Computing for Biomedical Engineers 6
BIOM9050 Microprocessors and Circuit Design for Biomedical Engineers 6

Session 1

General Subjects
BIOM9060 Biomedical Systems Analysis 6
BIOM9510 Introductory Biomechanics 6
BIOM9551 Biomechanics of Physical Rehabilitation 6
BIOM9601 Biomedical Applications of Microcomputers 6
BIOM9621 Biological Signal Analysis 6
BIOM9701 Dynamics of the Cardiovascular System 6
ELEC9411 Introductory Physiology for Engineers P 6

Session 2

General Subjects
BIOM9010 Biomedical Engineering Practice 3
BIOM9012 Biomedical Statistics 6
BIOM9027 Medical Imaging 6
BIOM9311 Mass Transfer in Medicine 6
BIOM9321 Physiological Fluid Mechanics 6
BIOM9332 Biocompatibility 6
BIOM9541 Mechanics of the Human Body 6
BIOM9561 Mechanical Properties of Biomaterials 6
BIOM9612 Medical Instrumentation 6

Notes:
HR Highly recommended
P Part-time students only

(1) For students with no mechanics background

8665
Master of Engineering Science

MEngSc

Candidates are required to complete a program totalling at least 48 units of credit composed of graduate level subjects, including an optional 12 unit project.

Individual study programs, generally selected from the subjects listed below, are to be approved by the Head of School or nominee. Although appropriate graduate level subjects may be taken from other schools within the University a minimum of 60% of the coursework UOC (i.e. 30 units) are to be selected from subjects offered by the Graduate School of Biomedical Engineering (BIOM9xxx). The degree will normally comprise one year (two sessions) of full-time study or two years (4 sessions) of part-time study.

Session 1

NotesUOC

BIOM9060 Biomedical Systems Analysis 6
BIOM9510 Introductory Biomechanics (1) 6
BIOM9551 Biomechanics of Physical Rehabilitation (2) 6
BIOM9601 Biomedical Applications of Microcomputers (3) 6
BIOM9621 Biological Signal Analysis 6
BIOM9701 Dynamics of the Cardiovascular System 6
ELEC9411 Introductory Physiology for Engineers (4) 6

Session 2

NotesUOC

BIOM9010 Biomedical Engineering Practice (4) 3
BIOM9012 Biomedical Statistics 6
BIOM9060 Biomedical Systems Analysis 6
BIOM9027 Medical Imaging 6
BIOM9311 Mass Transfer in Medicine 6
BIOM9321 Physiological Fluid Mechanics 6
BIOM9332 Biocompatibility 6
BIOM9541 Mechanics of the Human Body (2) 6
BIOM9561 Mechanical Properties of Biomaterials (2) 6
BIOM9612 Medical Instrumentation 6
BIOM9913 Project Report (5) 12
Notes:
1. For students with no mechanics background
2. These three electives vary according to session offered. BIOM9510, or equivalent, is prerequisite for BIOM9541, and BIOM9541 is prerequisite for BIOM9551.
3. Prerequisite BIOM9050 or equivalent. Class size restricted.
4. Highly Recommended for 8665 MEngSc students
5. Research project may be done concurrently with course work during the other sessions.

5445
Graduate Diploma in Biomedical Engineering

GradDip
Details of the recommended programs of study, totalling at least 36 units, may be obtained from the Head of the Graduate School of Biomedical Engineering. Graduate subjects from the Masters programs can be taken in the Graduate Diploma program subject to the approval of the course coordinators.
Course Descriptions

Descriptions of all courses are presented in alphanumeric order within organisational units. For academic advice regarding a particular course consult with the contact for the course as listed. A guide to abbreviations and prefixes is included in the chapter Handbook Guide, appearing earlier in this book.

BIOM1001
Professional Biomedical Studies
Staff Contact: Prof K Schindhelm
UOC3 HPW1 WKS14 S1

Provides an introduction to biomedical engineering; examines the range of professional engineering activities; highlights ethical considerations associated with clinical applications; and develops skill in oral, written and graphical communication.

BIOM5910
Thesis Part A
Staff Contact: School Office
UOC6 HPW8

For BE(Elec)/MBiomedE students only.

BIOM5911
Thesis Part B
Staff Contact: School Office
UOC6 HPW8

For BE(Elec)/MBiomedE students only.

BIOM9006
Thesis B
Staff Contact: School Office
HPW6

For BE(Mech)/MBiomedE students only. To be taken in the year of completion of the BE(Mech)/MBiomedE degree course. A thesis is to be submitted at the end of the 14th week of the final session which reports the work of both BIOM5000 Thesis A and BIOM5001 Thesis B.

BIOM9010
Biomedical Engineering Practice
Staff Contact: Prof K Schindhelm
UOC3 HPW2 WKS14 S2

Note/s: Compulsory for all students.

Introduction to clinical situations in hospitals. Presentation of guest lectures by eminent people working in this field. Lecture topics include cardiology, neurology, orthopaedics, rehabilitation. Visits to various biomedical engineering units.

BIOM9012
Biomedical Statistics
Staff Contact: Dr R Odell
UOC3 HPW3 WKS14 S2


BIOM9027
Medical Imaging
Staff Contact: A/Prof CD Bertram
UOC3 HPW4 WKS14 S2

Fundamentals of producing a medical image, image collection techniques, image reconstruction algorithms. Detailed examination of the four main areas of medical imaging: Nuclear Medicine and Positron Emission Tomography, Ultrasound, Diagnostic Radiology, Magnetic Resonance. Clinical application of each area.

BIOM9040
Analogue Electronics for Biomedical Engineers
Staff Contact: Dr N Lovell
UOC3 HPW3 WKS14 S1

Note/s: For students with no electronics background.

Basic theory of passive components, simple network analysis, small signal amplifiers, feedback and oscillators, operational amplifiers and their uses, analogue integrated circuits. Safety requirements for medical instruments, circuit diagram analysis and component identification. Laboratory work involves both design and construction of analogue circuits.

BIOM9050
Microprocessors and Circuit Design for Biomedical Engineers
Staff Contact: A/Prof BK Milthorpe
UOC3 HPW4 WKS14 S2

Prerequisite/s: BIOM901, BIOM9040 or equivalents.

Note/s: Students should NOT have a digital electronics background.

Examination of the fundamental digital and analogue circuits commonly found in medical applications. Emphasis is given to project-oriented practical experience involving aspects of biological signal acquisition by microcomputers. Fundamentals of microprocessor hardware and software.

BIOM9060
Biomedical Systems Analysis
Staff Contact: Dr R Odell
UOC6 HPW3 WKS14 S1

Corequisite/s: BIOM901 or equivalent

Note/s: Mathematics background required.

Analysis of compartmental systems in biology and medicine. Applications include pharmacology, physiology and nuclear medicine. Topics include the mathematics of linear compartmental systems, non-linear systems, tracer methods, parameter estimation by fitting models to data, the optimum design of experiments, and methods of control.

BIOM9101
Mathematical Modelling for Biomedical Engineers
Staff Contact: Dr R Odell
UOC6 HPW4 WKS14 S1

Note/s: Compulsory for Strand B students. This subject is also for students with 1 year university maths or less. Model formulation and validation. Ordinary differential equations. Laplace transforms. Partial differential equations. Fourier series. Numerical methods.

BIOM9311
Mass Transfer in Medicine
Staff Contact: Dr R Odell
UOC6 HPW3 WKS14 S2


BIOM9321
Physiological Fluid Mechanics
Staff Contact: A/Prof CD Bertram
UOC6 HPW3 WKS14 S2

Fluid mechanics of unsteady flow. Fundamentals of biological fluid flow by way of the governing equations. Kinematics and dynamics, viscous and inertial flow, boundary layers, separation, physiological flows (cardiac, vascular, pulmonary, urinary, etc.) and flow in artificial organs. Emphasis on physical rather than mathematical understanding of the relevant phenomena, to allow realistic appraisal of the nature of flow in a given organ.
BIOM9332
Biocompatibility
Staff Contact: Prof K Schindhelm
UOC6 HPW3 WKS14 S2

Interaction of biological fluids and cells with foreign surfaces, in vitro tests to assess biocompatibility and thrombogenicity, current status of biocompatible materials as applied to extracorporeal systems, surgical implants and prosthetic devices.

BIOM9410
Regulatory Requirements of Biomedical Technology.
Staff Contact: A/Prof A Simmons
UOC6 HPW3 WKS14 S2

The regulatory requirements of medical devices in Australia, Japan, North America and Europe will be reviewed. Data collation and documentation methods are examined, case studies of medical device registration will be presented.

BIOM9420
Clinical Laboratory Science
Staff Contact: A/Prof BK Milthorpe
UOC3 HPW3 WKS14 S1

The technologies, tests and operation of a variety of clinical laboratories (biochemistry, haematology, immunology, histology). Engineering solutions to the automation of chemical and biochemical assays, design and development of instrumentation, limitations of automatesystems. Data recording, tracking and validation. Routes to innovation in a clinical laboratory.

BIOM9430
Electromedical Standards
Staff Contact: A/Prof AP Avolio
UOC3 HPW3 WKS14 S1


BIOM9440
Biomedical Practical Measurement
Staff Contact: Dr N Lovell
UOC3 HPW3 WKS14 S1

Hands-on practice in the use and testing of medical transducers and electromedical equipment in common use in hospitals and research laboratories to make measurements of biomedical variables of clinical significance.

BIOM9450
Clinical Information Systems
Staff Contact: Dr N Lovell
UOC3 HPW3 WKS14 S2


BIOM9501
Computing for Biomedical Engineers
Staff Contact: Dr N Lovell
UOC6 HPW3 WKS14 S1

Note/s: Highly recommended for Strand B students. This subject is for students with little or no computing experience or for those students who wish to learn about object oriented programming in a Windows environment. Algorithm design and documentation; programming in standard PASCAL and in Delphi for Windows; object oriented program design; event driven programming in a graphical environment; database structures and interfacing.

BIOM9510
Introductory Biomechanics
Staff Contact: School Office
UOC6 HPW3 WKS14 S1

The principles of the mechanics of solid bodies, force systems, kinematics and kinetics of rigid bodies, stress-strain relationships, stress analysis of simple elements application to musculoskeletal system.

BIOM9541
Mechanics of the Human Body
Staff Contact: School Office
UOC6 HPW2 WKS14

Prerequisite/s: BIOM9510 and ANAT2111

Statics and dynamics of the musculoskeletal system: mathematical modelling and computer simulation, analysis of pathological situations.

BIOM9551
Biomechanics of Physical Rehabilitation
Staff Contact: School Office
UOC6 HPW2 WKS14

Prerequisite/s: BIOM9510 or equivalent

The physical properties of materials having significance to biomedical engineering; human tissues; skin; soft tissues; bone; metals; polymers and ceramics. The effects of degradation and corrosion.

BIOM9601
Biomedical Applications of Microcomputers 1
Staff Contact: A/Prof A Avolio
UOC6 HPW3 WKS14 S1

Prerequisite/s: BIOM9040 and BIOM9050 or equivalents.

Note/s: A reasonably advanced background in microprocessors is required. Entry to course is only on interview. Microcomputer architecture; physiological data acquisition systems: input/output signals and devices; assembly language programming; interfacing to higher level languages; the numeric data coprocessor; interrupts; graphics; practical sessions on use of Debug, Assembler, familiarisation with interrupt vector table and I/O ports. Major assignment on specific biomedical application (eg. bedside ECG monitor).

BIOM9612
Medical Instrumentation
Staff Contact: A/Prof CD Bertram
UOC6 HPW5 WKS14 S2

Prerequisite/s: BIOM9040 or equivalent

A critical comparative survey of the theoretical physics and practical applications of medical transducers and electromedical equipment in common use in hospitals and research laboratories. How to choose a measurement device for a given situation. Includes laboratory practicals.

BIOM9621
Biological Signal Analysis
Staff Contact: A/Prof CD Bertram
UOC6 HPW3 WKS14 S1

Note/s: Basic electronics and mathematics background required.

Use of digital computers to extract information from biological signals. Signal processing using filtering, averaging, curve-fitting and related techniques, and analysis using model simulations, correlation, spectral analysis etc.
BIOM9701
Dynamics of the Cardiovascular System
Staff Contact: A/Prof CD Bertram
UOC6 HPW3 WKS14 S1
Note/s: Some mathematics background desirable.
Structure of the heart; organisation of the mammalian vasculature;
mechanical, electrical and metabolic aspects of cardiac pumping;
the solid and fluid mechanics of blood vessels; rheology of blood.

BIOM9913
Master Project
Staff Contact: UOC12
Projects are undertaken at the Graduate School or other relevant
institutions towards the end of the course. Topics are chosen in
collaboration with a supervisor from the Graduate School.
MBT Program

The MBT is a business program with a technological orientation. Courses in the MBT Program aim at providing professional engineers, other technical and non-technical people with world-class business education and training. The MBT Program was developed with the support of industry and the program continues a commitment to quality and relevance in tertiary education to the private and public sectors.

The program provides opportunities for students to develop the skills, knowledge and attitudes necessary to meet the challenges of the business world. Individual courses are designed around core management demands and blend mainstream business requirements with the challenges of evolving technologies.

Courses in the MBT Program can be taken by distance mode, on campus or through a combination of both. This flexible delivery assists with the demands of modern work organisation and family commitments. All of the materials necessary for the completion of the program are supplied in comprehensive individual course study guides. Some courses are accessible in electronic formats and all courses are supported by quality academic staff who are available for personal consultation.

Assessment, as far as possible, is centred on the day to day work of students and around their education and training needs of that of their organisations. UNSW academic staff are supported by external industry experts in the delivery of courses including interaction and consultation with students.

Candidates successfully completing four MBT courses with a credit average will have the option of either being awarded Graduate Certificate in Industrial Management (GradCertIndMgmt) or proceeding to the second level, the Graduate Diploma in Industrial Management course. Those successfully completing the requirements for the Graduate Diploma may be eligible to transfer to the Master of Business and Technology award course subject to approval by the Faculty of Engineering.

In some cases candidates may be granted advanced standing in courses not already taken for an award.

In order to fulfil the requirements of the program, candidates are normally expected to have a degree or substantial industry experience. The courses in the Program are full-fee paying.

Course Outlines

8616
Master of Business and Technology

MBT

To qualify for the Master of Business and Technology (MBT), a candidate must successfully complete a minimum of 72 Units of Credit (normally 12 courses of 6 Units of Credit each). However candidates admitted to the MBT with an approved degree need only complete a minimum of 60 Units of Credit (normally 10 courses of 6 Units of Credit each). The program can be completed in five sessions. The minimum time for completion is two sessions on a full time basis, however, the program must be completed within a maximum of ten sessions.

<table>
<thead>
<tr>
<th>Courses</th>
<th>Units of Credit</th>
</tr>
</thead>
<tbody>
<tr>
<td>ACCT5901</td>
<td>Accounting: A User's Perspective</td>
</tr>
<tr>
<td>ACCT5980</td>
<td>Value Based Management in a Global Economy</td>
</tr>
<tr>
<td>ACCT5981</td>
<td>Strategic Resource Management</td>
</tr>
<tr>
<td>ACCT5982</td>
<td>Managing Agile Organisations</td>
</tr>
<tr>
<td>ACCT5983</td>
<td>Managing Strategic Change</td>
</tr>
<tr>
<td>ACCT5984</td>
<td>Managing Intangible Resources</td>
</tr>
<tr>
<td>ACCT5985</td>
<td>The Innovative Organisation</td>
</tr>
<tr>
<td>BIOT7320</td>
<td>Food Biotechnology (Management)</td>
</tr>
<tr>
<td>ECON5103</td>
<td>Business Economics</td>
</tr>
<tr>
<td>FINS5511</td>
<td>Corporate Finance</td>
</tr>
<tr>
<td>GBAT9101</td>
<td>Project Management</td>
</tr>
<tr>
<td>GBAT9102</td>
<td>Management of Manufacturing Systems</td>
</tr>
</tbody>
</table>
or other courses as may be approved by the Faculty.

Courses of study leading to the award of a Master of Business and Technology provide candidates with opportunities to extend their career paths into management. A candidate in appropriate cases may be granted advanced standing for similar work already completed but not used for another award, and may be permitted to count courses from other programs up to a limit not exceeding one third of the MBT Program. Each course is based on open learning principles and a 6 Unit of Credit rating is expected to involve the candidate in a total work load equivalent to some 8-10 hours per week of study for a 14 week session.

5457
Graduate Diploma in Industrial Management
GradDiplIndMgmt

Candidates must complete a minimum program totalling 48 Units of Credit points taken from MBT courses or such other courses as may be approved by the Faculty. Those successfully completing all 48 Units of Credit may elect to graduate with the Graduate Diploma in Industrial Management or if they wish to proceed to the Masters. For further information, contact the Director, Graduate Programs in Business and Technology.

The Graduate Diploma in Industrial Management is based on open learning principles. It can normally be completed in a minimum of four academic sessions. The maximum period of candidature is six academic sessions. In special circumstances extensions may be granted.

The Graduate Certificate in Industrial Management is based on open learning principles. It can normally be completed in a minimum of two academic sessions. The maximum period of candidature is four academic sessions. In special circumstances extensions may be granted.

The courses in the MBT, GradDiplIndMgmt and the GradCertIndMgmt are full-fee paying and may be undertaken by distance learning or by face to face learning.

Course Descriptions

Descriptions of all courses are presented in an alphanumerical order within organisational units. For further details and academic advice regarding the following courses, consult with the contact for the course as listed. A guide to abbreviations and prefixes is included in the chapter "Handbook Guide", appearing earlier in this book.

ACCT5901
Accounting:A User Perspective
Staff Contact: School Office
UOC6 HPW1.5 WKS14 S1 S2

This course is primarily for the users rather than the preparers of accounting information. The focus is on the understanding and the use of accounting information; the concept of adding value to the business rather than emphasizing financial control. The new Management Accountant is strategic, proactive, customer focused, team based and change oriented. The link between strategy, resource allocation and change is highlighted to ensure the effective use of an organisation's resources in creating value. The course aims to introduce strategic resource management as a new way of thinking about organisational functioning, and develop an understanding of the key drivers of value in organisations from the perspectives of stakeholders and customers.

ACCT5981
Strategic Resource Management
Staff Contact: ACMAD (02) 9385 5913
UOC6 HPW WKS14 S1 S2 (Distance)

This course will introduce you to emergent thinking on the role of the management accountant. The focus is on adding value to the business rather than emphasising financial control. The new Management Accountant is strategic, proactive, customer focused, team based and change oriented. The link between strategy, resource allocation and change is highlighted to ensure effective use of an organisation's resources in creating value. The course aims to introduce strategic resource management as a new way of thinking about organisational functioning, and develop an understanding of the key drivers of value in organisations from the perspectives of stakeholders and customers.

ACCT5983
Managing Strategic Change
Staff Contact: ACMAD (02) 9385 5913
UOC6 HPW WKS14 S1 S2 (Distance)

Managing strategic change offers a perspective from state-of-the-art international strategic theory and practice. A vital part of the management accountant's new role in organisations is to act as creators, analysers and communicators of information in strategy formulation processes. Management accountants therefore need to be able to support the strategic re-positioning of their organisations through the use of appropriate investment strategies, participation in team based processes and the application of performance measurement techniques. Management accountants need the skills to become players in the strategy process.

ACCT5985
The Innovative Organisation
Staff Contact: ACMAD (02) 9385 5913
UOC6 HPW WKS14 S1

The course introduces emergent types of organisation structure and process which are designed to foster innovation, organisational learning and inter-organisational networks and alliances. It will highlight the cultural, capability and behavioural issues involved in working and managing within these innovative organisational forms.

GBAT7230
Food Biotechnology (Management)
Staff Contact: Graduate Programs in Business and Technology
Coordinator: Prof P Rogers
UOC6 HPW1.5 WKS14 S1 (Distance)

The course is designed to develop management skills related to biotechnology-based innovations in the food industry. It provides an overview and analysis of the Australian and international food industries as well as covering the principles of economic feasibility analysis for new opportunities and strategies for effective R&D, marketing and commercialisation to exploit these opportunities. Intellectual property and patenting regulatory aspects (novel foods, applications of gene technology in foods) are also covered as well as a comparative study of food standards in Australia and internationally. A series of case studies on new food biotechnology products and processes is designed to integrate the various concepts developed in the course.

GBAT9101
Project Management
Staff Contact: Graduate Programs in Business and Technology.
Coordinator: Prof H Kaebernick
UOC6 HPW1.5 WKS14 S1 S2

Project Management involves the overall planning, control and coordination of a project. It is the process by which the responsibility for all phases is combined within one multi-disciplinary function. This course introduces you to the project management skills needed during the lifetime of a project by working through a chronological model.
GBAT9102
Management of Manufacturing Systems
Staff Contact: Graduate Programs in Business and Technology.
Coordinator: A/Prof R Kerr
UC6 HPW1.5 WKS14 S2

Presents an integrated and coherent account of new production management philosophies to give you a sound basis in the modern principles and techniques of the manufacturing industry. There is strong emphasis on strategic perspectives of manufacturing, the relationship between manufacturing and business strategies, and the implications of a given manufacturing strategy for detailed manufacturing management decisions, plans, policies and performance measures.

GBAT9103
Environmental Management
Staff Contact: Graduate Programs in Business and Technology.
Coordinator: A/Prof R Harding
UC6 HPW1.5 WKS14 S2

Gives you an overview of the range of environment issues facing our community. By understanding the big picture you will be able to make sound economic decisions without losing your commitment to a sustainable environment. The more specific issues and control strategies discussed will give you new insights into environmental control techniques and methods for handling environmental problems, ranging from legal aspects to quantitative risk assessment.

GBAT9104
Management of Innovation and Technical Change
Staff Contact: Graduate Programs in Business and Technology.
Coordinator: A/Prof D Hull
UC6 HPW1.5 WKS14 S1 S2

The world in which we live and the organisations in which we work are now best viewed as systems in which everything, everywhere, truly affects everything else. This course provides you with the opportunity of learning some new tools and some new ways of thinking that are better suited to addressing the complex problems and opportunities inherent in our organisations today.

GBAT9105
Risk Management
Staff Contact: Graduate Programs in Business and Technology.
Coordinator: Prof J Cross
UC6 HPW1.5 WKS14 S1 S2

Whereas at one time the different risks faced by an organisation were managed by separate departments with few linkages, organisations are increasingly moving towards integrated risk management following the establishment of AS/NZS4360 "Risk Management". This course discusses the risk management process which can be applied to any type of risk, technical or financial. Tools and techniques for identifying and assessing risks are discussed with a particular focus on the types of risks which need to be managed in a technical context. Students apply the steps of the risk management process to a case study of their own choosing relevant to the risks that they need to manage. Project management involves the overall planning, control and coordination of a project. It is the process by which the responsibility for all phases is combined within one multi-disciplinary function. This course introduces you to the project management skills needed during the lifetime of a project by working through a chronological model.

GBAT9106
Information Systems Management
Staff Contact: Graduate Programs in Business and Technology.
Coordinator: A/Prof B Edmundson
UC6 HPW1.5 WKS14 S2

Addresses the need for information management, covering: Organisations and implementation of software engineering and technological projects; uses and abuses of information technology; traditional and future ways of acquiring, generating, preparing, organising and disseminating information; analysis, design implementation (software and hardware).

GBAT9107
Maintenance Management
Staff Contact: Graduate Programs in Business and Technology.
Coordinator: Dr R Platfoot
UC6 HPW1.5 WKS14 S1 (Distance)

Covers the following topics: maintenance policies and strategies; cost and productivity; equipment failure and reliability; repair and damage control; inspection and preventive maintenance programs; monitoring and measurement; failure characteristics of plant and equipment; systems engineering approaches; optimum decision making; the introduction of change to the workplace and risk management.

GBAT9109
Energy Management
Staff Contact: Graduate Programs in Business and Technology.
Coordinator: To be advised
UC6 HPW1.5 WKS14 S2 (Distance)

Gives you an understanding of energy flows in the community, the choices of energy forms available now and possible in the future, and how to manage the selection and utilisation of the various energy forms in industry and commerce.

GBAT9110
Strategic People Management
Staff Contact: Graduate Programs in Business and Technology.
Coordinator: Dr D Lowry
UC6 HPW1.5 WKS14 S1 S2

This course examines the ways in which organisations seek to manage their employees. It explores various facets of strategic human resource management practice, and attempts to locate the management of people at work within various theoretical, philosophical, historical and regulatory contexts. This course is targeted at generalist managers who manage people within a context of new and changing HR practices. By learning about such contemporary HR issues, managers will be better equipped to meet the challenge of managing people in a dynamic environment. A broad aim of this course is to encourage learners to critically evaluate assumptions and practical implications of different approaches to the management of human resources. In particular, the course examines the implications of various forms of workplace reform which have emerged over the last decade or so. Workplace strategies such as downsizing, work intensification, and casualisation, amidst wider strategies of institutional deregulation, have had effects on individuals and communities. This course thus considers the implications of such strategies at the individual, organisational and societal levels.

GBAT9112
Managing Occupational Health and Safety
Staff Contact: Graduate Programs in Business and Technology.
Coordinator: A/Prof J Toohy
UC6 HPW1.5 WKS14 S2

Workplace injury involves organisations in insurable costs (workers compensation premium) and uninsured costs (productivity losses, low morale, reputation damage, equipment losses and downtime). This course concentrates on the prevention of workplace injury and associated costs and losses through the application of effective management systems. Industry case studies are used as are analysis and application of management techniques.
GBAT9113
Strategic Management of Business and Technology
Staff Contact: Graduate Programs in Business and Technology.
Coordinator: Dr P Gibson
UOCS HPW1.5 WKS14 S1 S2
This course opens with an examination of competitive posture, market structure, key successfactors, competitive advantage, generic strategies, strategic implementation of technology. It goes on to cover strategic business units, strategy, strategy documentation, strategic choice and risk. It looks at analytical approaches to strategy development and strategic design principles, and the classic approaches of Machiavelli, Sun Tzu, Clausewitz and their relevance to business strategy. Other issues include: Diversification, corporatisation of publicutilities, strategic alliances, mergers and acquisitions. Implementation of strategy. Organisation, centralisation and devolution options and process re-engineering. Taught largely by case study, syndicate work and debate.

GBAT9114
Marketing for Technical Managers
Staff Contact: Graduate Programs in Business and Technology.
Coordinator: M Caldwell
UOCS HPW1.5 WKS14 S1 S2
Introduction to marketing - definitions of marketing and the customer emphasis; marketing planning, its role and purpose; the environment and how to monitor it; market segmentation - what, why and how; customer behaviour; organisational marketing and behaviour product design; product pricing; product place; product promotion; other marketing applications; marketing strategy.

GBAT9115
Information Technology for Managers
Staff Contact: Graduate Programs in Business and Technology.
Coordinator: G Dick
UOCS HPW1.5 WKS14 S1 S2
Prerequisite/s: Students must have personal access to a PC
This course has the principle objective of giving line managers an understanding of how information technology might be able to assist them in their day to day tasks and the capabilities and drawbacks of that technology, including changes to the workplace. In addition the course will ensure that knowledge/information workers take away a range of essential skills including use of computers, decision support tools, database query languages, presentation tasks and tools and an understanding of the Internet covering some of the opportunities and problems it presents.

Course Descriptions
The courses present in this prospectus are representative of popular selections. The availability of a particular course is subject to review each session. The publication of particular course details does not necessarily indicate that the course will be offered. Intending students are advised to check with the MTM Program Coordinator prior to enrolment.

Faculty of Commerce and Economics

School of Accounting
ACCT5901
Accounting: A User Perspective
Staff Contact: School Office
UOCS HPW3 WKS14 S1
Notes: Instead of ACCT5901, students may enrol in ACCT5930, which is a more technical introductory accounting subject.
Students who wish to complete the special program in Professional Accounting or who wish to study more advanced financial accounting subjects, such as ACCT5970, should start with ACCT5930 rather than ACCT5901
This subject is primarily for the users rather than the preparers of accounting information. The focus is on the understanding and the use of accounting information; the composition and meaning of the financial statements prepared for resource providers in accordance with the law and contractual arrangements; and accounting systems and reports designed for the decision makers within an organisation.

ACCT5917
Strategic Management: Systems and Processes
Staff Contact: School Office
UOCS HPW3 WKS14 S1
This subject explores the process and practice of strategic management - the constitution of an organisation's competitive positioning in its environment. Topics to be covered include: strategic thinking and analysis; the formulation and choice of strategic alternatives; managing extended strategic change; and the embedding of organisation strategy in everyday activities. These topics are explored through a critical examination of relevant literatures, documented case studies and contemporary business practices.
ACCT5930
Financial Accounting
Staff Contact: School Office
UOC6 HPW3 WKS14 S1 and S2
Note/s: Students may not enrol in ACCT5901 and ACCT5930 as both are introductory accounting courses. While ACCT5901 has a strong focus on the use of financial reports, ACCT5930 is more concerned with the technical aspects of financial report preparation. Although ACCT5901 is the normal core accounting unit, students are allowed to substitute ACCT5930 for it.
This course examines the fundamentals of financial accounting for entities of simple organisational design; financial recording processes, systems design and internal control; preparation of general purpose statements of financial position, operating performance and cash flow statements; responsibilities in financial reporting; financial reporting constraints; recognition and measurement of specific financial statement elements; and analysis and interpretation of financial reports.

ACCT5931
Strategic Financial and Resource Management
Staff Contact: School Office
UOC6 HPW3 WKS14 S1
Prerequisite/s: ACCT5901 or ACCT5930 equivalent
Note/s: Excluded students who have completed ACCT3583 or ACCT3593 in the last three years
This subject will introduce emergent thinking about the interfaces between financial and business performance, with a focus on adding value to the business rather than emphasising financial control. The link between strategy, resourcing and change is highlighted, in focusing on the effective use of an organisation’s financial and other resources in creating value for customers and shareholders. The subject aims to introduces strategic financial management as an integrated way of thinking about the key drivers of value in organisations.

ACCT5984
Managing Intangible Resources
Staff Contact: Graduate Programs in Business and Technology
Coordinator: Prof B Birkett
UOC8 HPW1.5 S1
The ever-widening gap between the market value of firms and the capitalisation of their assets in the balance sheet highlights the value that investors are prepared to attribute to the intangible resources of many organisations (such as financial service, software development and e-commerce companies). The value generating potential of such organisations is attributed to resources, and competencies in managing those resources, that the traditional accounting system is both unable and unwilling to represent in explicit financial terms. This course aims to identify these intangible resources and to examine their role in achieving superior financial performance. Illustrative topics would include: customer relationships, supplier relationships and advances in financial reporting which attempt to capture and represent the intangible resources of an organisation, for example, triple line reporting, the Scandia Navigator system and other recent attempts of a social accounting. This course is based on the premise that long term sustainable value creation is achieved only from collaborative organisational practices in which the contribution of all stakeholders is recognised and rewarded.

ACCT5980
Value Based Management In a Global Economy
Staff Contact: Graduate Programs in Business and Technology
Coordinator: A/Prof P Luckett
UOC6 HPW1.5 S2
This course examines the design and use of contemporary management technologies that have been developed to support value creation in organisations. Topics include design and implementation of strategic cost management systems, advanced cost analysis and advanced cost estimation techniques; assessing and evaluation customer and segment profitability; revenue analysis and capacity management; and target costing and life-cycle costing. Cases are used extensively in the subject and particular focus is placed on the role of the technologies in multi-national organisations.

School of Economics
ECON5108
Public Finance
Staff Contact: School Office
UOC6 HPW3 WKS14 S2
Prerequisite/s or corequisite/s: ECON5103
Public expenditure and taxation, budgetary policy and federal-state financial relations; partial and general equilibrium analysis of taxation; incidence and resource allocation effects of income taxes, wealth taxes and outlay taxes.

ECON5103
Business Economics
Staff Contact: School Office
UOC6 HPW1.5 S2
The overall objective for students is to understand how the economic way of thinking can add value and control risk in business. Students will learn the main terms that are routinely used in business stories and government reports on the economy, along with the interpretation of business and economic statistics. How government decisions affect business will be explained, along with the facts and theories needed in order to engage with confidence in the national economic debate.

ECON5118
Environmental Economics
Staff Contact: School Office
UOC6 HPW3 WKS14 S1 or S2
This course considers the main elements of environmental economics and cost benefit analysis as it relates to the assessment of environmental issues. Topics include: pollution and pollution policy; environmental cost-benefit analysis and economic methods for measuring costs and benefits; species extinction and irreversibility; environmental ethics and discounting; the environment and developing countries; and the sustainable economy.

ECON5203
Statistics for Business
Staff Contact: School Office
UOC6 HPW3 WKS14 S1 or S2
The aim of this subject is to provide students with the appropriate statistical tools for application to applied problems and current research in business. Topics will include: quantitative analysis of statistical data, sampling distributions, statistical estimation; hypothesis testing; multiple regression; introduction to time series analysis; forecasting; index numbers. This subject will emphasise practical aspects of model building.

School of Banking and Finance
FINSS511
Corporate Finance
Staff Contact: School Office
Coordinator: Prof T Pham
UOC6 HPW1.5 S2
Corporate Finance is an introductory course in financial management. It stresses the modern fundamentals of corporate financial decision making with special reference to investment, financing and dividend distribution. While building upon introductory courses in accounting, economics and quantitative analysis the course develops distinctive conceptual frameworks and specialised tools for solving real world financial problems at both the individual and corporate level.

FINSS512
Financial Markets and Institutions
Staff Contact: School Office
HPW3
Corequisite/s: FINSS513
This subject serves as one of the introductory subjects to the study of finance. It focuses on the major financial markets, including the
equity, money, bond, exchange rate and derivatives markets. Students will learn about the basics of financial instruments in these markets, such as bank bills, treasury bonds, futures and options. In addition, students are exposed to the tools of analyses and the roles and innovations of major financial institutions. These include the banks and non-banks, such as finance companies, building societies and credit unions, life and insurance companies as well as funds management companies.

**FINS5513**
Security Valuation and Portfolio Selection
*Staff Contact:* School Office
*Prerequisite/s: ECON5103 and ECON5203*

The aim of this subject is twofold: (i) to introduce students to theoretical building blocks in the theory of finance; and (ii) to illustrate these by means of a combination of tutorial problems and case studies. Topics include: investment decisions under certainty; investment decisions under uncertainty (the portfolio selection problem); capital asset pricing model and arbitrage pricing theory; rudiments of theory and evidence; fundamentals of bond valuation; introduction to duration and the term structure of interest rates; valuation of equity shares; market efficiency: fads, bubbles, martingales.

**FINS5514**
Capital Budgeting and Financial Decisions
*Staff Contact:* School Office
*UOC6 HPW3 WKS14 S1 or S2*
*Prerequisite/s: ECON5103, ECON5203 and FINS5513 or corequisite*

This course focuses on various aspects of corporate decision making. Topics include: Objectives of the corporation. Investment criteria under certainty and uncertainty. Quantitative techniques to assist managerial judgement including capital budgeting; modelling and management of risk (including decision-tree analysis, diversification, sensitivity analysis and simulation). Capital structure propositions; the impact of taxation and bankruptcy costs; information asymmetry and signalling approaches; dividend policy and imputation. Particular references to case studies and computer applications.

**FINS5522**
Asian Financial Market Analysis
*Staff Contact:* School Office
*UOC6 HPW3 WKS14 S2*
*Prerequisite/s: FINS5513*

This course provides an in-depth analysis of the major financial markets in Asia. It aims at applying investment and international finance theory to the context of diverse Asian markets. After a review of the institutional structure of the markets and their role in economic development, the subject will examine equity market relationships, country risk analysis, portfolio management and hedging across Asian markets, syndication and off-shore banking and other contemporary issues.

**School of International Business**

**IBUS5601**
Global Business and the Multinational Enterprise
*Staff Contact:* School Office
*UOC6 HPW3 WKS14 S1 or S2*
*Prerequisite/s: ACC5901, ECON5103 and ECON5203*

The globalisation of business and the challenge of dynamic political, economic, social and technological environments. The impact of cultural differences on international business transactions and international management. The evolution and development of the multinational enterprise and alternative contractual modes including exporting, licensing, franchising and manufacturing. International acquisitions, joint ventures and strategic alliances. Theories of the internationalisation process and foreign direct investment by multinational enterprises. The relationship of multinationals with governments and issues of political risk.

**IBUS5602**
International Business and Cross-Cultural Management
*Staff Contact:* School Office
*UOC6 HPW3 WKS14 S1*
*Prerequisite/s: IBUS5601*
*Corequisite/s: IBUS5601*


**IBUS5603**
Global Business Strategy and Management
*Staff Contact:* School Office
*UOC6 HPW3 WKS14 S2*
*Prerequisite/s: IBUS5601*
*Corequisite/s: IBUS5601*


**IBUS5604**
Asia-Pacific Business and Management
*Staff Contact:* School Office
*UOC6 HPW3 WKS14 S2*
*Prerequisite/s: IBUS5601*
*Corequisite/s: IBUS5601*


**IBUS5681**
Business Communication
*Staff Contact:* School Office
*UOC6 HPW3 WKS14 S1 or S2*

Managing communication is an essential skill required in business and professional contexts. This course raises awareness of effective business communication skills and strategies, develops students capacity to manage communication processes, and enhances communication competence. It examines different models of communication, and explores topics such as language and communication, persuasion, reasoning and argument in communication, non-verbal communication, interpersonal communication, intercultural communication, communicating in small groups and teams, communication for the workplace, and written and spoken communication. Advanced topics in organisational communication, globalisation and intercultural communication competence, business negotiation, and public relations are also included.
School of Information Systems

INFS5848 Information Systems Project Management
Staff Contact: School Office
UOC6 HPW3 WKS14 S1
Prerequisite/s: INFS5988

An introduction to the central concepts and issues of project management and the practical benefits of project planning and management together with resource management. Practical sessions in project planning and the use of a computer based management tool. Additional topics include customer focus, lifecycle customisation, work packages, progress monitoring, risk evaluation, quality management, people skills, and negotiation skills. Case studies of and examples from software development projects will be used as illustrations.

INFS5957 Information and Decision Technology
Staff Contact: School Office
UOC6 HPW3 WKS14 S1

The role of information and models in managerial decision making and prediction. The role of information systems in decision making. Assessing the value of information systems and the contribution of information in decision making under uncertainty. The role of information in managerial prediction and forecasting. The development of computer based models to support tactical management.

INFS5988 Business Information Systems
Staff Contact: School Office
UOC6 HPW3 WKS14 S2

This subject aims to provide an introduction to the use and management of information systems in business. Students will have the opportunity to develop their knowledge and understanding of the role of information systems in organisations, study relevant and current topics to the area, and examine the components that interact within information systems. This subject also encourages students to consider ethical practices related to the development and use of information systems.

INFS5992 Data Management
Staff Contact: School Office
UOC6 HPW3 WKS14 S2

A review of data management principles including both simple and complex file designs, and the concept of database management systems. Alternative database management system architectures, including network hierarchical and relational approaches. Database query systems, including relational algebra. Case studies and assignments embodying these principles.

School of Industrial Relations and Organisational Behaviour

IROB5700 Management, Work and Organisation
Staff Contact: School Office
UOC6 HPW3 WKS14 S1 S2

Provides a multi-disciplinary introduction to the concepts, processes, practices, issues and debates associated with the management of people in paid employment and the organisational, institutional and market place contexts within which employment relations are played out. Topics covered include the changing nature of work and work organisations, the development of labour management theory and practice, the meaning and purpose of the Human Resource Management approach, current trends and debates in management thinking and methods, the industrial relations context, the role of the state, unions and management strategy, workplace conflict, the nature of managerial work, leadership, gender and work, organisational culture, and employee motivation, remuneration and performance management.

IROB5920 Men and Women In Organisations
Staff Contact: Dr L Taka
UOC6 HPW3 WKS14 S2
Prerequisite/s: IROB5700 or IROB5900
Corequisite/s: IROB5700 or IROB5900

Presents a multi-disciplinary overview of the issues and problems pertaining to gender relations in organisations. It evaluates a range of concepts and methods necessary for understanding the processes and structures responsible for the current position of men and women as employees and managers in both the public and private sectors. Topics covered from the perspective of gender relations include: labour market segmentation, industrial relations theory and practice, the role of the state, organisational power and politics, Equal Employment Opportunities and the functioning of the merit principle and the use of post-modernist theory for understanding the operation of human resource management and organisational culture.

IROB5949 International Human Resource Management
Staff Contact: School Office
UOC6 HPW3 WKS14 S1 S2
Prerequisite/s or Corequisite/s: IROB5700 or IBUS5601

Examines the impact of culture on the process of managing human resources in multinational or global corporations. Topics examined include the conceptual and methodological challenges in international HRM research; the role of culture in shaping managerial perceptions and actions; HRM systems as cultural artefacts; conflict between indigenous HRM frameworks; and the problematic of transferring HRM systems across cultural boundaries. Issues such as expatriation versus local management, selecting and preparing for international assignments, intercultural competence, cultural adaptation at the individual and system level, the management of host country nationals and joint venture partnerships, and the influence of globalisation on future HRM practice are also examined. The subject also examines the global uniformity/differentiation policy debate and its implications for global organisations.

School of Business Law and Taxation

LEGT5511 Legal Foundations of Business
Staff Contact: School Office
UOC6 HPW3 WKS14 S1 or S2

Law is an increasingly significant factor in business. In any business decision fundamental legal questions may arise about the potential liabilities of the parties, the rights that the parties have and how the law of contract and torts, the law relating to specialised commercial transactions, the regulation of restrictive trade practices and sales promotion, and intellectual property.

LEGT5561 Legal Aspects of Finance
Staff Contact: School Office
UOC6 HPW3 WKS14 S1

The size and complexity of modern capital markets requires a comprehensive understanding of financial legal concepts involved. Topics include commercial structures including companies, joint ventures, partnerships and trusts; procedures for equity and debt financing of entrepreneurial schemes with special reference to both law and practice; the regulation of the securities market; corporate restructuring and take-overs, mergers and reconstructions; the law of company charges; aspects of the taxation of commercial financing.
LEGT5562
Business Law in a Global Economy
Staff Contact: School Office
UOC6 HPW3 WKS14 S2

Developments in technology, telecommunication and deregulation which have taken place in the latter part of this century have led to the creation of a global economy. This subject addresses the legal environment of this economy and aspects of its operation. Topics include GATT and the World Trade Organisation; the laws and practices relating to international sales and financing agreements; arrangements for conducting international business, including franchising, licensing, joint ventures and technology transfer; the resolution of international disputes and the protection of intellectual property.

LEGT5563
Technology, Information and the Law
Staff Contact: School Office
UOC6 HPW3 WKS14 S1

The rapidly evolving developments in computers and information technology pose particular challenges for society and the law. This course examines those areas of law which have a major regulatory impact on the hardware, software, and networked communications which make up information technology. Topics include the intellectual property regime (in particular copyright, patents and confidential information); technology crimes; tortious and contractual issues in relation to the supply of goods and services; data protection and privacy; regulation of the Internet; and other current issues.

LEGT9101
Business Law & Technology
Staff Contact: Graduate Programs in Business and Technology
Coordinator: Prof A Terry
UOC6 HPW1.5 WKS14 S2

Business Law and Technology deals with the relationship between law and commerce with a particular focus on the technology sector. This relationship has always been close and intimate but the massive increase in scope, volume and complexity of the law regulating business over recent years demands that all who operate in commerce understand and appreciate the significance of the legal environment which governs commerce.

Business Law and Technology provides an overview of the legal environment for, and the legal regulation of, business in Australia. It introduces the Australian legal system, alternative forms of business organisation and the legal framework of business regulation, and examines areas of law of particular relevance to business including business contracts and torts, restrictive trade practices and fair-trading, the protection and exploitation of intellectual property and technology contracts.

School of Marketing

HOSP5901
Elements of Tourism and Hospitality
Corequisite/s: MARK5902

The history of tourism and hospitality in Australia and overseas. The commercial context of the industry: policy, planning, and legal aspects. The operational context of the industry: service, managing people, and facilities. Marketing hospitality and tourism. The characteristic of major industry segments and their global competitive positioning. These issues are explored using cases and workshops. This course assumes no prior study in commerce.

HOSP5903
Hospitality Service Management
Prerequisite/s: MARK5902 and HOSP5901
Note/s: Excluded MARK5920

The world is fast becoming a service industry. The largest sector of service is the hospitality and tourism industry which employs over 10% of the world's workforce. This course will focus on principles and practices of successful service companies. Reference will also be made to leading service providers in banking, retailing and other service industries in the hospitality and tourism industries. Service organisations have distinct needs and problems with respect to management and marketing. Therefore, services marketing activities cover many management issues which will be canvassed in this course.

MARK5902
Elements of Marketing
Staff Contact: School Office
UOC6 HPW3 WKS14 S1 or S2

Prerequisite or corequisite: one core unit. The course is a blend of theory and practical application. The central theme running throughout the teaching program is that marketing is not a fragmented assortment of actions and functions taking place among disconnected institutions operating in isolation. Rather it is a total system of business action. The task of managing a marketing operation involves strategic and tactical decision making. It also demands an understanding of the structure of the marketing system, the various institutions that make up that system, and the role of each institutions that make up that system, and the role of each institution within the system.

MARK5911
Consumer Analysis
Prerequisite/s or Corequisite/s: MARK5902

Major concepts and theories from the social and behavioural sciences provide a background to the study of why people buy. Behavioural topics include perception, attitude and decision-making processes, and the psychology of purchases. Social science topics include values and lifestyles, mass communication and advertising, and buyer-seller relationships.

MARK5917
Marketing in Asia
Prerequisite/s or Corequisite/s: MARK5902

This course examines conceptual and descriptive aspects of marketing management in East Asian countries and the challenges that global firms face in operating in the region. A comparative approach that acknowledges both similarities and differences among East Asian countries is adopted. Discussion will focus in particular on Australia's important Asian commercial and trading partners: Japan, South Korea, Indonesia and China. Guest lecturers and case studies will be used to highlight key points.

ECN5203
Statistics for Business
Staff Contact: School Office
UOC6 HPW3 WKS14

The aim of this subject is to provide students with the appropriate statistical tools for application to applied problems and current research in business. Topics will include: quantitative analysis of statistical data, sampling distributions, statistical estimation; hypothesis testing; multiple regression; introduction to time series analysis; forecasting; index numbers.

This subject will emphasise practical aspects of model building.
Faculty of Engineering

School of Chemical Engineering and Industrial Chemistry

CEIC5310 Computing Studies in the Process Industries
**Staff Contact:** Dr T Pham
**UOC6 HPW3 S1 or S2**

CEIC5313 Environmental Technologies
**Staff Contact:** Prof A Fane
**UOC6 HPW3 S1 or S2**
This subject deals with conventional and advanced separation processes for pollution control, effluent treatment and waste minimisation in the Process Industries. Topic areas covered will be selected from: Gravity Separations, Filtration Processes, Sorption Processes, Extraction Processes, Membrane Technology, BiologicalProcesses, Design, Control and Monitoring, Clean Production Technologies.

CEIC5330 Process Engineering in the Petroleum Industry
**Staff Contact:** Dr A Adesina
**UOC12 HPW6 S1 or S2**
1. Origin and nature of crude oil overview of the Petroleum refinery.

CEIC5333 Experimental Design in the Process Industries
**Staff Contact:** A/Prof R Chaplin
**UOC6**
This course is structured to provide a sound introduction to the fundamentals of experimental design and its impact on productivity and quality in research development and manufacturing processes. Topics covered will include: basic statistical hypothesis testing, quality control, control charts, regression analysis, factorial designs, fractional factorial designs, response designs, linear and curve-linear models, non-linear models, Taguchi concepts, optimisation, response surface concepts.

CEIC5337 Particle Characterisation in the Process Industries
**Staff Contact:** Dr R Amal
**UOC6 HPW3 S1 or S2**
This course will cover theoretical principles and practical aspects of methods of characterising fine particulate materials. Characteristics investigated include: particle size and size distribution, density, porosity, surface area, zeta potential and electrostatic charge, morphology and structure. Techniques covered include: sedimentation, optical techniques, electrozone sensing, image analysis, time of flight analysis, inertial impactation, mercury porosimetry, gas adsorption, helium pycnometry, morphological analysis. Practical examples of industrial applications will be given together with laboratory demonstrations using all the techniques.

School of Civil and Environmental Engineering

CVEN9405 Urban Transport Planning Practice
**Staff Contact:** Dr V Vandebona
**UOC6 HPW3 WKS14 SS**

CVEN9423 Transport Environmental Analysis, Assessment and Control
**Staff Contact:** Dr V Vandebona
**UOC6 HPW3 WKS14 S2**

CVEN9711 Management of Professional Services
**Staff Contact:** Prof D G Carmichael
**UOC6 HPW3 WKS14 SS**
The management of the delivery of professional engineering and technology services which are predominantly knowledge-based, such as designs, reports and investigations. The client relationship. Planning and control of work, staff and resources. Marketing including the promoting and pricing of services. Contracts for the provision of services. The design process and organisation and team management. Financial management of the engineering/technology firm.

CVEN9724 Construction Engineering and Technology
**Staff Contact:** Mr J B O Brien
**UOC6 HPW3 WKS14 SS**
Structure of the construction industry; construction engineering theory, construction processes: methods engineering, automation and mechanisation concepts; modelling, design and analysis; problem solving; task analysis; adaptive systems and control concepts; experimental studies of construction processes. Construction technologies; construction robotics, applications of expert and knowledge based systems. Case studies.

CVEN9730 International Project Management
**Staff Contact:** Prof D G Carmichael
**UOC6 HPW3 WKS14 S2**

CVEN9824 Advanced Materials Technology
**Staff Contact:** Dr N Gowripalan
**UOC6 HPW3 WKS14 S2**
Concrete: high performance concrete; new methods of workability measurement; methods of placing-pumping, spraying; mix design methods; special concrete mixes. Fibre Reinforced Plastics (FRP): advanced polymer composites for structures; polymer matrix materials; fibres used properties of polymers; properties of fibres; structural applications; durability of FRP.
School of Computer Science and Engineering

COMP9020
Foundations of Computer Science
Staff Contact: A/Prof A Ramer
UOC6 HPW3 WK514 S1 or S2

COMP9021
Principles of Programming
Staff Contact: Prof P Compton
UOC6 HPW3 WK514 S1 or S2
Corequisite/s: COMP9020
Note/s: Excluded COMP1811, COMP1021.
This is a first programming subject. It provides an introduction to procedural programming in an object-oriented language (Java). Algorithmic processes: state, sequence, selection, iteration/recursion. Data modelling: atomic types, arrays, objects, inheritance. Introduction to fundamental data structures and algorithm analysis. A brief introduction to Unix is also included. Lab: programming exercises and assignments.

COMP9311
Database Systems
Staff Contact: Dr X. Lin
UOC6 HPW3 WK514 S1 or S2
Corequisite/s: COMP9021
A first subject on database management systems. Relational and ER data models; principles of database design; high level database languages such as relational algebra and SQL; procedural languages for interacting with databases; query processing; transaction management and a brief introduction to various advanced databases.

COMP9511
Human-Computer Interaction
Staff Contact: Dr G Mann
UOC6 HPW3 WK514 S2
Provides an introduction to user-system interactions, both analysis and design. The approach is cognitive, focusing on matching user goals with computer technologies. Topics: the human information processing system, models of interaction, strategies for and process of design, and evaluation. Project work is emphasised.

School of Electrical Engineering and Telecommunications

ELEC9201
Power System Planning and Economics
Objectives for the energy sector and the electricity industry. Trends towards implementing competition. The Nodal Auction Model as a theoretical basis for implementing competition in the electricity industry. Planning in a competitive electricity industry: forward markets and the concept of coordinated pricing and planning. The role and implementation of regulation. Sustainability and the role of distributors. Review of practical approaches adopted internationally and in Australia.

ELEC9336
Digital Communication Networks
Note/s: Excluded ELEC9337, ELEC4351, ELEC4352, ELEC3018.
Introduction to data communication. Analog versus digital transmission. Transmission media. LANs; WANs, ISDN. Protocols: IEEE standards for LANs; fibre optic networks; satellite networks. OSI reference model. Some design issues and examples: topics include error detection and correction; routing and congestion control; internetworking; connection management; data representation and coding: frame relay and cell relay.

ELEC9350
Theory of Optical Fibres and Optical Signal Processing
Staff Contact: Prof PL Chu
UOC6 HPW3 S1

ELEC9352
Antenna Design and Applications
Principles of phased arrays and reflector antennas with some emphasis on space-borne and ground-terminal antennas for satellite communications. Analysis and synthesis of phased array, null steering theory. Single and dual reflector antennas, offset-reflector systems, optimisation techniques. Effects of satellite orbital saturation on design of ground terminal antennas. Monopulse tracking antennas. Antenna tolerance theory.

ELEC9502
Integrated Circuit Technology
Technologies for the fabrication of bipolar, CMOS, and BiCMOS VLSI integrated circuits. Includes technology modules of Crystal growth, wafer preparation, maskmaking, photolithography, oxidation, diffusion, ion implantation, plasma processing, thin film deposition and metallisation. Advanced technologies such as GaAs high speed IC and SOI for radiation hard or 3-D integration are briefly discussed. Process integration and the link of device physics, circuit design to technology development are emphasised.

School of Geomatic Engineering

GMAT9211
Introduction to Geodesy
Staff Contact: A/Prof AHW Kearsley
UOC6 HPW3 WK514 2

GMAT9600
Principles of Remote Sensing
Staff Contact: School Office
UOC6 HPW3 WK514 1

GMAT9604
Land Information Systems
Staff Contact: Dr EG Masters
UOC6 HPW3 WK514 2
School of Mechanical and Manufacturing Engineering

MANF9340
Factory Automation
Staff Contact: Dr P Mathew
UOC6 HPW3 WKS14 SS
Note/s: Excluded MANF8340

Elements of factory automation such as Flexible Manufacturing Cells and Systems, material handling and warehousing, assembly systems, automated quality control systems, sensors and data acquisition. Cellular manufacturing techniques and layout planning. Simulation and intelligent manufacturing, Communication networks in a factory environment. Strategies for factory automation.

MANF9410
Total Quality Management
Staff Contact: Dr B Kayis
UOC6 HPW3 WKS14 SS

Quality control systems, quality assurance, planning for quality, total quality management (TQM) philosophy, implementation of TQM in service and manufacturing industries, national and international standards.

MANF9420
Managing Manufacturing Operations
Staff Contact: Dr B Kayis
UOC6 HPW3 WKS14 SS
Note/s: Excluded MANF8420

Managing manufacturing operations as a competitive weapon, strategic linkage of operations through quality, value added management, strategic quality management approach, International Human Resource Management, Technology Transfer, Strategic Management of Technology, Variation and its Causes, improvement strategies, productivity and its measurement, Taguchi techniques.

MANF9543
Computer Aided Design/Computer Aided Manufacture
Staff Contact: A/Prof K Hoang
UOC6 HPW3 WKS14 SS

Preference will be given to CIM Program Students. Students must contact the Lecturer one week after enrolment to confirm enrolment.

Topics to be covered include: manufacturing systems; elements of CAM; computer process monitoring and control; production systems at the plant and operation levels; principles underlying the interpretation between a CAD/CAM package such as CATIA and a Manufacturing Management System such as Fourth Shift; applications to design and engineering processes.

MECH9211
Modelling and Control of Mechatronic Systems
Staff Contact: Dr J Katupitiya
UOC6 HPW3 WKS14 SS
Prerequisite/s: MECH3212 or equivalent

Development of modelling technique and design of controllers using digital computers, with special emphasis on digital control systems for motion control. Typical examples of mechatronic systems.

MECH9221
Industrial Robotics
Staff Contact: Dr RA Willgoss
UOC6 HPW3 WKS14 SS


School of Mining Engineering

MINE8130
Technology Management in Mining
Staff Contact: School of Mining Engineering Office

The course addresses the role of technology in the mining process. Sensitivity of the mine profitability and performance is addressed with respect to different levels of technology in each stage of the mining operation. Appropriate specification of technology; capital justification and cost benefit analyses; performance monitoring; technology audits; training requirements and effectiveness; ergonomic factors and occupational health and safety implications of technology changes relative to skill levels.

MINE8220
Mine Feasibility, Planning and Project Evaluation
Staff Contact: School of Mining Engineering Office

This course addresses the process of mine feasibility planning and project evaluation commencing from the resource assessment stage. This subject covers the use of geostatistical techniques to assess a mineral resource, the estimation of recoverable reserves and ore and waste selection and grade control. Further topics include: feasibility study components, mine planning methodologies and scheduling techniques, mine cost structures, introduction to accounting, financial statements, financial theory in relation to project evaluation, evaluation techniques, project financing, cost of capital, revenue assumptions, cost assumptions, risk analysis and studies, institutional and corporate perspectives on project evaluation, introduction to financial modelling, review of cases for financial modelling, practical exercises in financial modelling, intra-project evaluation, comprehensive financial model case study, valuation reports and published assessments.

MINE8770
Mining Law
Staff Contact: A/Prof D Launrece

The course provides a comparison between different legislative philosophies from the fully prescriptive to the totally enabling perspective. The roles of specialist mining law and regulation, in addition to common law, including occupational health and safety - duty of care legislation is reviewed. Other topics to be covered with this course include: definitions of minerals and mining; common law; ownership; Aboriginal land rights miners rights and claims; exploration titles; production titles; private land/Crown land; administrative processes; environmental protection and royalties. Topics will be illustrated by reference to case histories.

MINE8780
Environmental Management for the Mining Industry
Staff Contact: A/Prof D Launrece

Topics addressed are: environmental regulation as a constraint on business operations; environmental planning and management as a component of overall business planning; financial costs and benefits of environmental management and their timing; environmental risks and uncertainty; integrated design strategies; emission control technologies; formal environmental impact assessment procedures, including public submissions and hearings; lease and license conditions; compliance with planning and pollution control legislation; developing and using environmental operations manuals; in-house environmental training programs; corporate environmental audit procedures; liaison with public and community groups; particular environmental applications in mining, oil, manufacturing, petrochemical, civil engineering and infrastructure, building and construction, coastal management and other industries; environmental issues and concerns in Asia-Pacific nations and the region as a whole.
Graduate School of Biomedical Engineering

BIOM9010
Biomedical Engineering Practice
*Staff Contact:* Prof K Schindhelm
*UCO6 HPW2 WKS14 S2*
*Note/s:* Compulsory for all students.

Introduction to clinical situations in hospitals. Presentation of guest lectures by eminent people working in this field. Lecture topics include cardiology, neurology, orthopaedics, rehabilitation. Visits to various biomedical engineering units.

BIOM9332
Biocompatibility
*Staff Contact:* Prof K Schindhelm
*UCO6 HPW3 WKS14 S2*

Interaction of biological fluids and cells with foreign surfaces, in vitro tests to assess biocompatibility and thrombogenicity, current status of biocompatible materials as applied to extracorporeal systems, surgical implants and prosthetic devices.

BIOM9501
Computing for Biomedical Engineers
*Staff Contact:* Dr N Lovell
*UCO6 HPW3 WKS14 S1*
*Note/s:* Highly recommended for Strand B students. This subject is for students with little or no computing experience or for those students who wish to learn about object oriented programming in a Windows environment. Algorithm design and documentation; programming in standard PASCAL and in Delphi for Windows; object oriented program design; event driven programming in a graphical environment; database structures and interfacing.

Faculty of Life Sciences

Department of Biotechnology

BIOT7061
Peptide and Protein Technology

Indirect scale production of enzymes, peptide hormones, antibodies including monoclonal antibodies, vaccines; regulation of synthesis by environmental control and genetic manipulation; recovery and down-stream processing techniques; immobilization by entrapment and binding.

Applications of proteins in medical therapy and diagnosis and as analytical tools including ELISA and affinity chromatography: applications of enzymes in the food and beverage industries.

BIOT7071
Biochemical Engineering

Design of bioreactors; range of biocatalysts from free enzymes to immobilized cells; heat and mass transfer, scale-up, economic feasibility studies as applied to bioprocesses; design of equipment and facilities for sterile operation and to meet recDNA guidelines; downstream processing, design and operation; instrumentation and control; use of computer-linked systems; mathematical simulation.


BIOT7081
Environmental Biotechnology

Environmental Biotechnology examines the way microbes decompose chemically complex materials. Applications include the use of bacteria and fungi to detoxify wastes, converting them to usable substances. Prevention of biodeterioration of valuable materials is also an important area of study. Lectures cover biodegradation of minerals, metals, celluliosics, aromatics, hydrocarbons and waste-water treatment. Students present research reviews and conduct experimental projects.

Department of Food Science

FOOD1577
Food Processing Principles
*Co-requisite:* FOOD1587

This subject is presented as a series of lectures and some discussion groups that cover methods of preservation and processing used in the food industry. Preservation principles and technologies covered include heating, chilling, freezing, dehydration, salt, sugar, acids, chemical preservatives, ionising radiations and novel methods. Basic principles of processing covered are mass and energy balances, heat transfer and fluid flow. Methods of processing include refrigeration, evaporation, dehydration, fermentation, extrusion, chemical and physical separation, and particle size reduction. The subject is run in conjunction with FOOD1587 Food Processing Laboratory designed to demonstrate key principles in a practical context.

FOOD1677
Product Design and Development

Consumer, commercial and national needs for new products, types of new products, the steps in the product development process; development team, idea generation; market research: its role, specific tasks, techniques, and limitations. Roles of advertising and supermarkets in new product success. Product lifecycle reasons for new product failure and preventative strategies. Ingredient and additive properties and contribution to foods, effects of processing on their properties and functionality. Optimisation of quality and acceptability of foods by manipulation of formulations. Packaging and processing for food acceptability; sensory properties, storage stability had nutritional properties of foods. Impact of new technology. Sensory analysis: basic sensory analysis techniques, expert vs consumer panels, interpretation and implementation of sensory testing data, sensory rankings from target markets.

FOOD2647
Food Safety

This subject presents a package of information and exercises designed to demonstrate (I) the public health risk associated with the production and consumption of foods and (ii) the strategies adopted by industry, government and consumers to manage and control these risks. Topics covered include: chemical risks - natural, additives and residues; microbiological risk - bacteria, fungi, viruses, algae, parasites, prions; nutrition - diet and health, genetically modified foods - concepts and specific safety issues; management of food safety by industry - TQM, HACCP, ISO; management of food safety by government - food law, national and international regulation and issues; legal and insurance issues; consumer concerns - education, social, moral and ethical issues; safety in the workplace.

Faculty of Science and Technology

School of Geography

GEOG9015
Population, Health and Environment

Relationship between environmental factors and disease morbidity and mortality is examined by consideration of the epidemiological transition in different countries, and the spatial and occupational-specific variation in disease incidence in Australia. Methodology for standardising, testing for significance and data quality.

GEOG9016
Principles of Geographic Information Systems
*Staff Contact:* School Office
*UCO6 HPW3 WKS14*

Study of selected geographic information systems; problems of data capture and display, datastorage and manipulation, system design and development; cartographic displays and computer mapping. INFO is used for database management, and ARCINFO and MAP for spatial data manipulation and display.
Techniques for extracting information from satellite imagery including image enhancement techniques, classification and feature recognition, statistical methods, and related procedures. Emphasis is on applications relating to vegetation cover and natural resource management. Practical work will be undertaken using the ERDAS image processing software.

School of Geology

GEOL0110
Geological Remote Sensing
The physics of various remote sensing techniques; interpretation of conventional aerial photography in exploration; Infrared remote sensing techniques; side looking airborne radar; theory and applications of Landsat imagery; enhancement techniques for satellite imagery; interpretation of Landsat photographic products and application to several case history areas. Integration of remote sensing information with the overall data base as applied to exploration.

GEOL9010
Groundwater Environments

Staff Contact: Dr J Jankowski

UOC6

Physical properties of groundwater. Darcy flow; hydraulic conductivity - field and laboratory methods; storage and transmissivity; flow nets - local and regional flow systems. Drilling methods; well design and completion; well development; pumping tests and interpretation. Study of the detailed occurrence, methods of development and environmental problems associated with groundwater in aquifer systems of importance to Australia. Environments will include fractured rock systems (upland salinity); the Murray-Darling Basin; The Great Artesian Basin; Oceanic Islands and coastal aquifers and karstic aquifer systems.

GEOL9060
Environmental Geology

Staff Contact: Mr GH McNally

Geology and urban planning; geological input to Environmental Impact Statements; soil and rock construction materials; ground subsidence due to mining and ground-water pumping; geological hazards; land degradation and problem soils; engineering geomorphology.

School of Safety Science

SESC9211
Risk Management

Staff Contact: Prof J Cross

UOC6 HPW3 WKS14 S1

This course gives an overview of Risk Management following the format of the Australian Standard in Risk Management (AS4360).

Tools and techniques applicable to each step of the risk management process are discussed using examples application to the class. The same risk management process is applied to manage a wide range of business issues including health and safety, the environment, finance and project management. This subject is therefore relevant as part of a wide variety of postgraduate courses and students from any postgraduate course are accepted if numbers permit. The student selects examples for exercises to suit the industry and role in which they work (or intend to work). At the end of the subject, students should be able to use risk management tools applicable to their specific interest and have an awareness of tools used in other industries.

SESC9221
Major Hazards Management

Staff Contact: Dr T Green

UOC6 HPW3 WKS14 S1

This course discusses the management of major hazardous facilities. Australian and overseas legislation is discussed, together with the preparation of safety cases, environmental impact statements and emergency planning. Analysis techniques that are required for these assessments will be discussed including how to quantify likelihood and the consequences through the use of modelling. Finally, the requirements for emergency plans are discussed.

SESC9441
Ergonomics and New Technology

Staff Contact: Mr R Hall

UOC6 HPW3 WKS14 S1

Prerequisite/s: Assumed knowledge: SESC9410 or SESC9411 or equivalent

The course will focus on the ergonomics issues related to the design and implementation of new technology. It assumes a knowledge of the principles of ergonomics and in particular it will look at cognitive aspects of human-computer interaction, human error and software design, usability and its assessment, user interface design, evaluation techniques, guidelines and standards, and the introduction of new systems into organisations.

SESC9451
Experimental Biomechanics

Staff Contact: Dr A McIntosh

UOC6 HPW3 WKS14 S1

This course commences with lectures on experimental methods, instrumental analysis methods. The student then undertakes a series of experiments by motion analysis, EMG, exercise tests and impact testing.

SESC9741
Environmental Management Systems

Staff Contact: Dr B Markovic

UOC6 S2

This course is designed to define the central role of management strategies for environmental issues. It describes the development of different approaches to fulfill the demands of the environment while considering not only the current legislative requirements but also customer requirements, competitive pressure and safety aspects of the firms respectively. A short course. Lecture materials are delivered as a short course.
Introduction

The undergraduate engineering degree in Photovoltaics (PV) and Solar Energy is a four-year full-time program. It is the first of its kind internationally and has been established in response to rapid growth in the industry in recent years in both manufacturing capacity and job creation. Australia has led the world for many years in this field through research achievements, technology commercialization and manufacturing. In particular, UNSW has held the world record for silicon solar cell efficiencies for almost 15 years, and has been responsible for developing the most successfully commercialized photovoltaic technology internationally throughout the same period.

The Centre for Photovoltaic Engineering offers undergraduate and graduate training encompassing all aspects of the photovoltaic sector. The new undergraduate engineering degree in Photovoltaics and Solar Energy commenced in the year 2000 and includes training in technology development, manufacturing, quality control, reliability and lifecycle analysis, cell interconnection and encapsulation, the full range of solar cell applications, system design, maintenance and fault diagnosis, marketing, policy development and the use of all renewable energy technologies. Innovative teaching techniques have been developed to enhance the learning environment including the availability of material via the internet to facilitate distance learning. UNSW academics in this field have been consistently ranked amongst the leaders worldwide through international peer review. This team has held the world record for silicon solar cell efficiencies for almost 15 years, and has been responsible for developing the most successfully commercialized photovoltaic technology internationally throughout the same period.

Photovoltaic Engineering has close links with several other engineering and science disciplines. A unique feature of this undergraduate degree program is the opportunity provided to students to specialise in a second area of engineering or science during the second and subsequent years of the program. These second areas of specialization can in general be further expanded through an extra year of study to facilitate the achievement of a double degree.

Second Area of Specialization

A unique feature of the degree is that in 2nd year, students are able to enrol in one 18 Credit Point strand chosen from the areas of computing, electronics, telecommunications, chemistry, mathematics, environmental/civil engineering, electric energy and mechanical engineering. The chosen strand will provide the necessary core material to facilitate subsequent selection of more advanced electives from the corresponding area in the 3rd and 4th years of the PV and Solar Energy degree. The cross-disciplinary nature of photovoltaics and renewable energy applications necessitates many PV engineers possessing broad engineering backgrounds or else working in teams with other engineers. A good example is the UNSW Solar Car Project involving PV engineers with skills suiting most areas of the project, electronics engineers, control engineers, mechanical engineers for the aerodynamics and mechanical design, chemical engineers in relation to battery technology, power engineers for motor technology, biomedical engineers for monitoring driver performance and fatigue, computer engineers, and communications engineers for telemetry, etc.

Double Degree Options

In general, the second area of specialization chosen in 2nd-year can be expanded into a double degree through an extra 5th year of study such as in PV and Solar Energy combined with, say, Electrical Engineering. Viable 5-year double-degree options include BE-BE, BE-BSc, BE-BA and possibly also the BE in conjunction with a Master's program. It may also be possible for students with an
alternative engineering degree to also gain a degree in PV and Solar Energy through additional study. Further details are provided in the section "Combined Degree Programs".

Computing Requirements

Information regarding recommended computing requirements for the courses offered by the Centre is available from the Centre for Computing Requirements Solar Energy through additional study. Further details are provided in the alternative engineering degree to also gain a degree in PV and Solar Energy through additional study. Further details are provided in the section "Combined Degree Programs".

Undergraduate Program Outlines

SOLAA13642
Photovoltaics and Solar Energy – Full-time Program

Bachelor of Engineering
BE

<table>
<thead>
<tr>
<th>HPW</th>
<th>UOC</th>
<th>S1</th>
<th>S2</th>
</tr>
</thead>
<tbody>
<tr>
<td>Year 1</td>
<td>SOLA1050</td>
<td>Introduction to Solar Energy, Photovoltaics &amp; Computing</td>
<td>4</td>
</tr>
<tr>
<td></td>
<td>SOLA1060</td>
<td>Chemistry for Semiconductor Devices</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td>ELEC1011</td>
<td>Electrical Engineering 1</td>
<td>6</td>
</tr>
<tr>
<td></td>
<td>ELEC1041</td>
<td>Digital Circuits</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td>*MATH1141</td>
<td>Higher Mathematics 1A</td>
<td>6</td>
</tr>
<tr>
<td></td>
<td>*MATH1241</td>
<td>Higher Mathematics 1B</td>
<td>6</td>
</tr>
<tr>
<td></td>
<td>PHYS1969</td>
<td>Physics 1</td>
<td>6</td>
</tr>
<tr>
<td>Total</td>
<td></td>
<td>22</td>
<td>22</td>
</tr>
</tbody>
</table>

* MATH1141 and * MATH1241 may be taken at the ordinary level.

Years 2 & 3 Strand Options

Students have the opportunity to select one of eight possible strands to complement their education in Photovoltaics and Solar Energy Engineering. Each strand comprises 18 Units of Credit (UC) with the opportunity to subsequently select additional Electives in the corresponding area in the final two years. The eight strands available are listed below with the subject(s) comprising the last 6 Units of Credit to be taken in year 3.

Year 2

<table>
<thead>
<tr>
<th>HPW</th>
<th>UOC</th>
<th>S1</th>
<th>S2</th>
</tr>
</thead>
<tbody>
<tr>
<td>SOLA2051</td>
<td>Selected Strand</td>
<td>Project in Photovoltaics and Solar Energy</td>
<td>5</td>
</tr>
<tr>
<td>SOLA2020</td>
<td>Photovoltaic Technology and Manufacturing</td>
<td>4</td>
<td>3</td>
</tr>
<tr>
<td>ELEC2042</td>
<td>Real Time Instrumentation</td>
<td>0</td>
<td>3</td>
</tr>
<tr>
<td>MATH2849</td>
<td>Statistics EE</td>
<td>0</td>
<td>3</td>
</tr>
<tr>
<td>MATH2689</td>
<td>Linear Algebra</td>
<td>0</td>
<td>3</td>
</tr>
<tr>
<td>SOLA2050</td>
<td>Sustainable Energy</td>
<td>2.5</td>
<td>0</td>
</tr>
<tr>
<td>SOLA2060</td>
<td>Introduction to Electronic Devices</td>
<td>0</td>
<td>2.5</td>
</tr>
<tr>
<td></td>
<td>General Education Electives</td>
<td>4</td>
<td>0</td>
</tr>
<tr>
<td>Total</td>
<td></td>
<td>19.5</td>
<td>19.5</td>
</tr>
</tbody>
</table>

Year 3

<table>
<thead>
<tr>
<th>HPW</th>
<th>UOC</th>
<th>S1</th>
<th>S2</th>
</tr>
</thead>
<tbody>
<tr>
<td>SOLA3055</td>
<td>Professional Electives</td>
<td>5</td>
<td>10</td>
</tr>
<tr>
<td></td>
<td>Selected Strand (continued)</td>
<td>5</td>
<td>0</td>
</tr>
<tr>
<td>SOLA3540</td>
<td>Renewable Energy Engineering</td>
<td>2.5</td>
<td>0</td>
</tr>
<tr>
<td>SOLA3507</td>
<td>Applied Photovoltaics</td>
<td>4</td>
<td>0</td>
</tr>
<tr>
<td>SOLA3054</td>
<td>Solar Cells and Systems</td>
<td>0</td>
<td>4</td>
</tr>
<tr>
<td></td>
<td>Renewable Energy Product Reliability</td>
<td>2.5</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td>General Education</td>
<td>0</td>
<td>4</td>
</tr>
<tr>
<td>Total</td>
<td></td>
<td>19</td>
<td>18</td>
</tr>
</tbody>
</table>

Years 2 & 3 Strand Options

Strand 1 Computing and Control

<table>
<thead>
<tr>
<th>HPW</th>
<th>UOC</th>
<th>S1</th>
<th>S2</th>
</tr>
</thead>
<tbody>
<tr>
<td>COMP1011</td>
<td>Computing 1A</td>
<td>0</td>
<td>6</td>
</tr>
<tr>
<td>COMP1021</td>
<td>Computing 1B</td>
<td>6</td>
<td>0</td>
</tr>
<tr>
<td>ELEC2041</td>
<td>Microprocessors and Interfacing</td>
<td>4</td>
<td>0</td>
</tr>
</tbody>
</table>

or

<table>
<thead>
<tr>
<th>HPW</th>
<th>UOC</th>
<th>S1</th>
<th>S2</th>
</tr>
</thead>
<tbody>
<tr>
<td>ELEC3017</td>
<td>Electrical Engineering Design</td>
<td>0</td>
<td>5</td>
</tr>
</tbody>
</table>

Strand 2 Electronics

<table>
<thead>
<tr>
<th>HPW</th>
<th>UOC</th>
<th>S1</th>
<th>S2</th>
</tr>
</thead>
<tbody>
<tr>
<td>ELEC2031</td>
<td>Circuits and Systems</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>ELEC3006</td>
<td>Electronics A</td>
<td>6</td>
<td>0</td>
</tr>
<tr>
<td>ELEC3016</td>
<td>Electronics B</td>
<td>0</td>
<td>5</td>
</tr>
</tbody>
</table>

Strand 3 Electric Energy

<table>
<thead>
<tr>
<th>HPW</th>
<th>UOC</th>
<th>S1</th>
<th>S2</th>
</tr>
</thead>
<tbody>
<tr>
<td>MATH2011</td>
<td>Several Variable Calculus</td>
<td>4</td>
<td>0</td>
</tr>
<tr>
<td>PHYS2939</td>
<td>Electromagnetism</td>
<td>3</td>
<td>0</td>
</tr>
<tr>
<td>ELEC2015</td>
<td>Electromagnetic Applications</td>
<td>0</td>
<td>3</td>
</tr>
<tr>
<td>ELEC3005</td>
<td>Electrical Engineering Design</td>
<td>5</td>
<td>0</td>
</tr>
</tbody>
</table>

Strand 4 Communications

<table>
<thead>
<tr>
<th>HPW</th>
<th>UOC</th>
<th>S1</th>
<th>S2</th>
</tr>
</thead>
<tbody>
<tr>
<td>ELEC2031</td>
<td>Circuits and Systems</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>MATH2620</td>
<td>Complex Analysis</td>
<td>0</td>
<td>2.5</td>
</tr>
<tr>
<td>MATH3150</td>
<td>Transform Methods</td>
<td>0</td>
<td>3</td>
</tr>
<tr>
<td>TELE3013</td>
<td>Telecommunications Systems 1</td>
<td>5</td>
<td>0</td>
</tr>
</tbody>
</table>

Strand 5 Mathematics

<table>
<thead>
<tr>
<th>HPW</th>
<th>UOC</th>
<th>S1</th>
<th>S2</th>
</tr>
</thead>
<tbody>
<tr>
<td>MATH2011</td>
<td>Several Variable Calculus</td>
<td>4</td>
<td>0</td>
</tr>
<tr>
<td>MATH2620</td>
<td>Complex Analysis</td>
<td>0</td>
<td>2.5</td>
</tr>
<tr>
<td>MATH1090</td>
<td>Discrete Mathematics</td>
<td>3</td>
<td>0</td>
</tr>
<tr>
<td>MATH3141</td>
<td>Mathematical Methods EE</td>
<td>0</td>
<td>4</td>
</tr>
</tbody>
</table>

Strand 6 Mechanical Engineering

<table>
<thead>
<tr>
<th>HPW</th>
<th>UOC</th>
<th>S1</th>
<th>S2</th>
</tr>
</thead>
<tbody>
<tr>
<td>MECH2601</td>
<td>Fluid Mechanics and Thermodynamics A</td>
<td>4</td>
<td>0</td>
</tr>
<tr>
<td>MECH2602</td>
<td>Fluid Mechanics and Thermodynamics B</td>
<td>0</td>
<td>4</td>
</tr>
<tr>
<td>MECH3601</td>
<td>Thermofluid System Design</td>
<td>3</td>
<td>0</td>
</tr>
<tr>
<td>MECH3602</td>
<td>Advanced Thermodynamics</td>
<td>0</td>
<td>3</td>
</tr>
</tbody>
</table>

Strand 7 Civil Engineering

<table>
<thead>
<tr>
<th>HPW</th>
<th>UOC</th>
<th>S1</th>
<th>S2</th>
</tr>
</thead>
<tbody>
<tr>
<td>CVEN1312</td>
<td>Statics</td>
<td>3</td>
<td>0</td>
</tr>
<tr>
<td>CVEN1314</td>
<td>Mechanics of Solids</td>
<td>0</td>
<td>3</td>
</tr>
<tr>
<td>CVEN2314</td>
<td>Engineering Materials</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>CVEN2312</td>
<td>Introduction to Structures</td>
<td>2</td>
<td>0</td>
</tr>
<tr>
<td>CVEN3116</td>
<td>Engineering Management 1</td>
<td>2</td>
<td>2</td>
</tr>
</tbody>
</table>

Strand 8 Chemical Engineering

<table>
<thead>
<tr>
<th>HPW</th>
<th>UOC</th>
<th>S1</th>
<th>S2</th>
</tr>
</thead>
<tbody>
<tr>
<td>CEIC0010</td>
<td>Mass Transfer and Material Balance</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>INDC3010</td>
<td>Thermodynamics</td>
<td>3</td>
<td>0</td>
</tr>
<tr>
<td>CHEN2030</td>
<td>Heat Transfer</td>
<td>0</td>
<td>3</td>
</tr>
<tr>
<td>CEIC2040</td>
<td>Applied Electrochemical and Surface Processes</td>
<td>1.5</td>
<td>0</td>
</tr>
<tr>
<td>INDC3031</td>
<td>Experimental Design</td>
<td>2</td>
<td>1</td>
</tr>
<tr>
<td>INDC3041</td>
<td>Corrosion in the Chemical Industry</td>
<td>0</td>
<td>3</td>
</tr>
</tbody>
</table>

Professional Electives for Years 3 & 4

Because of timetable clashes not all combinations of subjects are possible.

<table>
<thead>
<tr>
<th>HPW</th>
<th>UOC</th>
<th>S1</th>
<th>S2</th>
</tr>
</thead>
<tbody>
<tr>
<td>SOLA5508</td>
<td>High Efficiency Silicon Solar Cells</td>
<td>0</td>
<td>2.5</td>
</tr>
<tr>
<td>SOLA5011</td>
<td>Solar Cells: Operating Principles and Technology</td>
<td>0</td>
<td>4</td>
</tr>
<tr>
<td>SOLA5053</td>
<td>Wind Energy Converters</td>
<td>0</td>
<td>4</td>
</tr>
</tbody>
</table>
Students may transfer into a combined course after partially completing the requirements for either degree provided suitable subjects have been studied. However, the choice of subjects and the time taken to complete the program can be seriously affected by this. Thus, students considering double degree options should contact the Centre for Photovoltaic Engineering office before completing their Year 2 enrolment. An application for transfer to a combined course must be made in writing to the Head of the Centre by the start of the third week of December in the year that they complete Year 1 of the BE degree course.

**BE BE in Photovoltaics and Solar Energy plus second Engineering Degree of choice**

The cross disciplinary nature of photovoltaic engineering has led to the establishment of strand options in the second year of the program to provide students with a second chosen area of specialisation. These encompass many of the engineering disciplines that can be subsequently further developed through an extra 5th year of study to give a second engineering degree in the chosen second area of specialisation.

During year 2, students need to enrol in the appropriate strand and contact the Centre Office prior to year 3 enrolment.

**BE BA in Photovoltaics and Solar Energy**

With this combined degree course, students can add their choice of arts program to the standard engineering course offered by the Centre for Photovoltaic Engineering. The full range of arts programs is available.

Because the engineering and arts programs have common content, such as mathematics and physics, only one more year of study is normally required to gain the additional qualification of Bachelor of Arts.

Students should start discussing their program with representatives of the School of the Faculty of Arts and Social Sciences as soon as possible — preferably well before enrolment in Year 2. Enquiries should be directed to the Director of Academic Studies and the Executive Assistant to the Dean of the Faculty of Arts and Social Sciences.

Students should work out for themselves the Arts program they would like to add to their chosen engineering course. The Arts and Social Sciences Faculty Handbook describes the options. There are no special rules on what to include in each year. Students should schedule the Arts and Engineering components to suit their preferences while meeting the constraints of timetables and prerequisites.

The Arts component must be approved by the Faculty of Arts and Social Sciences. The final program and schedule must be approved by the Centre for Photovoltaic Engineering.

**BE BSc in Photovoltaics and Solar Energy**

As noted above, students wishing to transfer to the combined degree should contact the Centre for Photovoltaic Engineering office before completing their Year 2 enrolment.

During Year 2, students need to enrol in the appropriate strand for necessary core material for the BSc.

Students who plan to specialize in Computer Science, Mathematics or Physics in a BE/BSc degree course should consult the Centre before enrolling in Year 2.
Postgraduate Study

The Centre for Photovoltaics Engineering offers postgraduate education at the Masters and PhD level through the School of Electrical Engineering & Telecommunications. These degrees are intended to provide students with an exceptional basis in advanced concepts and research in the photovoltaics area.

Coursework Programs

8501
Master of Engineering Science in Electrical Engineering, Majoring in Photovoltaics

MEngSc

Qualifications
1. A candidate for the degree shall have been awarded a Bachelor of Engineering from the University of New South Wales in an appropriate discipline, or a qualification considered equivalent from another university or tertiary institution at a level acceptable to the Higher Degree Committee of the Faculty of Engineering (hereinafter referred to as the Committee).
2. Articulation from a Graduate Diploma, or upgrading from a Graduate Diploma program with advanced standing may be allowed by the Committee. Upgrading in other circumstances may be permitted by the Higher Degrees Committee on the recommendation of the Head of School, and may be offered with a reduced level of advanced standing.
3. In exceptional cases an applicant who submits evidence of such other academic and professional qualifications as may be approved by the Committee may be permitted to enrol for the degree.
4. Where a potential candidate does not meet the prerequisite required knowledge, a qualifying program can be arranged which will generally require enrolment in the Graduate Diploma, with the inclusion of Year 4 Electives. Upgrading to the MEngSc will be allowed after satisfactory progress and completion of at least 18 Units of Credit, with advanced standing in subjects which meet the requirements for the MEngSc. Progress will not be deemed to be satisfactory unless all subjects are passed at the first attempt.
5. Enrolment with advanced standing will be permitted where a candidate has completed non-award courses which would otherwise be acceptable for the MEngSc.

Enrolment and Progression
1. An application to enrol as a candidate for the degree shall be made on the prescribed form which shall be lodged with the Registrar at least two calendar months before the commencement of the session in which enrolment is to begin. Candidates may commence in Session 1 or Session 2.
2. All candidates elect to study in the Photovoltaics Major program offered by the School of Electrical Engineering and Telecommunications: the Program Coordinator will advise if applicants are adequately qualified to undertake the proposed courses and must recommend the chosen program to the Committee.
3. A candidate for the degree shall be required to undertake such courses and pass such assessment as prescribed.
4. The progress of a candidate shall be reviewed at least once annually by the Committee and as a result of its review the committee may cancel enrolment, permit the candidate to re-enrol in a Graduate Diploma, or take such other action as it considers appropriate.

The courses satisfying the 48 Units of Credit requirement may be selected from the following:
0 - 6 Units of Credit Year 4 Electives
12 - 48 Units of Credit Core Postgraduate Electives
0 or 12 Units of Credit Postgraduate Research Project
0 - 36 Units of Credit Postgraduate Electives
24 Units of Credit must be taken in the area of specialisation. At least 12 of these Units must be Core Postgraduate Courses.

One Year 4 Elective may be selected to make up prerequisite requirements for an area of study within the postgraduate program. These courses are taught by lecture during the day, and require attendance at laboratory sessions.

Core Postgraduate Electives are taught in-session at Kensington, and may include a component of web-based learning. However, these courses will require attendance at formal lectures.

The Postgraduate Research Project must be supervised by a member of the Academic Staff of the University. The project must relate to the major area of study being undertaken by the candidate. The project may take one of two forms:

Industry-related project. Such a project will require the agreement of an industry "sponsor", who will define the industrial requirements of the project. The project must still meet academic requirements, defined by the academic supervisor. An industry co-supervisor may be appointed from persons with appropriate academic standing or industrial experience, acceptable to the Committee.

Academic project. Such projects will be undertaken in the School's laboratories. The project may be motivated by an industrial problem, or it may be theoretical, experimental or design-based.

Postgraduate Electives may each contribute 3 or 6 Units of Credit, and may take one of several forms:

Formal Coursework These courses will have the same format as the Core Postgraduate Electives above.

Distance Education Such courses will be taught using web-based material, formal course notes, books and papers, and will require extensive self-study by the candidate. The subjects may require a component of attendance at lectures given within the School, or at other suitable venues.

Short Courses Short Courses are oriented toward continuing education. Each course will deal with a topical subject, and will provide Units of Credit which may be counted toward the MEngSc, or may be taken as a non-award course.

Short courses may contribute either 3 Units of Credit or 6 Units of Credit, (the equivalent of 75-90 hours or 150-180 hours of work on the part of the candidate). Short courses will typically require attendance at lectures, either periodically or in a block, supplemented by self-study and assignment work.

Symposia Symposia will be similar to Short Courses, except that material will be delivered in a conference format, by the course candidates themselves, and/or by members of academic staff and invited speakers.

Courses for this program include:
SOLARxxx Photovoltaics
SOLARxxx Solar Cells and Systems
SOLARxxx High Efficiency Solar Cells
SOLARxxx Solar Energy
SOLARxxx Advanced Semiconductor Devices
ELEC9502 Integrated Circuit Technology
SOLARxxx Solar Cell Technology & Manufacturing
SOLARxxx Grid Connected Photovoltaics

Additional subjects are being developed on an ongoing basis so students should consult the Photovoltaics Engineering Centre Office prior to completing enrolment. With permission from the Centre Office other electives may be chosen from programs offered by other schools provided pre-requisites and timetabling are satisfied.
**GradDip**

**Qualifications**

1. A candidate for the degree shall have been awarded a Bachelor of Engineering from the University of New South Wales in an appropriate discipline, or a qualification considered equivalent from another university or tertiary institution at a level acceptable to the Higher Degree Committee of the Faculty of Engineering (hereinafter referred to as the Committee).

2. In exceptional cases an applicant who submits evidence of such other academic and professional qualifications as may be approved by the Committee may be permitted to enrol for the degree.

3. Where a potential candidate does not meet the prerequisite required knowledge, a non-award qualifying program can be arranged which will generally require enrolment in undergraduate courses, recommended by the relevant Program Coordinator.

4. Enrolment with advanced standing will be permitted where a candidate has completed non-award courses which would otherwise be acceptable for the Grad. Dip.

Programs consist of 36 Units of Credit of coursework. At least 18 Units of Credit must be taken from one of the areas of specialisation defined for the MengSc (see Electrical Engineering, Major Areas of Study).

The Grad. Dip. Program comprises coursework only. There is no thesis or project in the Grad. Dip.

**PhD**

**Research Areas**

PhD topics are available for research students covering the entire photovoltaic sector but with greatest emphasis on device theory, device and module design, balance of system components, photovoltaic systems and applications.
Centre for Advanced Numerical Computation in Engineering and Science

Director
Professor CAJ Fletcher

Administrative Contact Officer
Ms Karen Hahn

The Centre for Advanced Numerical Computation in Engineering and Science (CANCES) is a specialist research centre and is a joint initiative of the Faculties of Engineering and Science and Technology to provide a focus for the very active UNSW community of computational engineers and scientists exploiting state-of-the-art workstation clusters, vector and parallel supercomputers. The Centre contributes to graduate training through coursework and research programs, carries out both fundamental and applied research through developing and using computer codes, provides short courses for industry-based engineers and scientists and organisers conferences and workshops on the latest computational techniques. The Centre has three areas of special emphasis: a) Industrial Computational Fluids and Heat Transfer, b) Environmental Modelling, c) Finite Element Structural Analysis.

ANCE9105
Computational Techniques for Fluid Dynamics
Staff Contact: CANCES
UOC15 HPW3 WKS14 S2

General and specific computational techniques for fluid flow behaviour occurring in industrial, geophysical and chemical processes etc.

Centre for Applied Polymer Science

Director
Professor R Burford

The Centre for Applied Polymer Science has been established to encourage collaboration between groups which have significant activities in polymer science and engineering. The multidisciplinary nature of Polymer Science is reflected by the fact that members of the Centre have interests spanning biomaterials, textiles, packaging and industrial manufacture of resins. A priority in the establishment of this Centre therefore, is to bring together appropriate expertise to tackle multifaceted problems, rather than focus upon a single discipline.

The University is well equipped with major items of equipment for the study of polymer structures and morphology. High resolution surface analysers, electron microscopes, thermal analysers and other sophisticated facilities are able to be accessed by members of the Centre.

Centre for Particle and Catalyst Technologies

Director
Dr R Amal

The Centre for Particle and Catalyst Technologies is located within the School of Chemical Engineering and Industrial Chemistry. It was established to encourage research in particulate systems and heterogeneous catalysis undertaken within the University, and to promote unique University facilities as services available to industry and government bodies.

Special objectives of the Centre include promotion of testing facilities available within the University. A wide range of industries, including pharmaceutical, chemical, water, etc. industries have sent samples for particle characterisation over the last two years. This has been achieved in conjunction with Unisearch (UNSW's corporate research arm), by the establishment of a centralised organisation for the allocation, review and management of short-term consultancy projects in particle and catalyst characterisation.

In addition to short-term projects, the Centre has been successful in attracting long-term industrial research contracts and research grants, resulting in improved transfer of technology to Australian industry in the areas of catalyst development, instrumental methods for particle and catalyst characterisation, and particulate systems.

The Centre also plays an important role in offering continuing education courses and conferences in areas relevant to industry.

The Centre houses much state-of-the-art equipment. These instruments allow staff and students to characterise particulate material in terms of size, surface area and other physical and chemical properties. The characteristics of particulate material influences its behaviour both as raw material and products in many industries.

Many of the measurement techniques have been developed within the Centre allowing the UNSW team to maintain its international reputation for expertise in particulate systems.

The Centre is now part of the Special Research Centre for Multiphase Processes together with the University of Newcastle and Queensland University. Centre for Remote Sensing and Geographic Information Systems.

Centre for Remote Sensing and Geographic Information Systems

Director
Dr R Lucas

The Centre is a joint multidisciplinary enterprise aimed at facilitating research in the broad area of spatial information systems, which include remote sensing, geographical information systems and land information systems. It maintains a remotely sensed and geographical information system data repository.

The Centre's research interests include applications of artificial intelligence in digital photogrammetry and remote sensing, radar backscattering and radar interferometry, and vegetation mapping from remote sensing images. Other interests include monitoring urban areas using high resolution satellite remotely sensed data, data
modelling and 3D visualisation, spatial information systems for road based transport planning, evaluation and design. Applications using imaging radar form a core interest of the Centre.

There are more than 30 academic staff associated with the Centre. Active links are maintained with researchers in Asia, North and South America, China and Europe.

Schools associated with the Centre offers undergraduate and postgraduate teaching and research in remote sensing and geographical information systems. The Centre also offers short courses on remote sensing and geographical information systems to the wider community.

The Schools involved in the Centre are the Schools of Geography and Geology in the Faculty of Science and Technology and the School of Geomatic Engineering in the Faculty of Engineering.

Graduate Programs In Geographic Information Systems
The Master of Applied Science in Geographic Information Systems 8027.1000 is offered in both Geography and Geology within the Faculty of Science and Technology. Entry into either discipline depends on the background of the applicant and the orientation of the proposed program. Detailed information on this course is listed under the School of Geography section in the Science and Technology handbook.

The Masters degree program is also offered in the Faculty of Engineering as a Master of Engineering Science 8652. This course has a stronger engineering bias.

Graduate Programs In Remote Sensing
The graduate programs in Remote Sensing are offered in both the Faculty of Science and Technology and the Faculty of Engineering. Entry into either Faculty depends on the background of the applicant and the orientation of the proposed program.

Programs are available:

- Faculty of Science and Technology
  - Graduate Diploma in Remote Sensing 5047.2000

- Faculty of Engineering
  - Master of Engineering Science in Remote Sensing 8641
  - Master of Engineering Science in GIS, 8652
  - Graduate Diploma in Remote Sensing 5496

Centre for Water and Waste Technology

Director
Professor TD Waite

The Centre for Water and Waste Technology was established in 1987 with a grant provided by the Australian Water Research Council. It is self-funding and continues to operate as an interface between environmental research and development and commercial applications. Our vocation is to apply innovative technology and methodology to the management of all waters and wastes.

The Centre's research interests include Atmospheric Emissions Program and Odour Research Laboratory, Biological Treatment and Environmental Microbiology Program, Physico-Chemical Processes Program and Waste Management Program.

The Centre's program involves grant projects, sponsored research projects, consultancies, education and training elements. As well as supporting research students, the Centre provides professional invigoration and additional continuing education courses in the fields of Water and Wastewater Treatment and Solid Waste and Management.

The Centre for Water and Waste lies within the School of Civil and Environmental Engineering and is continuing to maintain and further develop strong linkages between academic and project staff. Linkages with academic staff in other Schools on campus continue to grow, particularly strong associations with the School of Chemical Engineering and Industrial Chemistry (through joint activities with Professor Tony Fane and Dr Rose Amal) and the School of Microbiology.

Energy Research, Development and Information Centre (ERDIC)

Director
Vacant

UNSW is a major centre for energy research and development in Australia across the full spectrum of energy technologies and issues. The University has internationally recognised expertise in fossil fuels technology, coal, oil, gas and biomass; solar energy, photovoltaics, thermal, passive, energy storage, vanadium batteries; energy efficiency in manufacturing, processing, buildings and transport, and economics and socio-economics.

ERDIC produces an annual report on all these activities; organises inter and multidisciplinary seminars and workshops on both current research and development, and future directions; publishes reports and newsletters; organises lectures; serves as a focal point for enquiries on energy research and development; and assists in bringing multidisciplinary teams together for consultation and research projects.

ERDIC has established itself as an internationally recognised Centre, providing a contact point for energy researchers in many disciplines within the University. It assists Federal and State Governments and industry to determine future policies and directions on energy research and development.

ERDIC disseminates information on energy issues via its seminars, workshops, meetings and newsletters. It is also a point of enquirers in the wider community for information on energy technologies; particularly new and improved energy technology which are the key to safe, efficient and environmentally acceptable production and use of energy.

The Centre is also involved in the production of educational material. It has put together a twelve unit subject on energy management which is offered as a subject in the Master of Business and Technology Program at the University. The program is structured to enable it to be offered in packages of various units as shorter courses, both in Australia and overseas.

For further information please refer to web site: http://www.erdic.unsw.edu.au.

UNESCO Centre for Membrane Science and Technology

Directors
Professor HGL Coster (Biophysics Group)
Professor AG Fane (Chemical Engineering Group)
Deputy Director Dr DE Wiley (Chemical Engineering)

The Centre for Membrane Science and Technology was formed in 1987 as a collaborative venture between the School of Chemical Engineering and Industrial Chemistry and the Department of Biophysics, School of Physics. In 1988 it was granted Commonwealth Special Research Centre status and funding, and in 1992 it became one of only four UNESCO Science Centres worldwide.

Research programs include fundamental research on both biomembranes, and membrane processes, as well as synthetic (industrial) membranes; membrane based manufacturing processes (chemical and biological reactor systems); product purification; purification of water; treatment and safe disposal of wastes, including sewage; biomedical applications; and membrane based biosensor technology. Other activities include the development of novel conducting membranes, membrane biophysics, membrane pervaporation and supported liquid membranes, and membrane based systems using metal binding liquids to remove heavy metals.

The Membrane Centre maintains connections with membrane groups in China, Indonesia, Japan, Korea, Thailand, Malaysia and Singapore. It also has close links and collaborative projects operating
with research institutes in Italy, France, Germany, Denmark, Finland, The Netherlands, the United Kingdom, the United States and Canada.

The Centre organises postgraduate study programs, with up to half of its 25 students coming from countries other than Australia. It also offers shorter-term training programs for overseas trainees in aspects of membrane science and technology and runs specialist workshops on a diverse range of membrane related subjects.

Munro Centre for Civil and Environmental Engineering

Director
Associate Professor RJ Cox

The Munro Centre for Civil and Environmental Engineering was established in the School of Civil and Environmental Engineering in 1992. Its purpose is to support the School, and to facilitate interaction between the School, the engineering profession, industry and government. The Centre promotes ongoing education in civil and environmental engineering by organising conferences, courses and seminars.

Centre for Postgraduate Studies in Civil and Environmental Engineering

Director
Associate Professor RJ Cox

The Centre offers specialist short courses of 1 to 5 days for practising Civil and Environmental Engineers. The courses are offered under the Munro Centre for Civil and Environmental Engineering.

UNSW Groundwater Centre

Director
Dr J Jankowski

The UNSW Groundwater Centre’s facilities are based at the Water Research Laboratory in Manly Vale and in the School of Geology in the Faculty of Science and Technology.

The Centre organises a Masters course in Groundwater Studies, as well as undergraduate and PhD training. The Masters course is completed full-time over a period of twelve months and offers specialisations in contaminant hydrogeology and groundwater resource development. Students from Iran, Canada, UK, Zambia, Malaysia, Thailand, Indonesia, Botswana, Germany, Ireland and China have studied at the Centre in recent years, as well as many Australian students.

The staff at the Centre work closely with the Cooperative Research Centre for Waste Management and Pollution Control to develop geophysical techniques for mapping dense non-aqueous phase liquid contamination of unconsolidated aquifer formations. This work has involved the development of new sample acquisition and recovery techniques and the development of integrated hydrogeochemical and geophysical laboratories at the Water Research Laboratory.

Major research interests include the development of hydrogeochemical and biogeochemical models for the occurrence of dry land salinity; the characterisation of flow in fractured aquifers using a combination of isotope techniques; and the assessment of airborne multispectral scanner and airborne radar for the mapping of aquifer recharge and discharge areas.

The Centre offers specialised graduate courses in Groundwater Studies and carries out general teaching in Hydrogeology to Science and Technology and Engineering postgraduate students. Information on the Centre’s courses is listed under the School of Civil and Environmental Engineering section in this handbook or the School of Geology section in the Faculty of Science and Technology handbook. The following programs are available.

8022.2000
Master of Science and Technology in Groundwater Studies
The Master of Applied Science degree is undertaken through the School of Geology in the Faculty of Science and Technology

8612
Master of Engineering Science in Groundwater Studies
The Master of Engineering Science degree is undertaken through the School of Civil and Environmental Engineering in the Faculty of Engineering.

8614 (External) 8612.5100 (Internal)
Master of Engineering Science in Waste Management
The Master of Engineering Science degree is undertaken through the School of Civil and Environmental Engineering in the Faculty of Engineering.

5458
Graduate Diploma in Waste Management
The Graduate Diploma is undertaken through the School of Civil and Environmental Engineering in the Faculty of Engineering.
Descriptions of all courses are presented in alphanumeric order within organisational units. For academic advice regarding a particular course consult with the contact for the course as listed. A guide to abbreviations and prefixes is included in the chapter Handbook Guide, appearing earlier in this book.

The following courses are offered by other faculties at UNSW, and contribute either as part of courses contained in this handbook, or as electives.

**ACCT9001**
**Introduction to Accounting A**
*Staff Contact: School Office*
UOC3 HPW1.5 WK14 S1
This course introduces non-commerce students to the nature, purpose and conceptual foundation of accounting: information systems including accounting applications, and analysis and use of accounting reports.

**ACCT9002**
**Introduction to Accounting B**
*Staff Contact: School Office*
UOC3 HPW1.5 WK14 S2
Prerequisite/s: ACCT9001
Note/s: Compulsory for BBCM degree course students in the Faculty of Built Environment
This course introduces non-commerce students to managerial accounting: long-range planning, budgeting and responsibility accounting; cost determination, cost control and relevant cost analyses.

**ACCT9003**
**Introduction to Accounting Principles**
*Staff Contact: School Office*
UOC3 HPW2 WK14 S1
Note/s: Excluded ACCT1501 or ACCT9001 or ACCT9002 or ACCT9002
This course will provide students with a basic understanding of the key financial statements and how transactions they are likely to be involved with will affect those financial statements. Students will learn about some of the internal controls and why they exist in organisations. They will learn to analyse financial statements and make decisions using those statements. The basics of management accounting will be introduced including cost behaviour, cost-volume-profit analysis, costing and budgeting.

**ANAT2151**
**Introductory Functional Anatomy**
*Staff Contact: A/Prof K Ashwell*
UOC3 HPW3 WK14 S1
Overview of basic human anatomy and physiology with an emphasis on structures and systems which are most vulnerable to chemical and physical trauma under industrial conditions, such as the eye, ear and skin. Other systems studied include the musculoskeletal system, central and peripheral nervous systems, circulatory, respiratory, gastrointestinal, endocrine and urogenital systems. Offered as a distance-education course, or on campus if enrolments are sufficient.

**ANAT2200**
**Basic Histology**
*Staff Contact: Prof P Waite*
UOC3 HPW3 WK14 S1
Prerequisite/s: BIOS1101, BIOS1201
The course provides an overview of the structure of mammalian cells and their organisation into tissues. Topics include the use of the light microscope, the preparation of tissues and the recognition of artefacts. Morphology of epithelial, connective, muscular and nervous tissues will be compared with emphasis on the practical recognition of cell types and the correlation or structure and function.

**ANAT2210**
**Systems Histology**
*Staff Contact: Prof P Waite*
UOC3 HPW3 WK14 S2
Prerequisite/s: ANAT2200
The course includes the histological examination of the major body systems: cardiovascular, respiratory, lymphatic, integumentary, digestive, endocrine, urinary, reproductive and nervous systems. Emphasis is on integrating the microscopic structure of organs with their function and with abnormalities, which occur in common disease processes.

**ANAT2511**
**Fundamentals of Anatomy**
*Staff Contact: Dr E Tancred*
UOC6 HPW6 WK14 S2
This course will provide an introduction to the fundamental principals of human structure. It includes an introduction to the histology of basis tissues; an overview of the functional anatomy of the major body systems; human development, growth and aging; human evolution; body imaging.

**ANAT3131**
**Functional Anatomy 1**
*Staff Contact: Prof D Tracey*
UOC6 HPW6 WK14 S1
Prerequisite/s: ANAT2111
Functional anatomy of the musculoskeletal system in the head, neck and upper limb, includes biomechanics of connective tissue; in particular bone, cartilage and tendon. Tutorials involve study of prosected specimens, X-rays and surface anatomy; students will also carry out their own dissections of the upper limb.

**ANAT3141**
**Functional Anatomy 2**
*Staff Contact: Prof D Tracey*
UOC6 HPW6 WK14 S2
Prerequisite/s: ANAT3131
Functional anatomy of the musculoskeletal system in the trunk and lower limb. Includes functional aspects of muscle and a discussion of the mechanics and energetics of walking and running. Tutorials involve study of prosected specimens, X-rays and surface anatomy; students will also carry out their own dissections of the lower limb.

**ANAT3531**
**Functional Anatomy 1 (Adv)**
*Staff Contact: Prof D Tracey*
UOC6 HPW6 WK14 S1
Functional anatomy of the musculoskeletal system in the head, neck and upper limb, includes biomechanics of connective tissue; in particular bone, cartilage and tendon. Tutorials involve study of prosected specimens. X-rays and surface anatomy; students will also carry out their own dissections of the upper limb. The advanced course ANAT3531 will include an assessable detailed dissection program, incorporating submission of a report based on drawings of the student's work and a review of literature within the subject area.
ANAT3541  
Functional Anatomy 2 (Adv)  
Staff Contact: Prof D Tracey  
UOC6 HPW6 WKS14 S2  
Prerequisite/s: ANAT3531  
Functional anatomy of the musculoskeletal system in the trunk and lower limb. Includes functional aspects of muscle and a discussion of the mechanics and energetics of walking and running. Tutorials involve study of prosected specimens, X-rays and surface anatomy; students will also carry out their own dissections of the lower limb. The advanced course ANAT3541 will include an assessable of the mechanics and energetics of walking and running. Tutorials on literature within the subject area. Students will also carry out their own dissections of the lower limb. The advanced course ANAT3541 will include an assessable research project and submission of a research report based on literature within the subject area.

BIOS1201  
Molecules, Cells and Genes  
Staff Contact: A/Prof P Adam  
UOC6 HPW5 S1  
Prerequisite/s: HSC Exam Score Required: 2 unit Science (Physics) 53-100, or 2 unit Science (Chemistry) 53-100, or 2 unit Science (Geology) 53-100, or 2 unit Science (Biology) 53-100, or 3 unit Science 90-1500, or 4 unit Science 1-50  
Note/s: Practical and tutorial seat assignments must be obtained at the Biology Enrolment Centre on the day of enrolment. The course guide is available for purchase during enrolment week. Equipment required for practical classes is listed in the Course Guide and must be purchased before session starts. Students must consult if for details of the course and assessments.

The course is concerned with the basic characteristics of all life, from viruses to humans. The chemistry of life is covered and emphasis is placed on the ways in which organisms construct and break down macromolecules. Cell biology, the structure and function of cell components, is a major component of the course. The final topic of the course is genetics - the nature of the genetic code in all organisms, how the genetic code is inherited and how it can be modified.

BIOS3301  
Ecology for Environmental Engineers  
Staff Contact: Prof B Fox  
UOC3 HPW3 S2  
Note/s: Restricted Environmental Engineering Programs  
Factors regulating dynamics of interacting populations, renewable resource management, ecosystem stability, cycles and chaos, simulation modelling in ecology, niche theory, competition, habitat selection, community structure, species diversity, plant and animal succession following disturbances such as fire, mining and logging. Rehabilitation and restoration procedures following disturbance. Appropriate tutorial topics.

CHEM1011  
Fundamentals of Chemistry 1A  
Staff Contact: Dr P Chia  
UOC6 HPW6 WKS14 S1, S2  
Assumed Knowledge: A basic knowledge of chemistry (equivalent to one year of high school chemistry)  

CHEM1021  
Fundamentals of Chemistry 1B  
Staff Contact: Dr P Chia  
UOC6 HPW6 WKS14 S1, S2  
Prerequisite/s: CHEM1011  

CHEM1031  
Higher Chemistry 1C  
Staff Contact: Dr P Chia  
UOC6 HPW6 WKS14 S1  
Assumed Knowledge: Equivalent to a good standard in high school chemistry (HSC 2 unit chemistry (75-100) or equivalent)  
Atomic structure and periodicity. Structure and shapes of molecules. Chemical reactions, rates and mechanisms. Reactions or organic compounds. Includes advanced laboratory work.

CHEM1041  
Higher Chemistry 1D  
Staff Contact: Dr P Chia  
UOC6 HPW6 WKS14 S2  
Prerequisite/s: CHEM1031  

CHEM1817  
Chemistry 1ME  
Staff Contact: Dr P Chia  
UOC3 HPW3 WKS14 S2  
Note/s: Excluded CHEM1101, CHEM1201. Restricted to Plan 3610, 3663, 3680, 3700 and 3985 program 0176. Alternative courses are available to avoid timetable clashes (please consult with School of Chemistry)  

CHEM2011  
Physical Chemistry  
Staff Contact: A/Prof R Read  
UOC6 HPW6 WKS14 S2  
Prerequisite/s: CHEM1011 and CHEM1201 or MATH1231 or MATH1241 or MATH1201  
Note/s: Alternative courses are available to avoid timetable clashes (please consult with School of Chemistry)  

CHEM2021  
Organic Chemistry  
Staff Contact: Dr R Read  
UOC6 HPW6 WKS14 S2  
Prerequisite/s: CHEM1101 and CHEM1201  
Applications of spectroscopy in structure elucidation. Reactive intermediates, addition and rearrangement reactions, carbonyl group chemistry. Chemistry of aromatic compounds.

CHEM2031  
Inorganic Chemistry and Structure  
Staff Contact: Dr R Read  
UOC6 HPW6 WKS14 S1  
Prerequisite/s: CHEM1101 and CHEM1201  
Note/s: Excluded CHEM2839. Alternative courses are available to avoid timetable clashes (please consult with School of Chemistry)  
to enable the student to usefully employ the following concepts in a management.

FINS5512
Financial Markets and Institutions
Staff Contact: School Office
UOC6 HPW3 WKS14 S1 or S2
Prerequisite/s: FINS5513

This course serves as one of the introductory subjects to the study of finance. It focuses on the major financial markets, including the equity, money, bond, exchange rate and derivatives markets. Students will learn about the basics of financial instruments in these markets, such as bank bills, treasury bonds, futures and options. In addition, students are exposed to the tools of analyses and the roles and innovations of major financial institutions. These include the banks and non-banks, such as finance companies, building societies and credit unions, life and insurance companies as well as funds management companies.

ECON5116
Environmental Economics
Staff Contact: School Office
UOC6 HPW3 WKS14 S1

The aim of this course is twofold: (i) to introduce students to environmental economics and cost benefit analysis as it relates to the assessment of environmental issues. Topics include: pollution and pollution policy; environmental cost-benefit analysis and economic methods for measuring costs and benefits; species extinction and irreversibility; environmental ethics and discounting; the environment and developing countries; and the sustainable economy.

Advanced Investment and Funds Management
Staff Contact: School Office
UOC6 HPW3 WKS14 S1 or S2
Prerequisite/s: FINS5517, and FINS5535 or corequisite

This course covers advanced techniques of modern fund management. Topics include: asset allocation decisions, domestic versus international fund components, integration of equity, bond and cash management, program trading, design of algorithms for automated decisions and the legal and ethical ramifications of fund design and decisions. The course structure consists of lectures and speakers from the fund management industry.

FINS5511
Corporate Finance
Staff Contact: School Office
UOC6 HPW14 S2
Prerequisite/s: ACCT5901 and ECON5103 and ECON5203 (or ECON5105 and ECON5203 and ACCT5933 for students in Program 1051)

Essential aspects of financial decision-making in business. Designed to enable the student to usefully employ the following concepts in business environment: investment decisions under uncertainty; cost of capital structure; mergers and takeovers; and working capital management.

FINS5551
International Insurance Management
Staff Contact: School Office
UOC6 HPW3 WKS14 S2
Prerequisite/s: FINS5513 or corequisite

This course is designed to acquaint the student with the planning and administration of a worldwide corporate insurance program under conditions of uncertainty. International dimensions of risk management will be surveyed. Topics will include, inter alia: the structure of insurance markets internationally; the economics of international trade in insurance; the integration and globalisation of financial services; the legal environment of risk management and insurance internationally; the tax environment for insurance internationally; rationales and nature of government intervention.
into insurance markets worldwide; regulatory harmonisation in insurance; the demographic and social environment for insurance internationally. The course also deals with insurance with a focus on global risk management.

GEOG1721

Planet Earth: Environment In Crisis

Staff Contact: D Edwards, A/Prof M Fox, Dr S Mooney

UOC6 HPW4 WKS14 S2

Note/s: Excluded GEOG1701, GEOG1031, GEOG1073

An introduction to the role of environmental processes in shaping the patterns of the physical environment. The operation of global environmental systems. Emphasis on the interaction of humans with their environment and the causes of environmental crises. Topics include water resources, circulation of the atmosphere and oceans, weather and climate, the formation of the Earth, fluvial and coastal landforms, land degradation, the biosphere and ecosystems, Australian biotic patterns, human impact on natural systems.

GEOG2721

Soils and Landforms

Staff Contact: J Sammut

UOC6 HPW4 WKS14 S1

Prerequisite/s: GEOG1701 or GEOG1721 or GEOG1031 or GEOG1073

Note/s: Excluded GEOG2051, GEOG3011 and GEOG3025

The physical and chemical properties of soil, and the processes and factors of soil formation. Soil classification schemes. The relationship between soils and the landforms on which they form. The evolution of landforms in fluvial, arid and coastal environments. Emphasising current processes and Quaternary history.

GEOG2811

Introduction to Remote Sensing

Staff Contact: School Office

UOC6 HPW4 WKS14 S1

Note/s: Excluded GEOG2021

An essential knowledge base for future work and study in remote sensing. Topics include electromagnetic theory, principles of remote sensing, field and laboratory measurement of energy, aerial photography and photogrammetry, past, present and future sensors, and practical remote sensing using coarse resolution optical sensors, hyperspectral and thermal sensors, altimeters and radar. Computer-based laboratories use a wide range of images and provide familiarity with ERDAS Imagine and IDL ENVI and experience in image pre-processing, analysis and interpretation techniques.

GEOG3122

Geographic Information Systems

Staff Contact: S Filan

UOC6 HPW4 WKS14 S2

Prerequisite/s: Successful completion of at least one year of program 3978.0600 Computer Science or Enrolments in this subject are constrained by availability of laboratory facilities. All enrolments must be approved by the Head, School of Geography, or representative

An introduction to geographic information systems with special reference to computer-based systems for resource evaluation. Case study evaluation, application of the MAP and other GIS software.

GEOG3711

Biogeography

Staff Contact: A/Prof M Fox, Dr S Mooney

UOC6 HPW4 WKS14 S2

Prerequisite/s: GEOG2711, or two of BIOS1101, BIOS1201, BIOS1301

Note/s: Excluded GEOG2025


GEOG3721

Pedology

Staff Contact: A/Prof M Melville

UOC6 HPW4 WKS14

Prerequisite/s: GEOG2721, or both BIOS1101 & BIOS1201, or both GEOG1101 & GEOG1201, or both

Note/s: Excluded GEOG3011. Not offered in 2000

Soil physical and chemical properties and their interrelationships. Clay mineral structure and behaviour, soil solution chemistry, soil water movement. Soil properties in natural, rural, urban landscapes. Assessment of soil fertility, dwelling, dispersibility, erodibility and aggregate stability. Laboratory analysis with emphasis on properties associated with land capability assessment.

GEOG3761

Environmental Change

Staff Contact: Dr S Mooney

UOC6 HPW4 WKS14

Prerequisite/s: Successful completion of a Year 2 Program in Science, or Arts and Social Science.

Note/s: Excluded GEOG3062


GEOG4320

Soil Degradation and Conservation

Staff Contact: School Office

UOC6 HPW4 WKS14

Prerequisite/s: Completion of Stage 3 of a four-year degree program.

Note/s: Contact hour include some fieldwork which forms a compulsory part of this subject. Students will incur some personal costs for fieldwork

Identification, assessment and analysis of the main process of soil degradation, including the role of climate, vegetation, geomorphology and pedology in controlling the processes. Discussions of appropriate management strategies for reducing degradation for reclaiming degrade landscapes. Topics include: surface wash, gully erosion, wind erosion, soil acidification, soil structure decline, salinisation, accumulation of toxins and desertification.

GEOG9011

Environmental Impact Assessment

Staff Contact: Mr J Sammut

UOC6 HPW4 WKS14

Environmental planning legislation and decision making processes in Australia with special reference to NSW. The content and structure of Environmental Impact Statements and the stages in the granting of development consent. Approaches to EIA with reference to the assessment of impacts on the natural, social and economic environments. Case studies exemplifying procedures, techniques, methods, and issues. Trends in EIA in Australia and selected other countries.

GEOG9012

Remote Sensing Applications

Staff Contact: School Office

UOC6 HPW3 WKS14

Using a diverse range of case studies, this subject demonstrates broad remote sensing applications in forestry, agriculture, natural resource management, wildlife conservation, environmental change, pedology, oceanography, geology, meteorology, and politics. Specific applications relate to the assessment of tropical and sub-tropical land cover change, ecosystem dynamics and biogeochemical cycles, vegetation biophysical properties, wetlands management and monitoring, fire, pollution, urban studies and cold region hydrology. Computer-based laboratories allow the student to explore a range of optical, thermal and radar data appropriate to particular applications, and provide exposure to practical image processing and interpretation techniques including classification, change
detection, formulation of indices and derivation of empirical relationships. Practical experience with IDL ENVI and Erdas Imagine is provided.

GEOG9013
Directed Problems in Remote Sensing
Staff Contact: School Office
UOC6 HPW3 WK514
A detailed investigation of a particular aspect of remote sensing technology or an area of applications relevant to candidates interests and background.

GEOG9014
Computer Mapping and Data Display
Staff Contact: S Filan
UOC6 HPW4 WK514 S1
Introduction to automated cartography and thematic mapping; theoretical and practical problems in displaying and mapping data by computer; review and application of selected computer mapping packages. Mapinfo is used for cartographic manipulation and output.

GEOG9016
Principles of Geographic Information Systems
Staff Contact: School Office
UOC6 HPW3 WK514 S1
Study of selected geographic information systems; problems of data capture and display, datastorage and manipulation, system design and development; cartographic displays and computer mapping. INFO is used for database management, and ARCINFO and MAP for spatial data manipulation and display.

GEOG9017
Advanced Geographical Information Systems
Staff Contact: School Office
UOC6 HPW3 WK514 S2
Prerequisite/s: GEOG9240 or GEOG9016
Advanced topics and concepts in GIS research and development. Focus is primarily on vector-based systems. Topics include data models, structures and capture; vector editing and algorithms; errors and data accuracy. Practical exercises based on ARCh INFO; INFO is used for data base management.

GEOG9018
Transportation Applications of Geographical Information Systems
Staff Contact: Dr B Parolin
UOC6 HPW3 WK514 S2
Prerequisite/s: GEOG9240 or GEOG9016
This subject provides an overview and hands-on experience in the design, use, and interpretation of Transport Information Systems (GIS-Ts) . Topics covered include transportation layers, transportation related referencing systems, data structures, network structures, urban transportation planning models, log and other spatial models. At the end of the subject, the student will have a sound working knowledge of transportation GIS and an ability to work directly with real problems in government and private sectors.

GEOG9020
Application and Management of Geographical Information Systems
Staff Contact: School Office
UOC6 HPW3 WK514
Note/s: Not offered in 2000

*GEOG9021
Image Analysis of Remote Sensing
Staff Contact: School Office
UOC6 HPW3 WK514
*Note/s: Please check with school
This subject, which is largely laboratory based, provides an in-depth understanding of image processing, analysis and interpretation. Topics include human vision and colour, the construction, display, enhancement and filtering of images, geometric, radiometric and atmospheric correction, supervised and unsupervised classification, principal components analysis, and spatial modelling. The subject also demonstrates the theory of hyperspectral and radar remote sensing through lectures and practical computer-based processing. The subject provides training in both remote sensing and GIS software, including ERDAS, ENVI, ArcView and ArcInfo.

GEOG9022
Vegetation Management
Staff Contact: A/Prof M Fox
UOC6 HPW3 WK514 S1
Note/s: Fieldwork forms a compulsory part of this subject and students will incur personal costs
The subject provides a background in theory and practice in vegetation management, particularly under Australian conditions. It covers the description and measurement of vegetation, vegetation dynamics, vegetation response to perturbation and human impacts, theories, and modelling of vegetation change. A third of the subject is devoted to management strategies of selected vegetation types.

GEOL0360
Remote Sensing Applications In Geoscience
Staff Contact: A/Prof GR Taylor
UOC6
The physics of various remote sensing techniques. Consideration of various sources of imagery; Landsat, TM, SPOT, aircraft scanners etc. Spectral properties of rocks, soils and vegetation. Geophysical applications of visible, infrared, thermal and multi-parameter microwave imagery in resource exploration, tectonic studies, geological hazard recognition and environmental monitoring. Mapping and data integration methodologies.

GEOL5211
Geology for Mining Engineers 1
Staff Contact: Dr PG Lennox
UOC3
Note/s: Fieldwork of up to 1 day is a compulsory part of this subject. Students will incur personal costs

GEOL5301
Physical Geology for Petroleum Engineers
Staff Contact: Dr PG Lennox
UOC3 HPW3
Note/s: Fieldwork of up to 2 days is a compulsory part of this subject. Students will incur personal costs. This is a servicing subject taught within courses offered by other schools or faculties. Not offered in 2000
Introduction to earth sciences nature and properties of rocks and minerals; sedimentation, sedimentary structures and sedimentary environments; stratigraphy and the geological time scale; geological maps and strickers; introduction to plate tectonics. Origin and occurrence of groundwater. Formation of coal and petroleum. Regional geology of Australian petroleum basins.

GEOL5311
Geology for Mining Engineers 2
Staff Contact: Dr PG Lennox
Prerequisite/s: GEOL5211
Structural geology including stereographic projection and fracture analysis as applied to mining operations. Origin and properties of coal, oil, oil shale and natural gas. Principles of hydrogeology including the significance of groundwater in mining operations. Mineralogy of important non-metallic resources, processes of ore formation. Exploration methods.
GEOL5312
Petroleum Geology and Geophysics
Staff Contact: A/Prof CR Ward
UOC3 HPW3 S2
Prerequisite/s: GEOL5301
Note/s: Excluded GEOL5321
Petroleum Geology: Petroleum generation including kerogen types and maturation, migration, entrapment and degradation; sedimentary features of reservoir sequences. Structural traps, diapirs and fractured rock reservoirs; coal-bed methane, porosity development; exploration and resource evaluation. Petroleum Geophysics: fundamentals of seismic wave propagation, seismic data acquisition and interpretation; three dimensional seismic methods; case studies.

GEOL5321
Petroleum Geology and Geophysics
Staff Contact: A/Prof CR Ward
UOC6 HPW6 S2
Note/s: Excluded GEOL5301, GEOL5302, GEOL5312
Introduction to the Earth sciences: nature and properties of rocks and minerals; sedimentation and sedimentary environments; stratigraphy and the geological time scale; geological maps and structures; introduction to plate tectonics. Nature and geological properties of petroleum; petroleum generation, migration, entrapment and degradation; sedimentology of petroleum-bearing sequences; primary and secondary porosity; structural and stratigraphic traps; formation waters; coal-bed methane, oil shale and other non-conventional petroleum sources; geological and geophysical methods in petroleum exploration and development; regional geology of selected petroleum basins.

GEOL5331
Petroleum Reservoir Geology
Staff Contact: Dr PG Lennox
UOC3 HPW3 S2
Prerequisite/s: GEOL5302
Note/s: Excluded GEOL5401. Not offered in 2000
Analysis of petroleum provinces, basins and fields, including their tectonic setting and hydrocarbon habitat; reservoir sedimentology and basin development; petroleum systems; subsurface geologic maps and sections; traps and trapping mechanisms; geological and geophysical characteristics of selected reservoir types; microscopic features of reservoir rocks; fundamentals of seismic reflection methods, including wave propagation, data acquisition, processing and interpretation; three-dimensional and time-lapse seismic methods; introduction to sequence stratigraphy; estimation of petroleum resources.

GEOL5332
Petroleum Reservoir Geophysics
Staff Contact: D Palmer
UOC3 HPW3 S2
Prerequisite/s: GEOL5331
Note/s: Excluded GEOL5401. Not offered in 2000
Interpretation of 2D and 3D seismic reflection data, including horizontal and vertical slices, presentation parameters, horizon autotracking, fault mapping, stratigraphic and structural interpretation, reservoir evaluation. Inversion of seismic reflection data to determine petrophysical properties. Direct hydrocarbon indicators, including amplitude variation with offset.

GEOL5412
Special Topics In Petroleum Geoscience
Staff Contact: A/Prof CR Ward
UOC8 HPW6 S2
Note/s: Subject to approval
Instruction by lectures, tutorials and assignments in aspects of geoscience and their application to the petroleum industry. Individual students will select modules, in consultation with the Head, School of Geology, covering topics such as sedimentary rocks and clay minerals, groundwater hydrology, geophysics, coastal monitoring and environmental assessment, complemented by a relevant project task.

GEOL9011
Groundwater Environments
Staff Contact: Dr J Jankowski
UOC3
Note/s: Short course
Study of the detailed occurrence and the environmental problems associated with groundwater in aquifer systems of importance to Australia. Environments will include karst hydrogeology and hydrogeochemical processes in karst terrains, natural saline groundwaters, deep sedimentary basins, groundwater-surface water interaction, fractured rock, alluvial plains, and unconsolidated sediments.

GEOL9053
Hydrogeochemistry
Staff Contact: Dr J Jankowski
UOC3
Note/s: Short course

GEOL9054
Analysis and Interpretation of Hydrochemical Data
Staff Contact: Dr J Jankowski
UOC3
Note/s: Short course

GEOL9055
Hydrogeochemical Modelling
Staff Contact: Dr J Jankowski
UOC3
Note/s: Short course

GEOL9060
Environmental Geology
Staff Contact: Dr DR Cohen
UOC6
Geology and urban planning; geological input to Environ-mental Impact Statements; soil and rock construction materials; ground subsidence due to mining and ground-water pumping; geological hazards; land degradation and problem soils; engineering geomorphology.

GEOL9112
Investigation and Management of Salinity
Staff Contact: Dr J Jankowski
UOC3
Note/s: Short course
This subject provides students with an understanding of data communication and distributed data processing in a business environment; and an understanding of the management issues associated with telecommunication systems. Main topics include data communication concepts; computer networks; reference to international standards and common industry communications software packages; local/metropolitan/wide area networks; network management; telecommunications services; and data security.

INFS3603  
Business Intelligence Systems  
*Staff Contact: School Office*

UOC6 HPW3 WKS14 S1  
*Prerequisite/s:* INFS1602 and INFS1603

This subject examines the process of decision making and work group activity by professional and managerial people; the tools and techniques available in information technology to support these processes and when they can be advantageously used; some of the reasons why so many executive support systems do not achieve their intended objectives; and the cultural and organisational issues involved in the use of Information Technology tools and techniques.

INFS3604  
Information Technology Management  
*Staff Contact: School Office*

UOC6 HPW3 WKS14 S2  
*Prerequisite/s:* INFS2603

This subject introduces the strategic and operational management issues involving information systems and software. Consideration is given to both quantitative and qualitative management techniques, including the practical application of tools and concepts for software project management, as well as material on software metrics and software quality. In addition, techniques are covered for strategic planning of information systems and ensuring business contribution.

INFS3608  
Advanced Database Systems  
*Staff Contact: School Office*

UOC6 HPW3 WKS14 S1  
*Prerequisite/s:* INFS1602 and INFS1603

This subject provides students with an in-depth understanding of database application design and database management for large and small businesses; practical experience using formal database design methodologies in systems development; and an understanding of the technological issues of database systems in a modern IT infrastructure. The main topics include advanced modelling of business applications, database logical design, normalisation through decomposition and synthesis, physical design, concurrency, security, and transaction management issues, contemporary issues of object-oriented databases, advanced database applications, multimedia databases, data warehousing, data mining, OLAP, and client/server design on the Internet.

INFS4811  
Knowledge Based Information Systems  
*Staff Contact: School Office*

UOC6 HPW3 S2  
*Prerequisite/s:* Admission to BEng in Software Eng. degree course at Honours level majoring in Information Systems plus approval of HOS first  
As for INFS5992. See Graduate Study: Subject Descriptions.

INFS4891  
Decision Support Systems  
*Staff Contact: School Office*

UOC6 HPW3 WKS14 S1  
*Prerequisite/s:* Admission to BEng in Software Eng. degree course at Honours level majoring in Information Systems plus approval of HOS first  
As for INFS5991. See Graduate Study: Subject Descriptions.
An introduction to the central concepts and issues of project management and the practical benefits of project planning and management together with resource management. Practical sessions in project planning and the use of a computer based management tool. Additional topics include customer focus, lifecycle customisation, work packages, progress monitoring, risk evaluation, quality management, people skills, and negotiation skills. Case studies of and examples from software development projects will be used as illustrations.

Software engineering management and measurement of complex systems, software development maturity, project planning and management, estimation models and techniques, project scheduling, software quality, reliability, assurance, software productivity models.

This subject aims to assist students to develop their knowledge and understanding of important issues involved in the management of information systems in organisations and their ability to critically analyse these issues. Management of information systems will be considered at strategic, tactical and operational levels. Particular emphasis will be given to the management of enterprise-wide and inter-organisational systems and planning for their strategic use. Students without knowledge of and experience in management or the use of IS in organisations may wish to take the subject INFS4848/INFS5848 before this subjects.

The role of information and models in managerial decision making and prediction. The role of information systems in decision making. Assessing the value of information systems and the contribution of information in decision making under uncertainty. The role of information in managerial prediction and forecasting. The development of computer based models to support tactical management.

This subject aims to provide an introduction to the use and management of information systems in business. Students will have the opportunity to develop their knowledge and understanding of the role of information systems in organisations, study relevant and current topics to the area, and examine the components that interact within information systems. This subject also encourages students to consider ethical practices related to the development and use of information systems.

An understanding of the role and expectations of a systems analyst in the context of the organisational environment, exploring and using the tools and techniques available to the systems designer, expanding and building on the framework of analysis and design acquired from the other subjects and student experiences.

Information used for decision making and the application of information technology to assist or support the decision making process. Topics include decision making models, the impact of different management styles, the use of decision tools and the development of decision support systems including issues of model management and interface design. Practical examples of decision support systems are examined as are executive information systems and computer mediated communications within an organisation.

A review of data management principles including both simple and complex file designs, and the concept of database management systems. Alternative database management system architectures, including network hierarchical and relational approaches. Database query systems, including relational algebra. Case studies and assignments embodying these principles.

Focuses on managing in a rapidly changing environment. Topics include: leadership, decision-making and innovation; power, legitimacy, and the socialisation process; the structure and design of organisations, organisation and domination, the evolution of ethical awareness; intergroup conflict and conflict resolution; skills of managing - communication, negotiation, coaching and objectives setting; organisational culture and transformation.

Concepts and issues in Australian industrial relations at the macro or systems level, with overseas comparisons where appropriate. Labour movements and the evolution of employee-employer relations in the context of industrialisation and change; origins and operations of industrial tribunals at the national and state levels; their instrumentalities; nature of industrial conflict and procedures for conflict resolution such as arbitration and bargaining; national wage policy.

Nature and purposes of the legal system and industrial law, the law concerning the contract of employment. Trade union law. Industrial law powers of governments. The Commonwealth and New South Wales conciliation and arbitration systems. Awards. Penal sanctions for industrial law. Industrial torts. Topics and issues of importance in the employment and industrial law field.
IROB5712
Negotiation, Bargaining and Advocacy
Staff Contact: S Hammond
UC6 HPW3 WK514 S2
Prerequisite/s: IROB5700 or IROB5900
Corequisite/s: IROB5700 or IROB5900
Aims to give students studying industrial relations and/or human resource management practical skills in the areas of industrial and workplace negotiation, bargaining and advocacy. The subject examines the content, character and making of industrial awards and agreements, with special emphasis on industrial tribunal processes and negotiation and advocacy in relation to paid employment. Students also receive a practical grounding in the requirements of particular policies and regulations governing employment relations, including Enterprise Bargaining, Equal Opportunity and Affirmative Action, Occupational Health and Safety, and Termination of Employment.
In addition, the subject provides appropriate theoretical perspectives on these and related employment issues.

IROB5901
Organisational Behaviour
Staff Contact: School Office
UC6 HPW3 WK514 S1
Note/s: Excluded PSYC7100.
Seeks to explain human behaviour within organisations. It draws predominantly from the behavioural science disciplines of psychology and social psychology. Its foci are the individual, the group, and the behavioural processes involved in organisation integration, change and development. Topics covered include personality, attitudes and values, motivation and learning, interpersonal behaviour, group dynamics, leadership and teamwork, decision-making, power and control.

IROB5903
Organisational Innovation and Change
Staff Contact: Dr D Morgan
UC6 HPW3 WK514 S2
Prerequisite/s: IROB5901 or IROB5700
Corequisite/s: IROB5901 or IROB5700
Examines the need for, awareness, nature and processes of organisational change. It focuses on administrative innovation and contemporary techniques and procedures used to initiate, plan and implement change. The subject is shaped by contemporary concerns over the need to combine consistent structures for predictable and efficient operations and personnel employment, with flexibility and timely adaptability to respond to the environment. It adopts a critical perspective and uses a multi-disciplinary framework with material drawn from Organisational Studies, Human Resource Management, Organisational Behaviour, and Sociology. Themes encompassed include: features of organisation design; types and phases of change; managerial and organisational cognition; culture and intervention for change; organisation development; techniques for process change, (eg TQM, business processes); technological innovation; public-private sector differences; employment systems; career management; and change agency. Emphasis for study and class work is placed on both analytical scholarship and practical projects.

IROB5908
Strategic Human Resource Management
Staff Contact: T Wilcox
UC6 HPW3 WK514 S1
Prerequisite/s: IROB5700
Corequisite/s: IROB5700
Deals with the integration of human resource management and corporate strategy and examines the way employment policies can create alignment between the internal and external environments of the organisation. It specifically examines the formulation, selection and implementation of human resource strategies, and deals with issues such as performance appraisal, competency development, corporate acculturation and management of corporate and cultural change. In addition, it analyses and evaluates competing human resource management packages and the issue of cultural and national transferability of human resource policies.

IROB5912
International Dimensions of Negotiation Behaviour
Staff Contact: Dr J Holt
UC6 HPW3 WK514 S2
Prerequisite/s: IROB5901 or IBUS5601
Corequisite/s: IROB5901 or IBUS5601
Every aspect of business negotiations by the dimensions of culture. The purpose of this course is to investigate how negotiation, as a process, differs across cultures in terms of culture conditioning, negotiations, style, approaches to problem solving, implied assumptions, and the role of ceremony and formality. The course consists of three modules. Taking an Asia-Pacific focus, the first module builds a framework through which to conceptualise the international dimensions that impact on Asia-Pacific business negotiations. The second module examines the roots and principles of East Asian strategic thinking that have shaped the negotiation mindset underlying the Asian business cultures of today. In the third module, students will be guided in applying the principles of intercultural negotiation derived from the previous modules to formulate specific negotiations strategies for selected case studies. Students will also be given the opportunity to question and evaluate the negotiation approaches of guest specialists involved in international negotiation from different cultural perspectives.

IROB5914
Employee Communication
Staff Contact: Dr A Bordow
UC6 HPW3 WK514 S1
Prerequisite/s or Corequisite/s: IROB 5700 or IROB5900
Considers how to understand communication in a work setting and the various ways we make use of communication in the course of organisational activity. The study of public relations, corporate and managerial, and interpersonal communication theories and practices will be reviewed to set the subject's foundations. Development of the knowledge-based organisations will also be thoroughly examined in the context of our contemporary information age. Case study project work is assigned to enable awareness of how to apply the subject matter to actual work places. Students participate in this subject in one of three flexible delivery modes: via weekly in-class attendance, via full distance learning through the Internet, or by alternating between in-class and on-line attendance throughout term (class attendance in Weeks 1 and 13 is mandatory for all students).

IROB5915
Human Potentailities
Staff Contact: School Office
UC6 HPW3 WK514 S1
Prerequisite/s: IROB5700 or IROB5901
Corequisite/s: IROB5700 or IROB5901
Follows an empirical and experiential approach to the study of human potentialities. Issues explored include: human dominance and destructiveness; the dynamics of awareness; intentionality and holonomy; skilled performance; human creativity; the individuation process; methods of realising potential, perennial and modern.

IROB5920
Men and Women in Organisations
Staff Contact: Dr L Takesa
UC6 HPW3 WK514 S2
Prerequisite/s: IROB5700 or IROB5900
Corequisite/s: IROB5700 or IROB5900
Presents a multi-disciplinary overview of the issues and problems pertaining to gender relations in organisations. It evaluates a range of concepts and methods necessary for understanding the processes and structures responsible for the current position of men and women as employees and managers in both the public and private sectors. Topics covered from the perspective of gender relations include: labour market segmentation, industrial relations theory and practice, the role of the state, organisational power and politics, Equal Employment Opportunities and the functioning of the merit principle and the use of post-modernist theory for understanding the operation of human resource management and organisational culture.
IROB5947
Remuneration and Performance Management
Staff Contact: School Office
UOC6 HPW3 WKS14 S1
Prerequisite/s: IROB5700
Corequisite/s: IROB5700
Examines theories, practices and debates in contemporary remuneration and performance management, with special reference to the trend away from traditional pay-for-position to performance-related remuneration at individual, work group and organisational level. Themes covered include: the concept of the New Pay, theories of employee motivation, competing perspectives on procedural and distributive justice, the ethics and effectiveness of performance-related pay, job-based pay and job evaluation, broadbanding, developing assessing and rewarding individual merit, recognition awards, gainsharing and team-based pay, profit-sharing and employee ownership plane, executive pay, and the development of comprehensive pay and performance management systems. Adopts a critical and multi-disciplinary perspective embracing Human Resource Management, Organisational Studies, Industrial Relations, Sociology, Labour Economics, Psychology and Ethics.

IROB5948
Human Resource Recruitment, Selection and Development
Staff Contact: C Royal
UOC6 HPW3 WKS14 S1
Prerequisite/s: IROB5700
Corequisite/s: IROB5700
Examines the recruitment, selection, training and development of people in organisations. Issues addressed include: staff recruitment procedures, selection practices and procedures, human resource planning, the analysis of skill, competency and training needs, learning systems, training program development, internal and external training policy, career planning and internal labour market and management development.

LAW5020
Occupational Health and Safety Law
Staff Contact: Prof A Brooks
UOC6 HPW4 SS
The law relating to compensation for work-related injuries and disabilities and to the regulation of safety standards in workplaces. Topics include: the employer's common law duty of care; the common law duty of care of manufacturers of products for use at work; the development and application of workers compensation schemes; existing protective legislation in Australia; individual rights under protective legislation.

LEG5511
Legal Foundations of Business
Staff Contact: School Office
UOC6 HPW3 WKS14 S1 or S2
Prerequisite/s: Nil
Law is an increasingly significant factor in business. In any business decision fundamental legal questions may arise about the potential liabilities of the parties, the rights that the parties have and how the business or transaction should be organised. This course introduces the Australian legal system; outlines alternative forms of business organisation; discusses the legal framework of business regulation; and examines areas of law particularly relevant to business including the law of contract and torts, the law relating to specialised commercial transactions, the regulation of restrictive trade practices and sales promotion, and intellectual property.

LEG5531
Competition and Consumer Law
Staff Contact: School Office
UOC6 HPW3 WKS14 S2
Prerequisite/s: LEGT5511 or equivalent or Approval from the Head of School
Trade practices and fair trading laws have assumed fundamental importance in the Australian marketplace. This course examines the regulation of restrictive trade practices under the Trade Practices Act 1974 (Commonwealth) and the Competition Code with particular reference to collusive activity, distribution methods, pricing arrangements, abuse of market power, mergers and access to essential facilities. This course also examines major fair trading initiatives under the Trade Practices Act and State and Territory Fair Trading legislation with particular reference to misleading or deceptive conduct, unconscionable conduct, advertising and marketing strategies and product liability. Aspects of the protection of intellectual property are also examined.

LEG5541
Company Law
Staff Contact: School Office
UOC6 HPW3 WKS14 S1
Prerequisite/s: LEGT5511 or equivalent or Approval from the Head of School
The law relating to business organisations, including partnerships, joint ventures, trading trusts, and companies incorporated under the Corporations Law. The primary focus is on company law and, in particular, the significance of the corporate entity; groups of companies; the division of corporate control amongst directors, management and shareholders and their respective roles; the duties of directors; share and debt capital; fund raising; enforcement of shareholders rights; insolvency and liquidation.

LEG5551
Revenue Law
Staff Contact: School Office
UOC6 HPW3 WKS14 S2
Prerequisite/s: LEGT5511 or equivalent or Approval from the Head of School
A series of major changes beginning in the mid 1980s have transformed the Australian tax system. The complexity and comprehensiveness of the Australian tax system mean that tax considerations are now of major importance in most business decisions. After outlining tax policy, tax mix and tax reform considerations, this course concentrates on income taxation in Australia. Topics include: concepts of income; allowable deductions; tax accounting; taxation of partnerships; trusts and corporations; anti-avoidance provisions; tax administration; capital gains tax; and fringe benefits tax.

LEG5561
Legal Aspects of Finance
Staff Contact: School Office
UOC6 HPW3 WKS14 S1
Prerequisite/s: Nil
The size and complexity of modern capital markets requires a comprehensive understanding of essential legal concepts involved. Topics include commercial structures including companies, joint ventures, partnerships and trusts; procedures for equity and debt financing of entrepreneurial schemes with special reference to both law and practice; the regulation of the securities market; corporate restructuring and take-overs, mergers and reconstructions; the law of company charges; aspects of the taxation of commercial financing.

LEG5562
Business Law in a Global Economy
Staff Contact: School Office
UOC6 HPW3 WKS14 S2
Prerequisite/s: Nil
Developments in technology, telecommunications and deregulation which have taken place in the latter part of this century have led to the creation of a global economy. This course addresses the legal environment of this economy and aspects of its operation. Topics include GATT and the World Trade Organisation; the laws and practices relating to international sales and financing agreements; arrangements for conducting international business, including franchising, licensing, joint ventures and technology transfer; the resolution of international disputes and the protection of intellectual property.
Franchising
Staff Contact: School Office
UOC6 HPW3 WKS14 S1
Franchising is becoming the dominant force in the distribution of goods and services. This course examines the nature, development and significance of franchising in the Australian and international economies and addresses relevant legal and commercial issues. The legal nature and commercial implications of other distribution strategies - technology transfers, trademark licensing, character and personality merchandising - are also examined.

MARK1012
Marketing Fundamentals
Staff Contact: School Office
UOC6 HPW4 WKS14 S2
Prerequisite/s: Prerequisites or Corequisites: ACCT1501, ECON1101, ECON1202
Major concepts and theories relevant to the study and practice of marketing are introduced. Topics include the changing global marketplace, marketing processes and planning, the use of market research, an understanding of consumers and customers, decision-making and the marketing mix, market segmentation, positioning and product differentiation. This introductory subject prepares students for further study across the broad spectrum of product, service, consumer, business-to-business, industrial global and social marketing.

MARK5902
Elements of Marketing
Staff Contact: School Office
UOC6 HPW3 WKS14 S1 or S2
Prerequisite or corequisite: one core unit The course is a blend of theory and practical application. The central theme running throughout the teaching program is that marketing is not a fragmented assortment of actions and functions taking place among disconnected institutions operating in isolation. Rather it is a total system of business action. The task of managing a marketing operation involves strategic and tactical decision making. It also demands an understanding of the structure of the marketing system, the various institutions that make up that system, and the role of each institution within the system.

MARK5903
International Marketing
Staff Contact: School Office
UOC6 HPW3 WKS14 S1
Prerequisite/s: MARK5902, MARK5911 and MARK5928
This subject contrasts international marketing with domestic marketing and highlights the conceptual, descriptive and strategic differences. It focuses on the various environments impacting on international marketing (economic, technological, socio-cultural, political-legal and corporate). The implications of these for the marketing mix are analysed, and broad strategic alternatives for the international marketer are covered. Product, pricing, promotional and distribution issues and options are canvassed. Cases are drawn from multiple markets and the subject has a global focus.

MATH1090
Discrete Mathematics for Electrical Engineers
Staff Contact: School of Mathematics First Year Office
UOC3 HPW3 S1
Prerequisite/s: As for MATH1131
Corequisite/s: MATH1131 or MATH1141
Note/s: Excluded MATH1081. Not available in the Science program unless specified as part of a combined degree program
The role of proof in mathematics, logical reasoning and implication, different types of proofs. Sets, algebra of sets, operations on sets, mathematical logic, truth tables, syntax, induction. Recursion, recursive logic, recurrence relations.

MATH1131
Mathematics 1A
Staff Contact: School of Mathematics First Year Office
UOC6 HPW6 S1 or S2
Prerequisite/s: HSC mark range required: 2 unit Mathematics (90-100), or 2 and 3 unit Mathematics (100-150) or 3 and 4 unit Mathematics (100-200) or MATH1011 (these ranges may vary from year to year). 2 unit Mathematics in this instance refers to the 2 unit Mathematics subject which is related to the 3 unit Mathematics subject. It does not refer to the subjects Mathematics in Society or Mathematics in Practice
Note/s: Excluded MATH1011, MATH1031, MATH1141, MATH1151, ECON1202, ECON2291
Complex numbers, vectors and vector geometry, linear equations, matrices and matrix algebra, determinants. Functions, limits, continuity and differentiability, integration, polar coordinates, logarithms and exponentials, hyperbolic functions, functions of several variables. Introduction to computing and the Maple symbolic algebra package.

MATH1141
Higher Mathematics 1A
Staff Contact: School of Mathematics First Year Office
UOC6 HPW6 S1
Prerequisite/s: HSC mark range required: 2 and 3 unit Mathematics (145-150) or 3 and 4 unit Mathematics (186-200) (these numbers may vary from year to year)
Note/s: Excluded MATH1011, MATH1031, MATH1131, MATH1151, ECON1202, ECON2291
As for MATH1131 but in greater depth.

MATH1231
Mathematics 1B
Staff Contact: School of Mathematics First Year Office
UOC6 HPW6 S2 or HPW9 SS
Prerequisite/s: MATH1131 or MATH1141
Note/s: Excluded MATH1021, MATH1031, MATH1241, MATH1251, ECON1202, ECON2291

MATH1241
Higher Mathematics 1B
Staff Contact: School of Mathematics First Year Office
UOC6 HPW6 S2
Prerequisite/s: MATH1131 or MATH1141, each with a mark of at least 65
Note/s: Excluded MATH1021, MATH1031, MATH1231, MATH1251, ECON1202, ECON2291.
As for MATH1231 but in greater depth.

MATH2011
Several Variable Calculus
Staff Contact: School Office
UOC6 HPW4 S1
Prerequisite/s: MATH1231 or MATH1241
Note/s: Excluded MATH2100, MATH2110, MATH2510, MATH2610.
Functions of several variables, limits and continuity, differentiability, gradients, surfaces, maxima and minima, Taylor series, Lagrange
MATH2019  
**Engineering Mathematics 2CE**  
*Staff Contact: School Office*  
UOC6  HPW5  S2  
*Prerequisite/s: MATH1231 or MATH1241*  
*Note/s: Excluded MATH2009, MATH2023, MATH2039. Not available in the Science program unless specified as part of a combined degree program.*  

MATH2020  
**Mathematics 2A**  
*Staff Contact: School Office*  
UOC6  HPW6  S1  
*Prerequisite/s: MATH1021(CR) or MATH1231 or MATH1241*  
*Note/s: MAT2020 and MAT2030 are intended for students who want to take no more than 6 units of credit in Level II Mathematics. If any other Level II courses in Mathematics (other than Statistics courses) are taken then neither MAT2020 nor MAT2030 will be counted. Taught by the Kellerself-paced learning method.*  

MATH2029  
**Engineering Mathematics 2A**  
*Staff Contact: School Office*  
UOC6  HPW6  S1  
*Prerequisite/s: MATH1231 or MATH1241*  
*Note/s: Not available in the Science program unless specified as part of a combined degree program.*  

MATH2030  
**Mathematics 2B**  
*Staff Contact: School Office*  
UOC6  HPW2  S2  
*Prerequisite/s: MATH1021(CR) or MATH1231 or MATH1241*  
*Note/s: MATH2020 and MATH2030 are intended for students who want to take no more than 6 units of credit in Level II Mathematics. If any other Level II courses in Mathematics (other than Statistics courses) are taken then neither MATH2020 nor MATH2030 will be counted. Taught by the Kellerself-paced learning method.*  
Fourier series; multiple integrals, matrices and their applications to the theory of linear equations, eigenvalues; introduction to numerical methods.

MATH2039  
**Engineering Mathematics 2B**  
*Staff Contact: School Office*  
UOC6  HPW3  S2  
*Prerequisite/s: MATH1231 or MATH1241*  
*Note/s: Not available in the Science program unless specified as part of a combined degree program.*  
Multiple integrals, vector calculus, extrema of functions of several variables.

MATH2049  
**Mathematics and Statistics for Materials Science A**  
*Staff Contact: School Office*  
UOC3  HPW3  S1  
*Prerequisite/s: MATH1231 or MATH1241*  
*Note/s: Only available to students for whom it is specifically required as part of their program.*  
Statistics: graphical data analysis, random variables and their properties, normal and binomial distributions, functions of random variables and their simulation using computers, one and two sample inference methods, simple and multiple linear regression. Mathematics: functions of two variables, double integrals.
MATH2400
Finite Mathematics
Staff Contact: School Office
UOC3 HPW2 S1 or S2
Prerequisite/s: MATH1081 or MATH2321 or MATH1241
Note/s: MATH1081 Discrete Mathematics is recommended
Positional number systems, floating-point arithmetic, rational arithmetic, congruences, Euclid's algorithm, continued fractions, Chinese remainder theorem, Fermat's theorem, applications to computer arithmetic. Polynomial arithmetic, division algorithm, factorization, interpolation, finite field. Codes, error correcting codes, public-key cryptography.

MATH2510
Linear Algebra
Staff Contact: School Office
UOC6 HPW5 S1 or S2
Prerequisite/s: MATH1231 or MATH1241
Note/s: Excluded MATH2509, MATH2601.

MATH2509
Linear Algebra for Engineers
Staff Contact: School Office
UOC3 HPW3 S2
Prerequisite/s: MATH1231 or MATH1241
Note/s: Excluded MATH2501, MATH2601. Not available in the Science program unless specified as part of a combined degree program.

MATH2510
Real Analysis
Staff Contact: School Office
UOC3 HPW2.5 S1
Prerequisite/s: MATH1231 or MATH1241
Note/s: Excluded MATH2011, MATH2610.
Multiple integrals, partial differentiation. Analysis of real valued functions of one and several variables.

MATH2520
Complex Analysis
Staff Contact: School Office
UOC3 HPW2.5 S1 or S2
Prerequisite/s: MATH1231 or MATH1241
Note/s: Excluded MATH2620.
Analytic functions, Taylor and Laurent series, integrals. Cauchy's theorem, residues, evaluation of certain real integrals.

MATH2601
Higher Linear Algebra
Staff Contact: School Office
UOC6 HPW5 S1
Prerequisite/s: MATH1231 or MATH1241, each with a mark of at least 70
Note/s: Excluded MATH2501, MATH2509.
As for MATH2501, but in greater depth, and with additional material on unitary, self-adjoint and normal transformations.

MATH2610
Higher Real Analysis
Staff Contact: School Office
UOC3 HPW2.5 S1
Prerequisite/s: MATH1231 or MATH1241, each with a mark of at least 70
Note/s: Excluded MATH2011, MATH2510
As for MATH2510 but in greater depth.
MATH2841
Statistics SS
Staff Contact: School Office
UOC6 HPW4 S2
Prerequisite/s: MATH1021 or MATH1231 or MATH1241
Note/s: Excluded MATH2801, MATH2870, MATH2901, MATH2819, BIOS2041. Statistics MATH2841 is included for students desiring to attempt only 6 units of credit in Level II Statistics.

An introduction to the theory of probability, with finite, discrete and continuous sample spaces. The standard univariate distributions: binomial, Poisson and normal, an introduction to multivariate distributions. Standard sampling distributions, including those of chi-square, t and F. Estimation by moments and maximum likelihood interval estimation. The standard tests of significance based on the above distributions, with a discussion of power where appropriate. An introduction to experimental design: fixed, random effect models.

MATH2859
Probability, Statistics and Information
Staff Contact: School Office
UOC6 HPW3 S1 or S2
Prerequisite/s: MATH1231 or MATH1241
Note/s: Not available in the Science program unless specified as part of a combined degree program.


MATH2899
Applied Statistics for Chemical Engineers
Staff Contact: School Office
UOC3 HPW3 S2
Prerequisite/s: MATH1231 or MATH1241
Note/s: Not available to Science students except where specified as part of a combined degree.

Graphical data analysis. Review of probability, random variables and their properties. The normal and binomial distributions, the central limit theorem. Applications to statistical quality control. Theory of statistical inference including confidence intervals and hypothesis testing with applications to one and two sample problems based on the t- and F- test. Simple and multiple linear regression including data transformations to normality. Design and analysis of experiments, analysis of variance, introduction to factorial designs. Applications will be drawn primarily from the fields of chemical, bioprocess and petroleum engineering. Statistical computing will be based on Matlab.

MATH2901
Higher Theory of Statistics
Staff Contact: School Office
UOC6 HPW4 S1
Prerequisite/s: MATH1231 or MATH1241
Note/s: Excluded MATH2801, MATH2841, MATH2870, MATH2901, BIOS2041.

As for MATH2801 but in greater depth.

MATH2910
Higher Statistical Computing for Categorical Data
Staff Contact: School Office
UOC3 HPW2 S2
Prerequisite/s: MATH2901
Note/s: Excluded MATH2810.

As for MATH2810 but in greater depth.

MATH2931
Higher Linear Models
Staff Contact: School Office
UOC6 HPW4 S2
Prerequisite/s: MATH2901
Note/s: Excluded MATH2831, BIOS2041.

As for MATH2831 but in greater depth.

MATH3150
Transform Methods
Staff Contact: School Office
UOC3 HPW2 S2
Prerequisite/s: MATH2520


MATH3411
Information, Codes and Ciphers
Staff Contact: School Office
UOC6 HPW4 S2

Note/s: MATH1081 Discrete Mathematics is recommended

Discrete communication channels: information theory, compression and error control coding, cryptography.

MATS1002
Microstructural Analysis
Staff Contact: Dr P Krauklis
UOC3 HPW3

Note/s: Restricted to Combined degree course 3681.


MATS1072
Physics of Materials
Staff Contact: Dr S Bandyopadhyay
UOC4 HPW3 WKS14
Prerequisite/s: PHYS1002

Interatomic bonding in solid materials. Types of interatomic bonds, metallic, covalent, ionic. Introductory quantum mechanics in one dimension, free electron theory, effects of periodic potential, density of states curves. Effect of electron to atom ratio on conductivity and crystal structure; semiconductors; intrinsic, extrinsic. Exchange energy; ferromagnetism, antiferromagnetism. Elementary perturbation theory, covalent bond; crystal structures, properties. Ionic bond; force models, properties.
Note/s:
UOC3 HPW2 WK514

**Phase Equilibria**
*Staff Contact: School Office*


**Materials for Mining Engineers**
*Staff Contact: Dr P Krauklis*


- Prerequisite/s: MATS9520
- Materials used in Mechanical Engineering and related fields (Manufacturing Engineering Management, Aerospace Engineering, Naval Architecture) are discussed with emphasis on the dependence of properties and performance on microstructure. Aspects of materials selection during the design of engineering components that affect the service performance in applications, where failure can occur by brittle fracture, corrosion, creep or fatigue, will also be discussed.

**Non-Ferrous Physical Metallurgy**
*Staff Contact: Dr P Krauklis*

- Constitution, microstructure, processing and properties of non-ferrous alloys. Cast and wrought alloys based on aluminium, copper, magnesium, lead, tin and zinc.

**Diffusion**
*Staff Contact: Prof DJ Young*


**Fundamentals of Microbiology and Immunology**
*Staff Contact: Dr I Couperwhite*

- This subject is designed to give undergraduate and post graduate students a solid background in fundamentals of microbiology and immunology regardless of whether they have had previous experience in biological sciences or not. It should be noted that this subject is not suitable for students without a strong background in the science based disciplines. The subject introduces the student to the fascinating world of microorganisms: their ubiquity, peculiarities and the three domains of life i.e. Eubacteria, Archaea and Eucarya. Most of the subject will consider bacteria, fungi, yeasts and viruses in our everyday life and how their activities impinge on our well being. Metabolism and growth, microbial death & microbial genetics will be introduced to the students. Practical aspects of microbiology will be considered such as food intoxication, infection, spoilage and food fermentation. The immune system & the study of immunology will also be introduced in this subject. This introduction will encourage the student to question controversial areas of microbiology and the three domains of life i.e. Eubacteria, Archaea and Eucarya.

**Metal Forming Processes and Thermochemical Processing of Metals**
*Staff Contact: A/Prof P Munroe*

- Strengthening mechanisms, creep, fracture, grain size dependence of strength. Introduction to the generation of deformation and recrystallisation textures. Measurements of age-hardening, activation energy of strain ageing.
PHPH2201
Physiology 1B
Staff Contact: Dr G Simonetta
UOC6 S2 HPW6
The areas of physiology covered in this unit build on the fundamental physiological principles introduced in PHPH2101 Physiology 1A. The topics covered include reproduction, the respiratory system, the gastrointestinal system, kidney and body fluids and the endocrine system. This unit includes a substantial series of practical class experiments on these different areas of physiology.

PHYS1111
Fundamentals of Physics
Staff Contact: First Year Director
UOC6 HPW6 S1 or S2
Corequisite/s: Recommended MATH1011 or MATH1131 or MATH1031
Note/s: Introductory level subject for students of all disciplines.
The methods of physics, describing motion, the dynamics of a particle, conservation of energy, kinetic theory of gases, properties of liquids, vibrations and waves, electricity and conduction in solids, magnetism and electromagnetic induction, alternating current, atomic nature of matter, X-rays, the nucleus and radioactivity, geometrical optics, optical instruments, wave optics.

PHYS1121
Physica 1A
Staff Contact: First Year Director
UOC6 HPW6 S1 or S2
Assumed Knowledge: HSC Physics 65-100
Corequisite/s: MATH1131 or MATH1141

PHYS1131
Higher Physics 1A
Staff Contact: First Year Director
UOC6 HPW6 S1 or S2
Assumed Knowledge: HSC Physics 65-100
Corequisite/s: MATH1131 or MATH1141
Vectors, kinematics, particle dynamics, work and energy, the conservation of energy, conservation of linear momentum, rotational kinematics, and dynamics, simple harmonic motion, gravitation. Electrostatics, magnetostatics in vacuum, ferromagnetism, electromagnetic induction.

PHYS1169
Engineering Physics 1 (Chemical & Mechanical Engineering)
Staff Contact: First Year Director
UOC6 HPW6 S1
Assumed Knowledge: HSC Physics 65-100

PHYS1189
Physics 1 (Geomatic Engineering)
Staff Contact: First Year Director
UOC6 HPW6 S1
Assumed Knowledge: HSC Physics 65-100

PHYS1221
Physics 1B
Staff Contact: First Year Director
UOC6 HPW6 S2
Assumed Knowledge: PHYS1121
Corequisite/s: MATH1231 or MATH1241
Note/s: Session 2 or Summer Session
Waves in elastic media: application of wave theories to optical and acoustical phenomena such as interference, diffraction and polarisation. Properties of matter: solids, liquids, gases. Fluids and thermal physics. Inductance and electric circuit transients. Alternating current circuit theory.

PHYS1229
Concepts In Engineering Physics
Staff Contact: First Year Director
UOC6 HPW6 S2
Prerequisite/s: PHYS1111
Corequisite/s: MATH1021 or MATH1031 or MATH1131
This course will examine selected topics from classical and quantum physics which are of relevance to the various Engineering disciplines.
The course extends the level beyond PHYS1111 Fundamentals of Physics presenting a more mathematical treatment and including physics applications in various Engineering areas to emphasise the essential way in which Physics underpins many of the advances which have been made in modern Engineering and technology.

PHYS1231
Higher Physics 1B
Staff Contact: First Year Director
UOC6 HPW6 S2
Assumed Knowledge: PHYS1131
Corequisite/s: MATH1231 or MATH1241
Note/s: Session 2 or Summer Session

PHYS1279
Physics 1 (Civil Engineering)
Staff Contact: First Year Director
UOC4 HPW4 S2
Assumed Knowledge: HSC Physics 65-100
Mechanics; elastic waves; electromagnetism; DC and AC circuits; introduction to electric measurement systems; instrumentation; digital electronic information processing systems; mechanical properties of matter; atomic structure; elasticity of solids; surface tension and viscosity of fluids; non-destructive testing; wave phenomena and acoustic techniques.

PHYS1601
Computer Applications In Experimental Science 1
Staff Contact: First Year Director
UOC6 HPW6 S1 or S2
Corequisite/s: PHYS1111 or PHYS1121 or PHYS1131, MATH1131 or MATH1141 or MATH1031
An introduction to the internal structure, operating and interfacing of computers. Binary and digital electronic logic; logic control devices; bus communication structures; instruction execution in a processor; machine language code and instruction sets; interfaces and interaction schemes between processor and the outside world.

PHYS2010
Mechanics
Staff Contact: Executive Assistant
UOC3 HPW2 S1
Prerequisite/s: PHYS1002, MATH1231 or MATH1241
Corequisite/s: MATH2111 or MATH2110
Note/s: Excluded PHYS2001
Simple, damped and forced harmonic oscillations, central force problems, systems of particles, Lagrange's equations, coupled oscillations, waves.
PHYS2020
Computational Physics
Staff Contact: Executive Assistant
UOC3 HPW2 S1
Prerequisite/s: PHYS1002 or PHYS1022, MATH1021 or MATH1231 or MATH1241
Note/s: Excluded PHYS2001
Use of computers to solve problems in Physics. Application to mechanics, chaos, quantum and thermal physics, data analysis.

PHYS2030
Laboratory
UOC3 HPW3 S1
Staff Contact: Executive Assistant
Prerequisite/s: PHYS1002 or PHYS1022, MATH1031 or higher
Note/s: Excluded PHYS2031
A selection of experimental investigations in a range of areas: X-ray diffraction, work function, semiconductor bandgap, Hall effect, carrier lifetimes, nuclear magnetic resonance, magnetic properties and electrostatics.

PHYS2040
Quantum Physics
Staff Contact: Executive Assistant
UOC3 HPW2 S1
Prerequisite/s: PHYS1002, MATH1231 or MATH1241
Note/s: Excluded PHYS2021
Postulates of quantum mechanics, operators. Applications: potential wells, steps, barriers and tunneling, harmonic oscillator. lattice and spin angular momentum, magnetic moment, spin-orbit coupling.

PHYS2060
Thermal Physics
Staff Contact: Executive Assistant
UOC3 HPW2 S2
Prerequisite/s: PHYS1002 or PHYS1022, MATH1231 or MATH1241
Note/s: Excluded PHYS2011
Laws of thermodynamics, kinetic theory, microscopic processes, entropy, solid-state defects, Heinoholtz and Gibbs functions, Maxwell's relations, phase diagrams, chemical and electrochemical potentials.

PHYS2310
Nuclear Science and Technology
Staff Contact: Executive Assistant
UOC3 HPW2 S1
Prerequisite/s: PHYS1002 or PHYS1022, MATH1231 or MATH1241
Note/s: Excluded PHYS2021
Structure of atom and nucleus, historical review, binding energy, mass defect, liquid drop model, semi-empirical mass formula. Radioactive decay, fission, nuclear reactors, natural (background) radiation, nuclear accidents, fusion and cosmology. Impact of radiation on living organisms, nuclear medicine.

PHYS2630
Electronics
Staff Contact: Executive Assistant
UOC3 HPW3 S2
Prerequisite/s: PHYS1002 or PHYS1022
Note/s: Excluded PHYS2920, PHYS2031
Electronic bench experiments and tutorials on diodes, transistors, operational amplifiers, power supplies and digital electronics.

PHYS2920
Measurement Electronics (Mining Engineering and Industrial Chemistry)
Staff Contact: Executive Assistant
UOC3 HPW3 S2
Prerequisite/s: PHYS1002 or PHYS1022 or PHYS1189
Note/s: Excluded PHYS2031, PHYS2630
The application of electronics to measurement. Includes principles of circuit theory; amplifiers; their specification and application, transducers; electronic instrumentation; industrial data acquisition.

PHYS2969
Physics of Measurement (Geomatic Engineering)
Staff Contact: Executive Assistant
UOC3 HPW3 S1
Prerequisite/s: PHYS1998

PHYS3010
Higher Quantum Mechanics
Staff Contact: Executive Assistant
UOC3 HPW2 S1
Prerequisite/s: PHYS2021 or PHYS2040
Corequisite/s: MATH2120
Note/s: Excluded PHYS3210. Not available in courses 3970, 3400, 3930 and 4075 without a mark of 65 or greater in PHYS2021 or PHYS2040
Fundamental principles and matrix formulation, spherically symmetric systems, angular momentum theory, perturbation theory and semiclassical radiation theory, variational methods, identical particles.

PHYS3020
Statistical Physics
Staff Contact: Executive Assistant
UOC3 HPW2 S1
Prerequisite/s: PHYS2060 or PHYS2011
Note/s: Excluded PHYS3011

PHYS3030
Higher Electromagnetism
Staff Contact: Executive Assistant
UOC3 HPW2 S1
Prerequisite/s: PHYS2011 or PHYS2050, MATH2011, MATH2120, MATH2520
Note/s: Excluded PHYS3210. Not available in courses 3970, 3400, 3930 and 4075 without a mark of 65 or greater in PHYS2011 or PHYS2050
Electromagnetic fields; Maxwell's equations, Poisson theorem, electromagnetic potentials. Plane and spherical waves. Reflection and transmission, fields in dispersive media, models and applications, emission of radiation from accelerated charges, covariant formulation of electromagnetism.

PHYS3040
Experimental Physics A1
Staff Contact: Executive Assistant
UOC3 HPW4 S1
Note/s: Some experiments assume knowledge of PHYS2030, PHYS2040 or PHYS2050
A selection of experimental investigations in areas including: chaotic motion, high temperature superconductivity, semiconductors, electron and tunneling microscopy, X-ray and electron diffraction, laser physics and holography, optical fibre technology, Fourier optics and transform spectroscopy, measurement techniques and resonance imaging, electromagnetic waves and waveguides, nuclear counting techniques and neutron activation, vacuum techniques. Formal scientific report writing.
PHYS3050
Nuclear Physics
Staff Contact: Executive Assistant
UOC3 HPW2 S2
Prerequisite/s: PHYS3010, or PHYS3210 with a mark of 65 or greater
Nuclear shell model; theory of beta decay; the deuteron, nucleon-nucleon scattering; theories of nuclear reactions, resonances; mesons and strange particles, elementary particle properties and interactions; symmetries and quark models; strong and weak interactions.

PHYS3060
Advanced Optics
Staff Contact: Executive Assistant
UOC3 HPW2 S2
Prerequisite/s: PHYS1002
Corequisite/s: MATH2120
Review of geometrical optics, including ray tracing, aberrations and optical instruments: physical optics, including Fresnel and Fraunhofer diffraction, transfer functions, coherence, auto and cross correlation: applications of optics, including fibre optics, lasers and holography.

PHYS3070
Experimental Physics A2
Staff Contact: Executive Assistant
UOC3 HPW4 S2
Note/s: Some experiments assume knowledge of PHYS2030, PHYS2040 or PHYS2050
As for PHYS3040.

PHYS3080
Solid State Physics
Staff Contact: Executive Assistant
UOC3 HPW2 S1
Prerequisite/s: PHYS2021 or PHYS2040
Corequisite/s: PHYS3010 or PHYS3210, PHYS3020
Note/s: Excluded PHYS3021
Free electron model of metals, Bloch states and energy bands, reciprocal space and the Fermi surface, electron dynamics, Landau levels. Crystal structure, Brillouin zones, elementary diffraction theory, bonding, cohesive processes, impurity states, impurity conductivity. Lattice vibration, monatomic and diatomic chain, acoustic and optic phonons, Einstein and Debye models, dielectric effects.

PHYS3110
Experimental Physics B1
Staff Contact: Executive Assistant
UOC3 HPW4 S1
Selected experiments and projects. Advanced experimental techniques and open ended projects in the areas covered in PHYS3040 Experimental Physics A together with projects involving electron and nuclear magnetic resonances, low temperature physics and superconductivity. Fourier optics, holography.

PHYS3120
Experimental Physics B2
Staff Contact: Executive Assistant
UOC3 HPW4 S2
As for PHYS3110 Experimental Physics B1.

PHYS3210
Applied Quantum Mechanics
Staff Contact: Executive Assistant
UOC3 HPW2 S1
Prerequisite/s: PHYS2021 or PHYS2040
Corequisite/s: MATH2120
Note/s: Not available to Advanced Science students in programs 0100, 0121 and 0161. Excluded: PHYS3010
Principles of wave mechanics and its applications including harmonic oscillator, spherically symmetric systems, angular momentum, perturbation theory and semi classical radiation theory, identical particles and the theory of atoms, solid state devices and quantum wells.

PHYS3230
Advanced Electromagnetism
Staff Contact: Executive Assistant
UOC3 HPW2 S1
Prerequisite/s: PHYS2011 or PHYS2050, MATH2011, MATH2120
Note/s: Not available to Advanced Science students in programs 0100, 0121 and 0161. Excluded: PHYS3030
Review of Maxwell's equations in integral and differential form, boundary conditions, applications to plane electromagnetic waves in vacuum and material media, dispersion, reflection and transmission, dipoles and antennas.

POLY3011
Polymer Science - Theory
Staff Contact: Prof R Burford
UOC3 HPW3 WKS14 S1
Prerequisite/s: CHEM2021, INDC2040

POLY3012
Polymer Science - Practice
Staff Contact: Prof R Burford
UOC3 HPW3 WKS14 S2
Prerequisite/s: CHEM2021, INDC2040, POLY3011
A series of practical laboratory exercises designed to illustrate the kinetics of polymerisation and the mechanical behaviour and properties of polymers.

SESC2090
Safety and Environmental Health
Staff Contact: A/Prof C Winder
UOC3 HPW2 WKS14 S2
This course introduces students to the different subdisciplines in SHE. Areas include Occupational Hygiene, Epidemiology, Ergonomics, Occupational Medicine, Rehabilitation, Safety Engineering, Toxicology and OHS Nursing.

SESC2100
Workplace Hazards
Staff Contact: Dr T Green
UOC3 HPW2 WKS14 S2
This course aims to make students aware of major workplace safety issues by discussing physical, chemical, biological, psychological and biomechanical hazards. Issues covered include noise, whole body vibration, ionising and non ionising radiation, electrical hazards, hazardous substances, dangerous goods, dust, fumes and ventilation, infectious diseases and stress.

SESC2500
Occupational Health and Safety
Staff Contact: A/Prof C Winder
UOC3 HPW2 WKS14 S1
Note/s: Excluded SESC6610
The legal system and OHS Law; workers compensation law, legal responsibilities for safety, safety committees and safety management.
systems. Introduction to OHS risk management and the hierarchy of controls, case studies, user centred design and human factors in OHS.

SESC3310
Social Issues In Science and Technology
Staff Contact: Dr B Markovic
UOC3 HPW2 WK514 S1
This subject is an objective 5 course which covers social issues arising from future scientific and technological developments and the role that the professional engineer or scientist can play in influencing future directions. The course is taught by a combination of group activities, case studies, projects and seminars. This course will cover four major topic areas, which are: professional ethics, environmental related issues, safety and liability and controls of future technology.

SESC3200
Hazard and Risk Assessment
Staff Contact: Prof J Cross
UOC3 HPW2 WK514 S1 S2
Note/s: Excluded SESC6610
This course takes a risk management approach to safety and demonstrates how safety risk management integrates into other areas of business risk. The concept of safety risk management and requirements for safety risk management in regulations are introduced over the first 4 units. These principles are then illustrated by considering how the risks of particular industrial hazards are assessed and controlled. The topics, which use different methods of risk assessment, include manual handling, machine guarding, fire and explosion, pressure vessels, confined spaces and construction safety issues. In each module the hierarchy of controls is applied in the discussion of risk control strategies. The course concludes with a discussion of accident investigation, prevention and recording and emergency planning.

SESC4211
Risk Management
Staff Contact: Prof J Cross
UOC6 HPW3 WK514 S1
This course gives an overview of Risk Management following the format of the Australian Standard in Risk Management (AS4360). Tools and techniques applicable to each step of the risk management process are discussed using examples applicable to the class. The same risk management process is applied to manage a wide range of business issues including health and safety, the environment, finance and project management. This course is therefore relevant as part of a wide variety of programs and students from any program are accepted. The student selects examples for exercises to suit the industry and role in which they work (or intend to work). At the end of the course, students should be able to use risk management tools applicable to their specific interest and have an awareness of tools used in other industries and applications.

SESC4310
Management of Safety, Health and the Environment
Staff Contact: D Gardner
UOC3 HPW2 WK514 S1
Prerequisite/s: PSYC3141 or PSYC3526 or equivalent
This course covers basic issues for managing health, safety and the environment in organisations. Topics include management and management theory, the behaviour of workers, the behaviour of managers, safety culture, systems for managing health, safety and the environment.

SESC4820
Chemical Safety and Toxicology
Staff Contact: A/Prof C Winder
UOC3 HPW3 WK57 S1
Assumed Knowledge: SESC2100
This course provides an outline of the toxicological, occupational hygiene and environmental aspects of chemical hazards and exposures. Metals, solvents, toxic and irritant gases, pesticides, carcinogens, hazardous wastes and dioxins are used as case studies.

SESC4850
Management of Dangerous Materials
Staff Contact: A/Prof C Winder
UOC3 HPW3 WK57 S1 or S2
Chemicals legislation, regulatory assessment of chemicals, the dangerous goods system, the hazardous substances regulation and systems for hazardous wastes.

SESC9020
Occupational Health and Safety Law 1
Staff Contact: Prof A Brooks
UOC3 HPW2 WK57 S2
Note/s: Also offered in off campus mode in either session
This course covers concepts of law; the judicial and court systems; common law and equity; the common law of employment, occupational health and safety legislation.

SESC9030
Occupational Health and Safety Law 2
Staff Contact: Prof A Brooks
UOC3 HPW2 WK57 S2
This course extends concepts of law introduced in SESC9020, and covers other workplace legislation and procedures, such as workers compensation and rehabilitation legislation; cases and actions under common law.

SESC9100
Physical Hazards
Staff Contact: Dr T Groen
UOC3 HPW3 WK57 S2
Assumed Knowledge: SESC6120
Note/s: Also offered in off campus mode in either session

SESC9121
Fire and Explosion
Staff Contact: Dr T Groen
UOC6 S2
Note/s: Short Course Mode.
This course introduces the students to the principles of combustion in fire and explosion processes. The first section deals with the control of industrial fires (liquids and gases). The second section deals with the control of building fires and the third section deals with explosion prevention and control.

SESC9150
Electrical Safety
Staff Contact: Prof J Cross
UOC3 S1
Note/s: Off campus mode only
Regulations and codes of safe practice relating to electricity. Identification assessment and control of electrical hazards including electrocution, electrical fires, static electricity, electrical wiring in hazardous areas, the effect of electric and magnetic fields, safety related systems.

SESC9160
Plant and Construction Safety
Staff Contact: School Office
UOC3 HPW2.5 WK57 S1
This course examines current issues and problems in ensuring the occupational safety and health of workers in building, construction and manufacturing industry. Topics include OHS act, legal responsibilities, implications of changes in legislation to building and construction safety, contractual relationship with subcontractors, risk assessment and control strategies, positive performance indicators, safeguarding of plant, systems safety management, audit reviews, hazards in building and construction work, human behaviour and occupational safety and incident investigation. Best practice initiatives in the construction sector.
SESC9170  
Traffic Safety  
Staff Contact: Dr A McIntosh  
Note/s: Not offered in 2000  
This course aims to provide students with an introduction to nature and scope of road safety and provide an understanding of the interdisciplinary and integrated approaches required to implement improvements in roads and traffic safety. Subject areas include identification of road safety problems, strategic planning, road environment safety, ergonomics, signals, signs, lighting, road user safety, knowledge attitudes, compliance and practices, vehicle and equipment safety, road safety schooling education, road safety campaigns and program evaluation.

SESC9200  
Hazard and Risk Assessment  
Staff Contact: Prof J Cross  
UOC6 HPW3 WK514 S1

Note/s: Also offered in off campus mode in either session  
Principles of risk management and systems safety, hazard identification, risk assessment, accident models, accident reporting, auditing. Each topic will be illustrated by practical examples and case studies.

SESC9211  
Risk Management  
Staff Contact: Prof J Cross  
UOC6 HPW3 WK514 S1

This course gives an overview of Risk Management following the format of the Australian Standard in Risk Management (AS4360). Tools and techniques applicable to each step of the risk management process are discussed using examples application to the class. The same risk management process is applied to manage a wide range of business issues including health and safety, the environment, finance and project management. This subject is therefore relevant as part of a wide variety of postgraduate courses and students from any postgraduate course are accepted if numbers permit. The student selects examples for exercises to suit their industry and role in which they work (or intend to work). At the end of the subject, students should be able to use risk management tools applicable to their specific interest and have an awareness of tools used in other industries.

SESC9221  
Major Hazards Management  
Staff Contact: Dr T Green  
UOC6 HPW3 WK514 S1

This course discusses the management of major hazardous facilities. Australian and overseas legislation is discussed, together with the preparation of safety cases, environmental impact statements and emergency planning. Analysis techniques that are required for these assessments will be discussed including how to quantify likelihood and the consequences through the use of modelling. Finally, the requirements for emergency plans are discussed.

SESC9231  
Risk Analysis  
Staff Contact: Prof J Cross  
UOC6 HPW3 WK514 S2

This course introduces methods used to analyse risk in different disciplines. Techniques covered include Fault Tree analysis and quantification, Trend analysis, Monte Carlo and other computer modelling techniques, use of risk analysis software. The methods are applied to examples which include decision making in financial, environmental and safety management. In addition students undertake a case study selecting areas of risk of their choice.

SESC9300  
Effective Behaviour In Organisations  
Staff Contact: D Gardner  
UOC3 HPW3 WK51 S1

Note/s: Also offered in off campus mode in either session  
This course examines issues of human behaviour as a major system factor in occupational health and safety. Topics include attitudes and motivation, decision making, leadership and group dynamics, selection, training and communication.
SESC9431
Physical Ergonomics
Staff Contact: Dr K Kothiyal
UOC6  S2
Assumed Knowledge: SESC9410 or SESC9411 or equivalent
Note/s: Off campus mode plus a 2-3 day workshop during S2
This course discusses various analytical tools and techniques used by ergonomists to assess or solve practical, physical ergonomics problems. It requires a knowledge of the principles of ergonomics and will provide in-depth knowledge and skills in assessing the physical ergonomics aspects of work systems. Topics include applied anthropometry, biomechanical models, electromyography, manual handling jobs with multiple tasks and work physiology. Students will gain hands-on experience with relevant equipment and software such as Mannequin, 2D and 3D SSP Programs, Energy Expenditure Program, and the revised NIOSH 1991 equation.

SESC9441
Ergonomics and New Technology
Staff Contact: R Hall
UOC6  HPW3  WKS14  S1
Assumed knowledge: SESC9410 or SESC9411 or equivalent
The course will focus on the ergonomics issues related to the design and implementation of new technology. It assumes a knowledge of the principles of ergonomics and in particular it will look at cognitive aspects of human-computer interaction, human error and software design, usability and its assessment, user interface design, evaluation techniques, guidelines and standards, and the introduction of new systems into organisations.

SESC9451
Experimental Biomechanics
Staff Contact: Dr A McIntosh
UOC6  HPW3  WKS14  S1
This course commences with lectures on experimental methods, instrumental analysis methods. The student then undertakes a series of experiments by motion analysis, EMG, exercise tests and impact testing.

SESC9460
Biomechanics of Impact Injury
Staff Contact: Dr A McIntosh
UOC3  S2
Assumed knowledge: SESC6110, SESC6120
Note/s: Short course mode
Impact injury occurs in the workplace, on the sports field, during recreation, and in traffic accidents. The course will cover mechanisms of trauma, research methods, human tolerance to impact and methods for reducing injury. The course will bring together biomechanics, engineering and traumatology.

SESC9471
Industrial Ergonomics
Staff Contact: Dr K Kothiyal
UOC6  HPW3  WKS14  S2
Assumed Knowledge: For students with an engineering background
Note/s: Excluded SESC9411
This course discusses the principles of ergonomics and their application to engineering systems. Topics include Introduction to ergonomics, works systems design and evaluation, neuromuscular function, perceptual motor skills, biomechanics of human body movement, workphysiology, anthropometry and workplace design, human information processing, human error and design, job design and work organisation, psychophysical measurements, manual materials handling, visual tasks measurements and design, environmental ergonomics, work schedules and sustained human performance (shift work), participatory ergonomics, ergonomics in manufacturing, ergonomics cost/benefits analysis.

SESC9530
Personal Protective Equipment
Staff Contact: A/Prof C Winder
UOC3  S2
Note/s: Short Course Mode
This subject provides an introduction to personal protective equipment. Protection for head, eyes, hearing, skin, respiration, feet and protection against falling. Relevant standards for personal protection. Personal protection programs.

SESC9533
Electrical Safety
Staff Contact: Prof J Cross
UOC6  WKS14  S2
Note/s: For Engineering students only. Off campus mode only
Regulations and codes of safe practice relating to electricity. Identification assessment and control of electrical hazards including electrocution, electrical fires, lightning, static electricity, electrical wiring in hazardous areas, the effect of electric and magnetic fields, displays and controls, safety related systems, accident analysis.

SESC9541
Assessment of the Workplace Environment
Staff Contact: Dr K Kothiyal
UOC6  HPW3  WKS14  S2
Assumed knowledge: Core subjects
This is an experimental and workplace based course where students will be required to assess ergonomics, physical and chemical hazards encountered in the occupational environment. Students will design and carry out a number of practical measurement programs to assess and report on workplace environmental parameters. Topics include measurement and analysis of noise, lighting, vibration, ventilation, air quality, thermal environment, radiation and magnetic fields, assessment of chemical hazards, and floor slip resistance characteristics.

SESC9711
Environmental Planning and Assessment
Staff Contact: Dr B Markovic
UOC6  HPW2.5  WKS14  S1
This course is a core element for the Graduate Diploma and Masters of Environmental Sciences courses and provides the conceptual framework for understanding interactions between humans, nature, philosophy, law, politics, ethics and decision making and how this is related to environmental planning and assessment.

SESC9721
Environment and Medicine
Staff Contact: Dr J Frith
UOC6  HPW2.5  WKS14  S1
Note/s: Also offered in off campus mode in either session
Aspects of medicine bearing upon physiological consequences of pollutants. Metabolic mechanisms; chemical interactions, synergism and antagonism; photosynthesis and phototoxicity. Ozone depletion and greenhouse effects. Mortality and morbidity surveys. Studies of particular pollutants and environmental contaminants.

SESC9731
Environment and Law
Staff Contact: School Office
UOC6  HPW3  WKS14  S2
Resources in law for the preservation of the environment. Types of legislation local government, town planning, environmental and common law; administrative infrastructure, problems and actions. The North American experience. Economic and sociological factors.

SESC9741
Environmental Management Systems
Staff Contact: Dr B Markovic
UOC6  WKS14  S2
Note/s: Short course mode
This course is designed to define the central role of management strategies for environmental issues. It describes the development of
different approaches to fulfil the demands of the environment while considering not only the current legislative requirements but also customer requirements, competitive pressure and safety aspects of the firms respectively. A short course. Lecture materials are delivered as a short course.

SESC9810
Introduction to Toxicology
Staff Contact: Assoc Prof C Winder
UOC3  HPW3  WKS7  S2
Note/s: Also offered in off campus mode in either session
This course provides an introduction to toxic hazards, including chemicals and biohazards. Effects of exposure to toxic hazards. Legislation and standards for the identification and control of toxic hazards.

SESC9820
Chemical Safety and Toxicology
Staff Contact: Assoc Prof C Winder
UOC3  HPW3  WKS7  S1
This course provides an outline of the toxicological, occupational hygiene and environmental aspects of chemical hazards and exposures. Metals, solvents, toxic and irritant gases, pesticides, carcinogens, hazardous wastes and dioxins are used as case studies.

SESC9850
Management of Dangerous Materials
Staff Contact: A/Prof C Winder
UOC3  HPW3  WKS7  S1 or S2
Chemicals legislation, regulatory assessment of chemicals, the dangerous goods system, the hazardous substances regulation and systems for hazardous wastes.
Conditions for the Award of Degrees

First Degrees

Rules, regulations and conditions for the award of first degrees are set out in the appropriate Faculty Handbooks.
For the list of undergraduate programs and degrees offered see Table of Programs by Faculty (Undergraduate Study) in the Calendar.

Higher Degrees

For the list of postgraduate degrees by research and course work, arranged in faculty order, see UNSW Programs (by faculty) in the Calendar. The conditions for the award of postgraduate degrees, diplomas and certificates appear in the relevant Faculty Handbook.

Doctor of Philosophy (PhD)

1. The degree of Doctor of Philosophy may be awarded by the Council on the recommendation of the Higher Degree Committee of the appropriate faculty or board (hereinafter referred to as the Committee) to a candidate who has made an original and significant contribution to knowledge.

Qualifications

2. (1) A candidate for the degree shall have been awarded an appropriate degree of Bachelor with Honours from the University of New South Wales or a qualification considered equivalent from another university or tertiary institution at a level acceptable to the Committee.
(2) In exceptional cases an applicant who submits evidence of such other academic and professional qualifications as may be approved by the Committee may be permitted to enrol for the degree.
(3) If the Committee is not satisfied with the qualifications submitted by an applicant the Committee may require the applicant to undergo such assessment or carry out such work as the Committee may prescribe, before permitting enrolment as a candidate for the degree.

Enrolment

3. (1) An application to enrol as a candidate for the degree shall be lodged with the Registrar at least one month prior to the date at which enrolment is to begin.
(2) In every case before making the offer of a place the Committee shall be satisfied that initial agreement has been reached between the "School and the applicant on the topic area, supervision arrangements, provision of adequate facilities and any coursework to be prescribed and that these are in accordance with the provisions of the guidelines for promoting postgraduate study within the University.
(3) The candidate shall be enrolled either as a full-time or a part-time student.
(4) A full-time candidate will present the thesis for examination no earlier than three years and no later than five years from the date of enrolment and a part-time candidate will present the thesis for examination no earlier than four years and no later than six years from the date of enrolment, except with the approval of the Committee.
(5) The candidate may undertake the research as an internal student i.e. at a campus, teaching hospital, or other research facility with which the University is associated, or as an external student not in attendance at the University except for periods as may be prescribed by the Committee.
(6) An internal candidate will normally carry out the research on a campus or at a teaching or research facility of the University except that the Committee may permit a candidate to spend a period in the field, within another institution or elsewhere away from the University provided that the work can be supervised in a manner satisfactory to the Committee. In such instances the Committee shall be satisfied that the location and period of time away from the University are necessary to the research program.
(7) The research shall be supervised by a supervisor and where possible a co-supervisor who are members of the academic staff of the School or under other appropriate supervision arrangements approved by the Committee. Normally an external candidate within another organisation or institution will have a co-supervisor at that institution.

Progression

4. The progress of the candidate shall be considered by the Committee following report from the School in accordance with the procedures established within the School and previously noted by the Committee.

(i) The research proposal will be reviewed as soon as feasible after enrolment. For a full-time student this will normally be during the first year of study, or immediately following a period of prescribed coursework. This review will focus on the viability of the research proposal.

(ii) Progress in the course will be reviewed within twelve months of the first review. As a result of either review the Committee may cancel enrolment or take such other action as it considers appropriate. Thereafter, the progress of the candidate will be reviewed annually.

Thesis

5. (1) On completing the program of study a candidate shall submit a thesis embodying the results of the investigation.

(2) The candidate shall give in writing to the Registrar two months notice of intention to submit the thesis.

(3) The thesis shall comply with the following requirements:

(a) it must be an original and significant contribution to knowledge of the subject;

(b) the greater proportion of the work described must have been completed subsequent to enrolment for the degree;

(c) it must be written in English except that a candidate in the Faculty of Arts and Social Sciences may be required by the Committee to write a thesis in an appropriate foreign language;

(d) it must reach a satisfactory standard of expression and presentation;

(e) it must consist of an account of the candidate's own research but in special cases work done conjointly with other persons may be accepted provided the Committee is satisfied about the extent of the candidate's part in the joint research.

(f) The candidate may not submit as the main content of the thesis any work or material which has previously been submitted for a university degree or other similar award but may submit any work previously published whether or not such work is related to the thesis.

(4) Four copies of the thesis shall be presented in a form which complies with the requirements of the University for the preparation and submission of theses for higher degrees.

(5) It shall be understood that the University retains the four copies of the thesis submitted for examination and is free to allow the thesis to be consulted or borrowed. Subject to the provisions of the Copyright Act, 1968, the University may issue the thesis in whole or in part, in photostat or microfilm or other copying medium.

Examination

6. (1) There shall be not fewer than three examiners of the thesis, appointed by the Committee, at least two of whom shall be external to the University.

(2) At the conclusion of the examination each examiner shall submit to the Committee a concise report on the thesis and shall recommend to the Committee that one of the following:

(a) The thesis merits the award of the degree.

(b) The thesis merits the award of the degree subject to minor corrections as listed being made to the satisfaction of the head of School.

(c) The thesis requires further work on matters detailed in my report. Should performance in this further work be to the satisfaction of the higher degree Committee, the thesis would merit the award of the degree.

(d) The thesis does not merit the award of the degree in its present form and further work as described in my report is required. The revised thesis should be subject to re-examination.

(e) The thesis does not merit the award of the degree and does not demonstrate that resubmission would be likely to achieve that merit.

(3) If the performance in the further work recommended under (2)(c) above is not to the satisfaction of the Committee, the Committee may permit the candidate to submit the thesis for re-examination as determined by the Committee within a period determined by it but not exceeding eighteen months.

(4) After consideration of the examiners' reports and the results of any further examination of the thesis, the Committee may require the candidate to submit to written or oral examination before recommending whether or not the candidate be awarded the degree. If it is decided that the candidate be not awarded the degree, the Committee shall determine whether or not the candidate be permitted to resubmit the thesis after a further period of study and/or research.

Fees

7. A candidate shall pay such fees as may be determined from time to time by the Council.

*"School" is used here and elsewhere in these conditions to mean any teaching unit authorised to enrol research students and includes a department where that department is not within a school, a centre given approval by the Academic Board to enrol students, and an interdisciplinary unit within a faculty and under the control of the Dean of the Faculty. Enrolment is permitted in more than one such teaching unit.*

Note: All new PhD candidates in the Faculty of Engineering must complete and pass three courses as approved by the Head of School, normally in the first year of candidature.
Master of Biomedical Engineering (MBiomedE)

1. The degree of Master of Biomedical Engineering may be awarded by the Council to a candidate who has satisfactorily completed a program of advanced study.

Qualifications

2. (1) A candidate for the degree shall have been awarded an appropriate degree of Bachelor from the University of New South Wales or a qualification considered equivalent from another university or tertiary institution at a level acceptable to the Higher Degree Committee of the Faculty of Engineering (hereinafter referred to as the Committee).

(2) In exceptional cases an applicant who submits evidence of such other academic and professional qualifications as may be approved by the Committee may be permitted to enrol for the degree.

(3) If the Committee is not satisfied with the qualifications submitted by an applicant the Committee may require the applicant to undergo such assessment or carry out such work as the Committee may prescribe, before permitting enrolment.

Enrolment and Progression

3. (1) An application to enrol as a candidate for the degree shall be made on the prescribed form which shall be lodged with the Registrar at least two calendar months before the commencement of the session in which the enrolment is to begin.

(2) A candidate for the degree shall be required to undertake such formal courses and pass such assessment as prescribed. The program of advanced study, including the preparation of the project report, shall total a minimum of 72 units of credit. The number of units of credit allocated for each course shall be determined by the Committee on the recommendation of the Head of the Graduate School of Biomedical Engineering (hereinafter referred to as the head of the school).

(3) The progress of the candidate shall be reviewed at least once annually by the Committee and as a result of its review the Committee may cancel enrolment or take such other action as it considers appropriate.

(4) No candidate shall be awarded the degree until the lapse of three academic sessions from the date of enrolment in the case of a full-time candidate or six sessions in the case of a part-time candidate. The maximum period of candidature shall be five academic sessions for a full-time candidate and eight sessions for a part-time candidate. In special cases an extension of these times may be granted by the Committee.

Fees

4. A candidate shall pay such fees as may be determined from time to time by the Council.

Master of Business and Technology (MBT)

1. The degree of Master of Business and Technology by formal coursework may be awarded by the Council to a candidate who has satisfactorily completed a program of advanced study.

Qualifications

2. (1) A candidate for the degree shall have been awarded an appropriate degree of Bachelor from the University of New South Wales or a qualification considered equivalent from another university or tertiary institution at a level acceptable to the Higher Degree Committee of the Faculty of Engineering (hereinafter referred to as the Committee).

(2) Alternatively a candidate for the Master of Business and Technology shall obtain a grade point average of at least credit in the Graduate Diploma in Industrial Management at the first attempt of each of the courses. A candidate may then be granted advanced standing in the Master of Business and Technology for the courses already completed in the Graduate Diploma in Industrial Management up to a limit of 18 units of credit with the provision that the candidate has not already graduated.

(3) In exceptional cases an applicant who submits evidence of such other academic and professional qualifications as may be approved by the Committee may be permitted to enrol for the degree.

(4) If the Committee is not satisfied with the qualifications submitted by an applicant the Committee may require the applicant to undergo such assessment or carry out such work as the Committee may prescribe before permitting enrolment.

Enrolment and Progression

3. (1) An application to enrol as a candidate for the degree shall be made on the prescribed form which shall be lodged with the Graduate School of Engineering at least two calendar months before the commencement of the session in which enrolment is to begin.

(2) A candidate for the degree shall be required to undertake such formal courses and pass such assessment as prescribed.
(3) The progress of a candidate shall be reviewed at least once annually by the Committee and as a result of its review the Committee may cancel enrolment or take such other action as it considers appropriate.

(4) No candidate shall be awarded the degree until the lapse of six academic sessions from the date of enrolment in the case of a part-time candidate or two academic sessions in the case of a full-time candidate. The maximum period of candidature shall be ten academic sessions from the date of enrolment for a part-time candidate and five academic sessions for a full-time candidate. In special cases a variation to these times may be granted by the Committee.

Fees

4. A candidate shall pay such fees as may be recommended from time to time by the Council.

---

Master of Computer Science (MCompSc)

1. The degree of Master of Computer Science may be awarded by the Council to a candidate who has satisfactorily completed a program of advanced study.

Qualifications

2. (1) A candidate for the degree shall have been awarded an appropriate degree of Bachelor from the University of New South Wales or a qualification considered equivalent from another university or tertiary institution at a level acceptable to the Higher Degree Committee of the Faculty of Engineering (hereinafter referred to as the Committee).

(2) In exceptional cases an applicant who submits evidence of such other academic and professional qualifications as may be approved by the Committee may be permitted to enrol for the degree.

(3) If the Committee is not satisfied with the qualifications submitted by an applicant the Committee may require the applicant to undergo such assessment or carry out such work as the Committee may prescribe, before permitting enrolment.

Enrolment and Progression

3. (1) An application to enrol as a candidate for the degree shall be made on the prescribed form which shall be lodged with the Registrar two calendar months before the commencement of the session in which the enrolment is to begin.

(2) A candidate for the degree shall:
   (a) undertake such formal courses and pass such assessment as prescribed, or
   (b) undertake an approved combination of the above and demonstrate ability to undertake research by the submission of a project report embodying the results of an original investigation of an approved topic.

(3) The program of advanced study shall total a minimum of 96 units of credit. The number of units of credit allocated for each course shall be determined by the Committee on the recommendation of the appropriate head of school.

(4) A candidate's proposed program shall be approved by the head of the Department of Computer Science prior to enrolment.

(5) The progress of a candidate shall be reviewed at least once annually by the Committee and as a result of its review the Committee may cancel enrolment or take such other action as it considers appropriate.

(6) No candidate shall be awarded the degree until the lapse of three academic sessions from the date of enrolment in the case of a full-time candidate or four sessions in the case of a part-time candidate. The maximum period of candidature shall be six academic sessions for a full-time candidate and eight sessions for a part-time candidate. In special cases an extension of these times may be granted by the Committee.

Fees

6. A candidate shall pay such fees as may be determined from time to time by the Council.

---

Master of Engineering (ME) and Master of Science (MSc)

1. The degree of Master of Engineering or Master of Science by research may be awarded by the Council on recommendation of the Higher Degree Committee of the appropriate faculty (hereinafter referred to as the Committee) to a candidate who has demonstrated ability to undertake research by the submission of the thesis embodying the results of an original investigation.

Qualifications

2. (1) A candidate for the degree shall have been awarded an appropriate degree of Bachelor from the University of New South Wales or a qualification considered equivalent from another university or tertiary institution at a level acceptable to the Committee.
(2) An applicant who submits evidence of such other academic or professional attainment as may be approved by the Committee may be permitted to enrol for the degree.

(3) When the Committee is not satisfied with the qualifications submitted by an applicant the Committee may require the applicant, before being permitted to enrol, to undergo such examination or carry out such work as the Committee may prescribe.

Enrolment and Progression

3. (1) An application to enrol as a candidate for the degree shall be made on the prescribed form which shall be lodged with the Registrar at least one calendar month before the commencement of the session in which enrolment is to begin.

(2) In every case, before permitting a candidate to enrol, the head of the school in which the candidate intends to enrol shall be satisfied that adequate supervision and facilities are available.

(3) An approved candidate shall be enrolled in one of the following categories:

(a) full-time attendance at the University;

(b) part-time attendance at the University;

(c) external – not in regular attendance at the University and using research facilities external to the University.

(4) A candidate shall be required to undertake an original investigation on an approved topic. The candidate may also be required to undergo such examination and perform such other work as may be prescribed by the Committee.

(5) The work shall be carried out under the direction of a supervisor appointed from the full-time members of the University staff.

(6) The progress of a candidate shall be reviewed annually by the Committee following a report by the candidate, the supervisor and the head of the school in which the candidate is enrolled and as a result of such review the Committee may cancel enrolment or take such other action as it considers appropriate.

(7) No candidate shall be granted the degree until the lapse of three academic sessions in the case of a full-time candidate or four academic sessions in the case of a part-time or external candidate from the date of enrolment. In the case of a candidate who has been awarded the degree of Bachelor with Honours or who had previous research experience the Committee may approve remission of up to one session for a full-time candidate and two sessions for a part-time or external candidate.

(8) A full-time candidate for the degree shall present for examination not later than six academic sessions from the date of enrolment. A part-time or external candidate for the degree shall present, for examination not later than ten academic sessions from the date of enrolment. In special cases an extension of these times may be granted by the Committee.

Thesis

4. (1) On completing the program of study a candidate shall submit a thesis embodying the results of the original investigation.

(2) The candidate shall give in writing two months notice of intention to submit the thesis.

(3) The thesis shall present an account of the candidate's own research. In special cases work done conjointly with other persons may be accepted, provided the Committee is satisfied about the extent of the candidate's part in the joint research.

(4) The candidate may also submit any work previously published whether or not such work is related to the thesis.

(5) Three copies of the thesis shall be presented in a form which complies with the requirements of the University for the preparation and submission of higher degree theses.

(6) It shall be understood that the University retains the three copies of the thesis submitted for examination and is free to allow the thesis to be consulted or borrowed. Subject to the provisions of the Copyright Act, 1968, the University may issue the thesis in whole or in part, in photostat or microfilm or other copying medium.

Examination

5. (1) There shall be not fewer than two examiners of the thesis, appointed by the Committee, at least one of whom shall be external to the University unless the Committee is satisfied that this is not practicable.

(2) At the conclusion of the examination each examiner shall submit to the Committee a concise report on the merits of the thesis and shall recommend to the Committee that:

(a) the candidate be awarded the degree without further examination; or

(b) the candidate be awarded the degree without further examination subject to minor corrections as listed being made to the satisfaction of the head of the school; or

(c) the candidate be awarded the degree subject to further examination on questions posed in the report, performance in this further examination being to the satisfaction of the Committee; or

(d) the candidate be not awarded the degree but be permitted to resubmit the thesis in a revised form after a further period of study and/or research; or

(e) the candidate be not awarded the degree and be not permitted to resubmit the thesis.

(3) If the performance at the further examination recommended under (2)(c) above is not to the satisfaction of the Committee, the Committee may permit the candidate to re-present the same thesis and submit to a further oral, practical or written examination within a period specified by it but not exceeding eighteen months.
(4) The Committee shall, after consideration of the examiners' reports and the reports of any oral or written or practical examination, recommend whether or not the candidate may be awarded the degree. If it is decided that the candidate be not awarded the degree the Committee shall determine whether or not the candidate may resubmit the thesis after a further period of study and/or research.

Fees
6. A candidate shall pay such fees as may be determined from time to time by the Council.

"School" is used here and elsewhere in these conditions to mean any teaching unit authorized to enrol research students and includes a department where that department is not within a school, a centre given approval by the Academic Board to enrol students, and an interdisciplinary unit within a faculty and under the control of the Dean of the Faculty. Enrolment is permitted in more than one such teaching unit.

Note: All new Masters research candidates in the Faculty of Engineering must complete and pass three courses as approved by the Head of School, normally in the first year of candidature.

Master of Engineering (ME) and Master of Science (MSc) without supervision

1. The degree of Master of Engineering or Master of Science without supervision may be awarded by the Council on the recommendation of the Higher Degree Committee of the appropriate faculty (hereinafter referred to as the Committee) to a candidate who has demonstrated ability to undertake research by the submission of a thesis embodying the results of an original investigation.

Qualification
2. A candidate for the degree shall have been awarded an appropriate degree of Bachelor of the University of New South Wales with at least three years relevant standing in the case of Honours graduates and four years relevant standing in the case of Pass graduates, and at a level acceptable to the Committee.

Enrolment and Progression
3. An application to enrol as candidate for the degree without supervision shall be made in the prescribed form which shall be lodged with the Registrar not less than six months before the intended date of submission of the thesis. A graduate who intends to apply in this way should, in his or her own interest, seek at an early stage the advice of the appropriate head of school (or department) with regard to the adequacy of the subject matter and its presentation for the degree. A synopsis of the work should be available.

Thesis
4. (1) A candidate shall submit a thesis embodying the results of the investigation.
   (2) The candidate shall give in writing to the Registrar two months notice of intention to submit the thesis.
   (3) The thesis shall present an account of the candidate's own research. In special cases work done conjointly with other persons may be accepted, provided the Committee is satisfied about the extent of the candidate's part in the joint research.
   (4) The candidate may also submit any work previously published whether or not related to the thesis.
   (5) Three copies of the thesis shall be presented in a form which complies with the requirements of the University for the preparation an submission of theses for higher degrees.
   (6) It shall be understood that the University retains the three copies of the thesis submitted for examination and is free to allow the thesis to be consulted or borrowed. Subject to the provisions of the Copyright Act, 1968, the University may issue the thesis in whole or in part, in photostat or microfilm or other copying medium.

Examination
5. (1) There shall be not fewer than two examiners of the thesis, appointed by the Committee, at least one of whom shall be external to the University unless the Committee is satisfied that this is not practicable.
   (2) Before the thesis is submitted to the examiners the head of the school in which the candidate is enrolled shall certify that it is prima facie worthy of examination.
   (3) At the conclusion of the examination each examiner shall submit to the Committee that:
      (a) the candidate be awarded the degree without further examination; or
      (b) the candidate be awarded the degree without further examination subject to minor corrections as listed being made to the satisfaction of the head of the school (or department); or
      (c) the candidate be awarded the degree subject to a further examination on questions posed in the report, performance in this further examination being to the satisfaction of the Committee; or
      (d) the candidate be not awarded the degree but be permitted to resubmit the thesis in a revised form after a further period of study and/or research; or
      (e) the candidate be not awarded the degree and be not permitted to resubmit the thesis.
   (4) If the performance at the further examination recommended under (3)(c) above is not to the satisfaction of the Committee, the Committee may permit the candidate to re-present the same thesis and submit to further examination as determined by the Committee within a period specified by it but not exceeding eighteen months.
**Master of Engineering Science (MEngSc)**

1. The degree of Master of Engineering Science may be awarded by the Council to a candidate who has satisfactorily completed a program of advanced study.

**Qualifications**

2. (1) A candidate for the degree shall have been awarded an appropriate degree of Bachelor from the University of New South Wales or a qualification considered equivalent from another university or tertiary institution at a level acceptable to the Higher Degree Committee of the Faculty of Engineering (hereinafter referred to as the Committee).

2. (2) In exceptional cases an applicant who submits evidence of such other academic and professional qualifications as may be approved by the Committee may be permitted to enrol for the degree.

2. (3) If the Committee is not satisfied with the qualifications submitted by an applicant the Committee may require the applicant to undergo such assessment or carry out such work as the Committee may prescribe, before permitting enrolment.

**Enrolment and Progression**

3. (1) An application to enrol as a candidate for the degree shall be made on the prescribed form which shall be lodged with the Registrar two calendar months before the commencement of the session in which the enrolment is to begin.

3. (2) A candidate for the degree shall:

(a) undertake such formal courses and pass such assessment as prescribed, or

(b) Undertake an approved combination of the above and demonstrate ability to undertake research by the submission of a project report embodying the results of an original investigation of an approved topic.

3. (3) The program of advanced study shall total a minimum of 48 units of credit. The number of units of credit allocated for each course shall be determined by the Committee on the recommendation of the appropriate head of school.

3. (4) A candidate's proposed program shall be approved by the appropriate head of school prior to an enrolment. For the purposes of this requirement the appropriate head of school shall normally be the head of the school providing the major field of study.

3. (5) The progress of a candidate shall be reviewed at least once annually by the Committee and as a result of its review the Committee may cancel enrolment or take such other action as it considers appropriate.

3. (6) No candidate shall be awarded the degree until the lapse of two academic sessions from the date of enrolment in the case of a full-time candidate or four sessions in the case of a part-time candidate. The maximum period of candidature shall be four academic sessions from the date of enrolment for a full-time candidate and eight sessions for a part-time candidate. In special cases, an extension of these times may be granted by the Committee.

**Fees**

4. A candidate shall pay such fees as may be determined from time to time by the Council.

---

**Master of Environmental Engineering Science (MEnvEngSc)**

1. The degree of Master of Environmental Engineering Science may be awarded by the Council to a candidate who has satisfactorily completed a program of advanced study.

**Qualifications**

2. (1) A candidate for the degree shall have been awarded an appropriate degree of Bachelor from the University of New South Wales or a qualification considered equivalent from another university or tertiary institution at a level acceptable to the Higher Degree Committee of the Faculty of Engineering (hereinafter referred to as the Committee).

2. (2) In exceptional cases an applicant who submits evidence of such other academic and professional qualifications as may be approved by the committee may be permitted to enrol for the degree.
(3) If the Committee is not satisfied with the qualifications submitted by an applicant the Committee may require the applicant to undergo such assessment or carry out such work as the Committee may prescribe, before permitting enrolment.

Enrolment and Progression

3. (1) An application to enrol as a candidate for the degree shall be made on the prescribed form which shall be lodged with the Registrar two calendar months before the commencement of the session in which the enrolment is to begin.

(2) A candidate for the degree shall undertake such formal courses and pass such assessment as prescribed and undertake an approved combination of the above and demonstrate ability to undertake research by submission of a project report embodying the results of an original investigation.

(3) A candidate's proposed program shall be approved by the head of the School of Civil and Environmental Engineering prior to enrolment.

(4) The progress of a candidate shall be reviewed at least once annually by the Committee and as a result of its review the Committee may cancel enrolment or take such other action as it considers appropriate.

(5) No candidate shall be awarded the degree until the lapse of two academic sessions from the date of enrolment in the case of a full-time candidate or four sessions in the case of a part-time candidate. The maximum period of candidature shall be four academic sessions from the date of enrolment for a full-time candidate and eight sessions for a part-time candidate. In special cases an extension of these times may be granted by the Committee.

Fees

4. A candidate shall pay such fees as may be determined from time to time by the Council.

Master of Information Science (MInfSc)

1. The degree of Master of Information Science may be awarded by the Council to a candidate who has satisfactorily completed a program of advanced study.

Qualifications

2. (1) A candidate for the degree shall have been awarded an appropriate degree of Bachelor from the University of New South Wales or a qualification considered equivalent from another university or tertiary institution at a level acceptable to the Higher Degree Committee of the Faculty of Engineering (hereinafter referred to as the Committee).

(2) In exceptional cases an applicant who submits evidence of such other academic and professional qualifications as may be approved by the Committee may be permitted to enrol for the degree.

(3) If the Committee is not satisfied with the qualifications submitted by an applicant the Committee may require the applicant to undergo such assessment or carry out such work as the Committee may prescribe, before permitting enrolment.

Enrolment and Progression

3. (1) An application to enrol as a candidate for the degree shall be made on the prescribed form which shall be lodged with the Registrar two calendar months before the commencement of the session in which the enrolment is to begin.

(2) A candidate for the degree shall:
(a) undertake such formal courses and pass such assessment as prescribed, or
(b) undertake an approved combination of the above and demonstrate ability to undertake research by submission of a project report embodying the results of an original investigation.

(3) The program of advanced study shall total a minimum of 72 units of credit. The number of units of credit allocated for each course shall be determined by the Committee on the recommendation of the appropriate head of school.

(4) A candidate's proposed program shall be approved by the head of the Department of Computer Science prior to enrolment.

(5) The progress of a candidate shall be reviewed at least once annually by the Committee and as a result of its review the Committee may cancel enrolment or take such other action as it considers appropriate.

(6) No candidate shall be awarded the degree until the lapse of three academic sessions from the date of enrolment in the case of a full-time candidate or four sessions in the case of a part-time candidate. The maximum period of candidature shall be six academic sessions from the date of enrolment for a full-time candidate and eight sessions for a part-time candidate. In special cases an extension of these times may be granted by the Committee.

Fees

4. A candidate shall pay such fees as may be determined from time to time by the Council.
Graduate Diploma (GradDip)

1. A Graduate Diploma may be awarded by the Council to a candidate who has satisfactorily completed a program of advanced study.

Qualifications

2. (1) A candidate for the diploma shall have been awarded an appropriate degree of Bachelor from the University of New South Wales or a qualification considered equivalent from another university or tertiary institution at a level acceptable to the Higher Degree Committee of the appropriate faculty (hereinafter referred to as the Committee).

   (2) An applicant who submits evidence of such other academic or professional attainment as may be approved by the Committee may be permitted to enrol for the diploma.

   (3) If the Committee is not satisfied with the qualifications submitted by an applicant the Committee may require the applicant to undergo such assessment or carry out such work as the Committee may prescribe before permitting enrolment.

Enrolment and Progression

3. (1) An application to enrol as a candidate for the diploma shall be made on the prescribed form which shall be lodged with the Registrar at least two calendar months before the commencement of the session in which enrolment is to begin.

   (2) A candidate for the diploma shall be required to undertake such formal courses and pass such assessment as prescribed.

   (3) The progress of a candidate shall be reviewed at least once annually by the Committee and as a result of its review the Committee may cancel enrolment or take such other action as it considers appropriate.

   (4) No candidate shall be awarded the diploma until the lapse of two academic sessions* from the date of enrolment in the case of a full-time candidate or four sessions in the case of a part-time candidate. The maximum period of candidature shall be four academic sessions from the date of enrolment for a full-time candidate and six sessions for a part-time candidate. In special cases an extension of these times may be granted by the Committee.

Fees

4. A candidate shall pay such fees as may be determined from time to time by the Council.

   *Failure of 18 units of credit may result in exclusion from the graduate diploma.

   *For the Graduate Diploma in Computer Science no candidate shall be awarded the diploma until a lapse of three academic sessions from the date of enrolment.

Graduate Diploma in Industrial Management (GradDip)

1. The Graduate Diploma in Industrial Management may be awarded by the Council to a candidate who has satisfactorily completed a program of advanced study.

Qualifications

2. (1) A candidate for the diploma shall have been awarded an appropriate degree of Bachelor from the University of New South Wales or a qualification considered equivalent from another university or tertiary institution at a level acceptable to the Higher Degree Committee of the appropriate faculty (hereinafter referred to as the Committee).

   (2) Alternatively a candidate for the Graduate Diploma in Industrial Management shall obtain a grade point average of at least credit in the Industrial Management Qualification at the first attempt of each of the courses. Candidates may then be granted advanced standing in the Graduate Diploma in Industrial Management for the courses already completed in the Industrial Management Qualification.

   (3) An applicant who submits evidence of such other academic or professional attainment as may be approved by the Committee may be permitted to enrol for the diploma.

   (4) If the Committee is not satisfied with the qualifications submitted by an applicant the Committee may require the applicant to undergo such assessment or carry out such work as the Committee may prescribe before permitting enrolment.

Enrolment and Progression

3. (1) An application to enrol as a candidate for the diploma shall be made on the prescribed form which shall be lodged with the Registrar at least two calendar months before the commencement of the session in which enrolment is to begin.

   (2) A candidate for the diploma shall be required to undertake such formal courses and pass such assessment as prescribed.

   (3) The progress of a candidate shall be reviewed at least once annually by the Committee and as a result of its review the Committee may cancel enrolment or take such other action as it considers appropriate.
No candidate shall be awarded the diploma until the lapse of four sessions from the date of enrolment for a part-time candidate. The maximum period of candidature shall be six sessions from the date of enrolment for a part-time candidate or three sessions for a full-time candidate. In special cases an extension of these times may be granted by the Committee.

Fees
4. A candidate shall pay such fees as may be determined by the Council.
The scholarships listed below are available to students whose courses are listed in this book. Each Faculty Handbook contains in its scholarships section the scholarships available for study in that Faculty. Travel scholarships are shown separately. Applicants should note that the scholarships and their conditions are subject to review and the closing dates for awards may vary from year to year.

Scholarship information is regularly included in the University publication ‘Focus’ and updated on the UNSW Web site: http://www.infonet.unsw.edu.au/academic/schopriz/httoc.htm.

Students investigating study opportunities overseas should also consult “Study Abroad” which is published by UNESCO. The British Council (02 9326 2365) may be of assistance for information about study in Britain. The Australian-American Education Foundation (02 6247 9331) or the U.S. Consulate General Educational Advising Centre (02 9373 9230) can provide information about study in America. Information may also be obtained from the embassy or consulate of the country in which the study is proposed and from the proposed overseas institution. Details of overseas awards and exchanges administered by the Department of Education, Training and Youth Affairs (DETYA) can be obtained from the Awards and Exchanges Section, DETYA, PO Box 826, Woden, ACT 2606.

KEY

L Students with Australian Citizenship or Permanent Resident status can apply.
I International students can apply.

Postgraduate scholarships for research or coursework are identified with the following codes:

R Available for study by research (normally Masters by Research or PhD).
C Available for study by coursework (normally Masters by Coursework or Graduate Diploma).

The scholarship information is normally provided in the following format:

• Amount
• Duration
• Conditions

Unless otherwise stated, application forms are available from the Scholarships, Loans and Research Students Office, c/- NewSouth Q (Student Enquiries) Lower Ground Floor, Chancellery. Applications normally become available four to six weeks before the closing date.
Undergraduate Scholarships

Following are details of scholarships available to undergraduate students at UNSW. The scholarships are listed according to the year of study for which the scholarship is available (ie scholarships for first year students; scholarships for second or later year students; scholarships for Honours year students) or whether they are available to undertake travel, and then also by Faculty and course (eg scholarships in Science and Technology or Engineering). If students from more than one Faculty are able to apply, the scholarship is listed in the General Scholarships section.

For further information contact:
The Scholarships, Loans and Research Students Office
The University of New South Wales
Sydney 2052 Australia
Tel: (02) 9385 3100/3101/1462
Fax: (02) 9385 3732
Email: scholarships@unsw.edu.au

Scholarships for students entering the first year of an undergraduate course

General

The Alumni Association Scholarships (L,L)
- Up to $1,500 pa
- 1 year renewable subject to satisfactory progress
The scholarships are available to students enrolled in any year of a full-time undergraduate course. Candidates must be the children or grandchildren of alumni of UNSW. Applications close early January.

The AUSIMM Education Endowment Fund (L)
- $2,500-$5,000 pa
- 1 year may be renewable subject to satisfactory progress
The scholarships are open to full-time undergraduate students enrolled in a course leading to the award of a Geoscience, Mining Engineering or Minerals Engineering (Minerals Processing or Extractive Metallurgy) degree related to the interests of the mineral industry. Further information is available from The Australian Institute of Mining and Metallurgy (AUSIMM), PO Box 660, Carlton South VIC 3053, Tel (03) 9662 5166.

The Australian Development Scholarships (ADS) (L)
- Tuition fees, medical cover, airfare and a stipend
- Duration of the course
This award is for international students from selected countries only. Information and applications can only be obtained from Australian Diplomatic Posts or Australian Education Centres in the home country. Applications normally close at least 12 months before the year of study.

The Australian Vietnam Veterans Trust Education Assistance Scheme (L)
- $3,500 pa
- Duration of the course subject to satisfactory progress
The scholarship is available to the children of Vietnam veterans who are aged under 25 at the time of application. The award is subject to the same income test as AUSTUDY. Applicants can be undertaking any year of a Bachelors course. Applications and further information are available from the Australian Vietnam War Veterans Trust National Office, PO Box K978, Haymarket NSW 1240, Tel (02) 9281 7077, Email vvt@accsoft.com.au. Applications close 31 October.

The Ben Lexcen Sports Scholarships (L,L)
- $2,000 pa
- 1 year with possibility of renewal

The Girls Realm Guild Scholarships (L)
- Up to $1,500 pa
- 1 year with the prospect of renewal subject to satisfactory progress and continued demonstration of need
The scholarships are available to female students under 35 years of age who are enrolling in any year of a full-time undergraduate course. Selection is based on academic merit, aptitude and commitment to the proposed course. Consideration may be given in cases of hardship or disadvantage. Applications close late January.

The Captain Reg Saunders Scholarship (L)
- $3,000
- Up to 4 years
Applicants must be Aboriginals or Torres Strait Islanders eligible to commence a university degree in the area of psychology, nursing, applied science, social work or education. Further information and applications are available from the Aboriginal Education Program, UNSW, Tel (02) 9385 3805.

The UNSW Co-Op Program (L)
- $11,150 pa, and between 9 and 20 months industry training
- Duration of the course subject to satisfactory progress
The scholarships are offered by industry sponsors through the University for some of the disciplines in the Faculties of Science and Technology, Commerce and Economics, and Engineering. Scholars are selected by interview with emphasis placed on achievements in community and extra-curricular activities as well as communication and leadership skills. A minimum UAI of 93.8 is expected. The UNSW Co-Op Program application form is available from school Careers Advisers or the Co-op Program Office on (02) 9385 5116. Applications close September 30 with interviews held at the end of November and beginning of December. Further information is available at the Co-op program web page http://co-op.web.unsw.edu.au.

The Girls Realm Guild Scholarships (L)
- Up to $1,500 pa
- 1 year with the prospect of renewal subject to satisfactory progress and continued demonstration of need
The scholarships are available to female students under 35 years of age who are enrolling in any year of a full-time undergraduate course. Selection is based on academic merit, aptitude and commitment to the proposed course. Consideration may be given in cases of hardship or disadvantage. Applications close late January.

The Ian Somervaille Scholarships (L,L)
- Up to $3,000
- 1 year
The scholarships are available to immediate family members (ie. children, parents, brothers, sisters, spouses, de facto partners) of UNSW staff members. Applicants must be full-time students enrolling in any year of an undergraduate course leading to the degree of Bachelor at UNSW. Selection will be based on academic merit, aptitude and commitment to the proposed course. Consideration may be given in cases of hardship or disadvantage. Applications close 31 January.
The John Niland Scholarships (L)
- $5,000
- 1 year
The scholarship assists rural students to undertake study at UNSW. Applicants will be students who complete the HSC (or its counterpart matriculation requirement) in the top five percent of their state-wide cohort, having been enrolled at a country high school in Australia. Selection will be based on academic merit, potential to contribute to the wider life of the University and consideration of social and/or economic circumstances which might otherwise hinder successful transition to UNSW. Applications close 30 October.

The Kensington Colleges Scholarships
Further information concerning the awards below is available from The Kensington Colleges, Tel (02) 9315 0000, Fax (02) 9315 0011, Email kenso-colleges@unsw.edu.au, Web http://www.kensocoll.unsw.edu.au.

The Matthew James Scholarship
The scholarship provides $1,500 credit towards accommodation costs and is awarded to a resident at the commencement of the second year of an undergraduate degree. Candidates will be assessed on their academic performance in the first year of their course.

The Access Scholarship
The scholarship provides up to half the accommodation fee for a limited number of first year ACCESS scheme students experiencing long term financial hardship. Nominations are forwarded by the UNSW ACCESS office.

The Malcolm Chaikin Scholarship (L)
- $15,000 pa
- Renewable for the duration of the course subject to satisfactory progress
The scholarship is available to students entering the first year of a Bachelor of Science or Engineering in the Faculties of Life Sciences, Science and Technology, or Engineering. Selection will take into account academic merit and interview performance. Applications close 31 October.

The Matthew James Reid Scholarship (L)
- $1,000
- one year only
The scholarships are to be awarded to encourage students from interstate to undertake study in an undergraduate degree at UNSW. The Scholarship is available to a student who completed the HSC (or its equivalent) in the previous year. Applicants must normally be resident interstate. Selection will be based on academic merit, demonstrated ability, leadership qualities, and potential to contribute to the wider life of the University and community. Consideration may also be given to circumstances which might otherwise hinder successful transition to UNSW. Applicants will be required to submit a statement detailing their reasons for undertaking the course of study. Applications close 31 January.

The National Health and Medical Research Council (NHMRC) Training Scholarship for Aboriginal Health Research (L,R)
- $16,135 - $23,997 pa (depending on qualifications)
- Up to 3 years
Applications will be assessed in terms of previous qualifications and experience. Consideration will be given to prior knowledge and experience of Aboriginal culture and health. Applications close early August.

The New College Access Scholarship
The scholarship provides up to half of the accommodation fee for a first year ACCESS scheme student selected by the College. Nominations are forwarded by the UNSW ACCESS office. For further information contact New College, Tel (02) 9381 1906, Fax (02) 9381 1919, Email admissions@newcollege.unsw.edu.au.

The New South Scholarships (L)
- $6,000
- 1 year
The scholarships are available to students commencing the first year of undergraduate study at UNSW in any discipline. Scholarships will be available only to those students who achieved a perfect score in the NSW HSC in the year prior to commencing study. No application form is required.

The Ngunnagan Club Scholarship (L)
- $5,000
- 1 year
The scholarship is available to students enrolled at an Australian country high school who complete the HSC (or its counterpart matriculation requirement) in the top five percent of their state cohort. Applications close 31 October in the year prior to their intended enrolment at UNSW. Final performance in the HSC (or its counterpart matriculation) examination should be reported to the Scholarships, Loans and Research Students Office once known.

Robert Riley Scholarships (L)
- $5,000
The scholarships are awarded to promote the pursuit of justice and human rights for Aboriginal Australians through education. Applicants must be Aboriginals or Torres Strait Islanders up to the age of 25 and proposing to pursue studies in the fields of law, human rights or juvenile justice. Further information and applications are available from the Aboriginal Education Program, UNSW, Tel (02) 9385 3805. Applications close 1 November.

The Smith Family Tertiary Scholarship Scheme (L,L)
- Up to $2,000 for University fees, books, laboratory/field or practical fees
- 1 year
The scheme offers scholarships to first year undergraduate students from disadvantaged families who demonstrate high academic ability and the personal commitment to succeed in tertiary studies. Applicants must be economically disadvantaged, as assessed by The Smith Family, and have demonstrated consistently high academic results. Applications are available from The Education Support Co-ordinator, The Smith Family, Locked Bag 1000, Camperdown NSW 2050, Tel (02) 9550 4422, Fax (02) 9516 4063. Applications close late July.

The St George Students' Association Lexcen Scholarship (L)
- $2,000
- 1 year only
Two scholarships will be awarded annually to high achieving sports persons undertaking, or proposing to undertake, study at UNSW. To be eligible, applicants must be enrolled in, or proposing to enrol in, a course of at least two years duration at UNSW. Applicants should possess an outstanding ability in a particular sport. It is desirable, but not essential, that an applicant's family home is located in the St George/Sutherland Shire region. Each applicant will be assessed on the basis of outstanding ability in a particular sport. Consideration may also be given to an applicant's leadership qualities, potential to contribute to the wider life of the University,
any social and economic circumstances which may affect the applicant and academic merit. Application must be made using the Ben Lexcen Scholarship application form. An interview may be required. Applications will normally close on 31 January.

The Vice-Chancellor's Equity Scholarships (L)
- $1,500 pa
- 1 year
In 1999, a small number of scholarships were awarded for financially disadvantaged students commencing full-time undergraduate study. Consideration is normally given to academic merit and financial need. The conditions may change each year.

The W.S. and L.B. Robinson Scholarship (L)
- Up to $6,500 pa
- 1 year renewable for the duration of the course subject to satisfactory progress
Applicants must have completed their schooling in Broken Hill or have parents who reside in Broken Hill. Applicants should be undertaking a course related to the mining industry, for example courses in mining engineering, geology, electrical and mechanical engineering, metallurgical process engineering, chemical engineering or science. A letter of application should be sent to Pasminco Mining, PO Box 460, Broken Hill NSW 2880. Applications close 30 September.

The UNSW Golden Jubilee Scholarships (I)
- Course fees for the minimum course duration less any advanced standing, subject to satisfactory progress
The scholarships have been established to encourage outstanding Diplomates from Singapore and Malaysia to complete an undergraduate degree at UNSW. To be eligible, applicants must be proposing to undertake an undergraduate qualification at UNSW in one of the Faculties of Arts and Social Sciences, the Built Environment, Commerce and Economics, Engineering, Life Sciences or Science and Technology or the College of Fine Arts. Successful applicants will be granted advanced standing on the basis of their studies in Singapore and Malaysia. The Scholarship is only available to graduands of specific institutions. Applicants must be Citizens or Permanent Residents of Singapore or Malaysia. Selection will be based on academic merit. Applications will normally close on 30 November for study commencing in Session One of the following year and 30 April for study commencing in Session Two of the same year.

The Bega Scholarship in Civil Engineering (L)
- $1,000
- 1 year only
The scholarship has been established to encourage students to undertake the Bachelor of Engineering in Civil Engineering course at UNSW. To be eligible, applicants must be assessed as eligible for the ACCESS Scheme, with one of the grounds for eligibility being financial need. The successful applicant must enrol in the Bachelor of Engineering in Civil Engineering as a full-time student. Students will be considered on the basis of their application for the ACCESS Scheme and academic merit. The first scholarship will be awarded in 2001.

The Faculty of Engineering Undergraduate Scholarships (L)
- $2,000
- 1 year
At least 100 Faculty of Engineering Undergraduate Scholarships are available. The scholarships are available to full-time students entering the first year of the following undergraduate programs: Aerospace Engineering, Biomedical Engineering/Chemical Engineering, Biomedical Engineering/Computer Engineering, Biomedical Engineering/Electrical Engineering, Biomedical Engineering/Mechanical Engineering, Chemical Engineering, Civil Engineering, Computer Engineering, Computer Science, Electrical Engineering, Environmental Engineering, Geomatic Engineering, Industrial Chemistry, Manufacturing Engineering and Management, Mechanical Engineering, Mechatronic Engineering, Mining Engineering, Naval Architecture, Petroleum Engineering, Software Engineering and Telecommunications Engineering. No application is required. Consideration will be given to students on the basis of their UAI score in the HSC (or equivalent matriculation).

The Jack Beale Scholarship (L,L)
- Up to $1,000
- 1 year
The scholarship is available to a first year student enrolling in the Faculty of Engineering. Applicants should be concerned about water resources and the environment. Applications close 31 October.

The UNSW ResMed Scholarship (I,L)
- $5,000 pa
- Course duration, subject to satisfactory progress
The scholarships are established to encourage students to undertake studies in the Graduate School of Biomedical Engineering, UNSW. Four Scholarships will be offered to students commencing the course in each of the academic years 2000 and 2001. To be eligible for a Scholarship, an applicant must be undertaking one of the following four concurrent degrees offered in the Graduate School of Biomedical Engineering - BE(Chem) MBiomedE, BE(Comp) MBiomedE, BE(Mech) MBiomedE or the BE(Elec) MBiomedE. Each applicant will be assessed on the basis of performance in the Higher School Certificate (or equivalent) in the year prior to commencing the BEMBiomedE qualification, the applicants' level of commitment to Biomedical Engineering and a statement detailing the reasons for undertaking the course. Applications will normally close on 30 November.

The Alexandria Ada Lam Scholarship (L)
- $1,000 pa
- The duration of the course subject to satisfactory performance
One scholarship is available to a female student who undertook the HSC in the previous year and is enrolling in the first year of a Bachelor of Engineering degree. Applicants will be initially assessed on the basis of academic merit. Consideration will also be given to the reasons for undertaking the course and financial need. Applications close at the end of January.

The Vida Balshaw Women in Engineering Scholarship (L)
- Up to $2,500
- 1 year
One scholarship is available to a female student enrolling in the first year of a Bachelor of Engineering degree course in Electrical or Mechanical Engineering. Applicants will be considered on the basis of academic merit and financial need. Applications close late January.
Chemical Engineering and Industrial Chemistry

The School of Chemical Engineering and Industrial Chemistry Undergraduate Scholarships (L)
- Up to $1,000
- 1 Year
Scholarships are available to full-time students in the Chemical Engineering and Industrial Chemistry course leading to the degree of Bachelor of Engineering/Bachelor of Science at UNSW. Selection is based on academic merit and interview performance. There is no application. Only applicants for the UNSW Co-Op Program Scholarship will be considered.

Civil Engineering

The Jacob N Frenkel Scholarship in Civil Engineering (L)
- Up to $1,200
- 1 year
The scholarship provides assistance to a student proposing to undertake a Bachelor of Engineering in Civil Engineering at UNSW. Selection is based on academic merit, reason for study and financial need. Applications close 31 October.

Geomatic Engineering

The Institution of Surveyors Scholarship (L)
- Up to $1,500 pa
- 1 year renewable for the duration of the course subject to satisfactory progress
Applicants must be eligible for admission to the full-time degree course in Geomatic Engineering. Selection is based on academic merit, personal qualities and financial need. Applications close at the end of January.

The Alumni Association Scholarships (L,L)
- Up to $1,500 pa
- 1 year renewable subject to satisfactory progress
- 1 year with the prospect of renewal subject to satisfactory progress
The scholarships are available only to female students under 35 years of age who are enrolling in any year of a full-time undergraduate course. Selection is based on academic merit and financial need. Applications close 25 March.

Scholarships for students in their second or later year of study

General

The AITD-MMI Insurance-Mark Pompei Scholarship (L)
- $1,000
The Australian Institute of Training and Development and MMI Insurance offer an annual scholarship to a part-time student currently working in the field of Training and Development. Applicants should be completing their first accredited qualification to assist their development in this field. Applications are available from AITD NSW Division Administrator, PO Box 5452, West Chatswood NSW 2057, Tel (02) 9419 4966, Fax (02) 9419 4142, Email nswdivn@aitd.com.au. Applications close in May.

The Australian Vietnam Veterans Trust Education Assistance Scheme (L)
- $3,500 pa
- Duration of the course subject to satisfactory progress
The scholarship is available to the children of Vietnam veterans who are aged under 25 at the time of application. The award is subject to the same income test as AUSTUDY. Applications and further information are available from the Australian Vietnam War Veterans Trust National Office, PO Box K978, Haymarket NSW 1240, Tel (02) 9281 7077, Email vvt@accsoft.com.au. Applications close 31 March.

The Ben Lexcen Sports Scholarships (L,L)
- $2,000 pa
- 1 year with possibility of renewal
The scholarships are available to students who are accepted into a course of at least two years duration. Prospective applicants should have an outstanding ability in a particular sport and are expected to be active members of a UNSW Sports Club. Applications close late January.

The Bill Pardy University Challenge Scholarship (L,L)
- $1,000
- 1 year only
The Scholarship is established to recognise Bill Pardy's achievement in winning the 1998 University Challenge on the television program Sale of the Century, and to encourage students to participate in and contribute to the cultural life of the University. To be eligible, applicants must be enrolled in the second or later year of an undergraduate degree at UNSW. Each applicant will be assessed on the basis of a personal statement detailing their previous and proposed contribution to the cultural life of the University. Consideration may also be given to academic merit. Applications will normally close on 31 March.

The Girls Realm Guild Scholarship (L)
- Up to $1,500 pa
- 1 year with the prospect of renewal subject to satisfactory progress and continued demonstration of need
The scholarships are available only to female students under 35 years of age who are enrolling in any year of a full-time undergraduate course. Selection is based on academic merit and financial need. Applications close 25 March.
The Dried Fruits Research and Development Council (DFRDC) Studentships and Student Awards (L,R)

- Up to $3,000 for Studentships, up to $1,000 for Student Awards

The studentships assist students to undertake research projects in the final year of a Bachelors degree (applications close April 15), or to undertake a research project during the summer vacation (applications close October 15). The Student Awards are provided for excellence in student research projects related to the dried fruit industry. Further information and applications are available from the Executive Officer, Dried Fruits Research and Development Council, PO Box 1142, Mildura VIC 3502, Tel (03) 5022 1515, Fax (03) 5023 3321, Email dfrdc@ozland.net.au

The Esso Australia Ltd Geosciences Scholarship (L,R)

- Up to $3,000
- 1 year

The scholarship is for a full-time student seeking to undertake study in the final year (Year 4) of a Bachelor of Science (AppGeol) or an equivalent Honours year, majoring in geology or geophysics. The successful applicant is expected to have an interest in petroleum related studies ie sedimentology, biostratigraphy, seismic/magnetic, basin studies, palynology or palaeoecology. Selection is based on academic merit, the benefit the student will gain by being awarded the scholarship and can include consideration of financial need. Applications close 30 November.

The Ian Somervaille Scholarships (L,R)

- Up to $3,000
- 1 year

The scholarships are available to immediate family members (ie. children, parents, brothers, sisters, spouses, de facto partners) of UNSW staff members. Applicants must be full-time students enrolling in any year of an undergraduate course leading to the degree of Bachelor at UNSW. Selection will be based on academic merit, aptitude and commitment to the proposed course. Consideration may be given in cases of hardship or disadvantage. Applications close 31 January.

The Julian Small Foundation Annual Research Grant (L,R)

- Up to $5,000

Applications are open to postgraduate and undergraduate students undertaking research and involved in the study of law, or industrial relations. Selection will be based on a research proposal which outlines how the research will advance thinking and practice in the area of employment law and industrial relations in Australia. Applications close mid-August.

The Kensington Colleges Scholarships

Further information concerning the awards below may be available from The Kensington Colleges, Tel (02) 9315 0000, Fax (02) 9315 0011, Email kenso-colleges@unsw.edu.au, Web http://www.kenso-college.unsw.edu.au.

The Nickoll Scholarship

The scholarship provides $650 credit for accommodation costs and is awarded to a returning resident in each College. Applicants will be assessed on their academic performance in the second or later year of their course.

Resident Assistant Scheme

The program provides subsidised accommodation, valued at up to $1,000, for 22 academically promising residents, and an apprenticeship in the collegiate Residential Academic Staff role. All residents who have successfully completed at least one year of university study are eligible to apply.

The National Health and Medical Research Council (NHMRC) Training Scholarship for Aboriginal Health Research (L,R)

- $16,135 - $23,997 pa (depending on qualifications)
- Up to 3 years

Applicants must be undertaking an undergraduate or postgraduate degree which includes, or leads to, research relevant to Aboriginal health. Applications will be assessed in terms of previous qualifications and experience. Consideration will be given to prior knowledge and experience of Aboriginal culture and health. Applications close late July.

The Nicholas Catchlove Scholarship in Flying (L)

- $10,000
- 1 year

The scholarship will be awarded to provide a final year student with the opportunity to undertake further flying training to prepare for a career in the aviation industry. Applicants must be proposing to undertake the final year of an appropriate course and hold a Commercial Pilot’s Licence. Selection will be based on academic merit, reasons for undertaking the course, financial need, commitment to flying and to the course, demonstrated ability, leadership qualities and interview performance. Applications close in October.

The NSW Ministry for the Arts Scholarships (L,R)

- $5,000 - $25,000 (depending on the award)

The NSW Government offers a number of scholarships and awards to writers, artists and scholars living in NSW. Further information is available from the New South Wales Ministry for the Arts, GPO Box 5341, Sydney NSW 2000, Tel (02) 9228 3533, Fax (02) 9228 4722.

The RGC Scholarship in Economic Geology (L)

- $5,000
- 1 year

The scholarship is available to a student entering Year 4 of the Applied Geology course or an Honours year in geology in the Science course and who is proposing to undertake a field project relevant to economic geology. Letters of application and requests for information should be directed to RGC, Gold Fields House, 1 Alfred St, Sydney NSW 2000. Applications close 31 January.

The Rural Allied Health Placement Grants (L,R)

- Up to $500

Grants are available to students undertaking rural placements, who are in the final two years of an undergraduate course in dietetics, diagnostic radiography, occupational therapy, pharmacy, physiotherapy, podiatry, social work, speech pathology, psychology (honours) or any year of a postgraduate course in dietetics or psychology (Masters). Applications are available from the NSW Health Rural Health Support Unit, Tel (02) 6640 2302, Fax (02) 6640 2499, Email rhsu@nor.com.au, Website www.nor.com.au/community/ rhsu. Session One applications close 15 May. Session Two applications close in August.

The Rural Allied Health Scholarships (L,R)

- $5,750

Scholarships are available to students who are in the final two years of a four year undergraduate course in Aboriginal health, dietetics, diagnostic radiography, occupational therapy, pharmacy, physiotherapy, podiatry, social work, speech pathology, or the final year of psychology (honours) degree or any year of a Masters qualification in dietetics or psychology. Applications are available from the NSW Health Rural Health Support Unit, Tel (02) 6640 2302, Fax (02) 6640 2499, Email rhsu@nor.com.au, Website www.nor.com.au/community/ rhsu. Applications close late September.
The Sam Cracknell Memorial Scholarships (L,L)
- Up to $1,500
- 1 year
Applicants should have already completed at least 2 years of a degree or diploma course and be enrolled in a full-time course during the year of application. Selection is based on academic merit, participation in sport both directly and administratively and financial need. Applications close 31 March.

The St George Students' Association Lexcen Scholarship (L)
- $2,000
- 1 year only
Two scholarships will be awarded annually to high achieving sports persons undertaking, or proposing to undertake, study at UNSW. To be eligible, applicants must be enrolled in, or proposing to enrol in, a course of at least two years duration at UNSW. Applicants should possess an outstanding ability in a particular sport. It is desirable, but not essential, that an applicant's family home is located in the St George/Sutherland Shire region. Each applicant will be assessed on the basis of outstanding ability in a particular sport. Consideration may also be given to an applicant's leadership qualities, potential to contribute to the wider life of the University, any social and economic circumstances which may affect the applicant and academic merit. Application must be made using the Ben Lexcen Scholarship application form. An interview may be required. Applications will normally close on 31 January.

The Spruson and Ferguson (Patent Attorneys) Scholarship for Innovation (L)
- At least $1,000
- 1 year
The scholarship is available to a student who is undertaking the final year of an undergraduate course in any school of the Faculty of Science and Technology or the Faculty of Engineering. Selection will be based on academic merit and the innovative nature of the proposed final year project. Applicants are required to submit an application and a 200 word outline of their proposed research topic. Applications close 7 March.

The Telstra Education Fellowships (L)
- $7,500
- 1 year
Applicants must be entering the final year of study in the disciplines of computer, electrical or electronic engineering, computer science or human factors. Students may also have the opportunity to undertake up to 12 weeks non-compulsory vacation employment. Further information is available from the Fellowship Applications Officer, Telstra Research Laboratories, PO Box 249, Rosebank MDC, Clayton Vic 3169, Email c.zaman@trl.telstra.com.au. Applications normally close at the end of July.

Telstra Network Technology Group and Multimedia (NTG&M) EEO Scholarships (L)
- $10,000, plus summer vacation work and guaranteed employment
- 1 year
The scholarships are open to undergraduate students enrolled in the second last year in electrical/electronic engineering, computers systems engineering, communications or other degree related to telecommunications. Applicants must belong to one of the following EEO groups: women, people from a non-English-speaking background, Aborigines or Islanders, people with a disability. The successful candidates are expected to work for Telstra NTG&M in the summer break and for at least two years after the completion of study. Enquiries to Karen Stewart on (03) 9634 3448, Email kstewart@vcomfin.telstra.com.au. Applications close late June.

The W.S. and L.B. Scholarship (L)
- Up to $6,500 pa
- 1 year renewable for the duration of the course subject to satisfactory progress
Applications must have completed their schooling in Broken Hill or have parents who reside in Broken Hill. Applicants should be undertaking a course related to the mining industry, for example courses in mining engineering, geology, electrical and mechanical engineering, metallurgical process engineering, chemical engineering or science. A letter of application should be sent to Pasminco Mining, PO Box 460, Broken Hill NSW 2880. Applications close 30 September.

Faculty second year or later

Faculty of Engineering

ACMEE Scholarship in Engineering (L,L)
- Up to $1,200
- 1 year
Applicants must be in their final year of study in any discipline of a Bachelor of Engineering degree in the Faculty of Engineering. The scholarship is provided to advance the management education of engineers. Selection will be based on academic achievement particularly in the field of management, demonstrated participation and performance in industry. The proposed final year project should be related to management and business performance in an engineering-based enterprise. Applications close 30 April.

The Clough Engineering Scholarship (L,L)
- $5000 pa
- 1 year
Clough Engineering Limited is pleased to offer scholarships to students in the Bachelor of Civil Engineering, Mechanical Engineering, Civil/Commerce or Mechanical/Commerce courses at UNSW. The aim of the scholarship is to encourage students in the application of their studies to business situations. Applicants must be full time students in the final or penultimate year of their undergraduate course during the year for which the scholarship is awarded. Applicants will be shortlisted for interview during October/November by Clough Engineering. All scholarship holders will be offered employment with Clough Engineering at the conclusion of their degree. Applications close 30 September.

The Shell Coal Undergraduate Scholarship (L)
- $5,000 pa
- Up to 3 years subject to satisfactory progress
Applicants must have successfully completed the first year of a degree course in mining, mechanical, environmental, geological, metallurgical or electrical engineering (or equivalent), and wish to pursue a career in mining. Selection will be based on academic and other achievements. Applications close late March.

Chemical Engineering and Industrial Chemistry

The Royston Scholarship in Chemical Engineering (L)
- Up to $1,000
- 1 year
The scholarship is available to a student undertaking Year 4 of the Bachelor of Engineering degree course in Chemical Engineering,
with a project in Mineral Process or Fuel Technology. Selection will be based on academic merit and the reasons for undertaking the proposed project/course of study. Applications close 31 October in the year prior to award.

Civil and Environmental Engineering

The PPK Environment and Infrastructure Scholarship (L)
- $1,500
- 1 year
The scholarship is available to a student who has completed Year 2 of a degree course in civil or environmental engineering. Selection will be based on academic merit, the reasons for undertaking the course of study, interest in pursuing a career in civil/environmental engineering and interview performance. The Head of School will invite applications from suitably qualified students. Further information is available from the Head of School, Civil and Environmental Engineering, UNSW, Tel (02) 9385 5018.

Mining Engineering

The BHP Minerals Scholarship in Mining Engineering (L)
- $10,000 pa and payment of HECS
- Up to 3 years subject to satisfactory progress
The scholarship is available to students in the second year of the Mining Engineering degree at UNSW. Selection will be based on academic performance in the first year of the degree. Applications close 31 March.

The Charles Warman Scholarship (L)
- $4,000 pa
- 1 year renewable subject to satisfactory progress
The scholarship is available to students enrolling in Year 3 or 4 of the full-time degree course in Mining Engineering (BE or BE/BSc). Selection will be based on academic merit. Applications close early March.

The Dyno Nobel Asia Pacific Ltd Scholarship (L)
- Up to $7,000 pa
- 2 years subject to satisfactory progress
The scholarship is available for Years 3 and 4 of the Mining Engineering course. The scholarship is offered every second year and will be offered again in 2000.

The Komatsu Scholarship (L)
- Up to $2,000 payable in two equal instalments
- 1 year
The scholarship is available to the student with the best performance in Year 3 and entering Year 4 of the Mining Engineering course. The student is nominated by the School. There is no application.

The Mintech Scholarship (L)
- Up to $1,000 pa
- 1 year
The scholarship is to be awarded to a full-time student in the final year of the Mining Engineering degree at UNSW. The student is nominated by the School. There is no application.

Honours Year Scholarships

General

The Alumni Association Scholarships (L)
- Up to $1,500 pa
- 1 year renewable subject to satisfactory progress
The scholarships are available to students enrolled in any year of a full-time undergraduate course. Candidates must be the children or grandchildren of alumni of UNSW. Applications close early January.

The Apex Foundation for Research into Intellectual Disability Studentships (L)
- $1,000
The studentships are available to students preparing a thesis related to intellectual disability. Applications should be in the form of a letter which includes a curriculum-vitae and thesis plan and must be supported by a letter from the Head of School/Department. Applications should be sent to the Honorary Secretary, Apex Foundation Studentships, PO Box 311, Mt Evelyn VIC 3796. Applications close 31 May.

The Australian and New Zealand Council for the Care of Animals in Research and Teaching (ANZCCART) Student Award (L)
- $1,000 for attendance at the annual conference
Applicants can be Honours students from any discipline. The award provides assistance for a student to attend the annual conference. Applications are available from ANZCCART, PO Box 19, Glen Osmond SA 5064, Tel (08) 8303 7325. Applications close in July.

The Australian Vietnam Veterans Trust Education Assistance Scheme (L)
- $3,500 pa
- Duration of the course
The scholarship is available to the children of Vietnam veterans who are aged under 25 at the time of application. The award is subject to the same income test as AUSTUDY. Applicants can be undertaking any year of a Bachelors course. Applications and further information are available from the Australian Vietnam War Veterans Trust National Office, PO Box K978, Haymarket NSW 1240, Tel (02) 9281 7077, Email vvt@accsoft.com.au. Applications close 31 October.
The Ben Lexcen Sports Scholarships (L,L)
- $2,000 pa
- 1 year with the possibility of renewal

The scholarships are available to students who are accepted into a course of at least two years duration. Prospective applicants should have an outstanding ability in a particular sport and are expected to be active members of a UNSW Sports Club. Applications close late January.

The CRC Reef Research Centre Support (L,L)
- $1,000

Applications must be undertaking a full-time Honours year project that contributes to planning and managing the Great Barrier Reef Marine Park and to the Reef’s ecologically sustainable development. Applications and further information may be obtained from The Administrative Assistant, CRC Reef Research Centre, James Cook University, Townsville QLD 4811. Email crcreef@jcu.edu.au.

Applications close mid December 1999.

The Esso Australia Ltd Geosciences Scholarship (L,L)
- Up to $3,000
- 1 year

The scholarship is for a full-time student seeking to undertake study in the final year (Stage 4) of a Bachelor of Science degree in Applied Geology or an equivalent Honours year, majoring in geology or geophysics. The successful applicant is expected to have an interest in petroleum related studies ie sedimentology, biostratigraphy, seismic/magnetic/gravity geophysical studies, basin studies, palynology or palaeontology. Selection is based on academic merit, the benefit the student will gain by being awarded the scholarship and can include consideration of financial need. Applications close 30 November.

The Girls Realm Guild Scholarships (L)
- Up to $1,500 pa
- 1 year with the prospect of renewal subject to satisfactory progress and continued demonstration of need

The scholarships are available only to female students under 35 years of age who are enrolling in any year of a full-time undergraduate course. Selection is based on academic merit and financial need. Applications close 25 March.

The Grains Research and Development Corporation (GRDC) Undergraduate Honours Scholarship (L,L)
- $6,000 (ie $5,000 to the student and $1,000 to the host School/Department).
- 1 year

Applicants must be undertaking a full-time Honours program. Study in an area of significance to the grains industry will be viewed favourably. A letter of application, including a curriculum-vitae, academic record, letter of support from the Head of School/Department and two referees' supporting statements, should be sent to GRDC Undergraduate Honours Scholarship, PO Box E6, Queen Victoria Terrace, Canberra ACT 2600, Tel (02) 62725528. Applications close early November.

The Ian Somerville Scholarships (L,L)
- Up to $3,000
- 1 year

The scholarships are available to immediate family members (ie. children, parents, brothers or sisters) of UNSW staff members or their married or de facto partners. Applicants must be full-time students enrolling in any year of an undergraduate course leading to the degree of Bachelor at UNSW. Selection will be based on academic merit, aptitude and commitment to the proposed course. Consideration may be given in cases of hardship or disadvantage. Applications close 31 January.

The National Health and Medical Research Council (NHMRC) Training Scholarship for Aboriginal Health Research (L,R)
- $16,135 - $23,997 pa (depending on qualifications)
- Up to 3 years

Applicants must be undertaking an undergraduate or postgraduate degree which includes, or leads to, research relevant to Aboriginal health. Applications will be assessed in terms of previous qualifications and experience. Consideration will be given to prior knowledge and experience of Aboriginal culture and health. Applications close late July.

The NSW Ministry for the Arts Scholarships (L,R,C)
- $5,000 - $25,000 (depending on the award)

The NSW Government offers a number of scholarships and awards to writers, artists and scholars living in NSW. Further information is available from the New South Wales Ministry for the Arts, GPO Box 5341, Sydney NSW 2000, Tel (02) 9228 3533, Fax (02) 9228 4722.

The RGC Scholarship in Economic Geology (L)
- $5,000
- 1 year

The scholarship is available to a student entering Stage 4 of the Applied Geology course or an Honours year in geology in the Science course and who is proposing to undertake a field project relevant to economic geology. Letters of application and requests for information should be directed to RGC, Gold Fields House, 1 Alfred St, Sydney NSW 2000. Applications close 31 January.

The River Basin Management Society Ernest Jackson Memorial Research Grants (L,L)
- Up to $2,000

The scholarship assists PhD and Masters students undertaking research in the field of river basin management. Fourth year Honours students are encouraged to apply. Further information is available from RBMS, PO Box 113, Forest Hill VIC 3131, Tel (03) 9816 6896. Applications close in April.

The RSPCA Alan White Scholarship (L,L)
- $2,500

Applicants should be undertaking original research to improve the understanding and welfare of animals. A letter of application should be sent to the Executive Officer, RSPCA Australia, PO Box E369, Queen Victoria Terrace, Canberra ACT 2600, Tel (02) 62311437. Applications close 31 March.

The Rural Allied Health Placement Grants (L)
- Up to $500

Grants are available to students undertaking rural placements, who are in the final two years of an undergraduate course in dietetics, diagnostic radiography, occupational therapy, pharmacy, physiotherapy, podiatry, social work, speech pathology, psychology (honours) or any year of a postgraduate course in dietetics or psychology (Masters). Applications are available from the NSW Health Rural Health Support Unit, Tel (02) 6640 2302, Fax (02) 6640 2499, Email rhsu@nor.com.au, Web www.nor.com.au/community/rhsu. Session One applications close 15 May. Session Two applications close in August.
The Rural Allied Health Scholarships (L)
- $5,750
Scholarships are available to students who are in the final two years of a four year undergraduate course in Aboriginal Health, dietetics, diagnostic radiography, occupational therapy, pharmacy, physiotherapy, podiatry, social work, speech pathology, or the final year of psychology (honours) degree or any year of a Masters qualification in dietetics or psychology. Applications are available from the NSW Health Rural Health Support Unit, Tel (02) 6640 2302, Fax (02) 6640 2499, Email rhsu@nor.com.au, Web www.nor.com.au/community/rhsu. Applications close late September.

The Sam Cracknell Memorial Scholarship (I,L)
- Up to $1,500
- 1 year
Applicants should be full-time students who have already completed at least 2 years of a degree or diploma course. Selection is based on academic merit, participation in sport both directly and administratively, and financial need. Applications close 31 March.

The St George Students' Association Lexcen Scholarship (L)
- $2,000
- 1 year only
Two scholarships will be awarded annually to high achieving sports persons undertaking, or proposing to undertake, study at UNSW. To be eligible, applicants must be enrolled in, or proposing to enrol in, a course of at least two years duration at UNSW. Applicants should possess an outstanding ability in a particular sport. It is desirable, but not essential, that an applicant's family home is located in the St George/Sutherland Shire region. Each applicant will be assessed on the basis of outstanding ability in a particular sport. Consideration may also be given to an applicant's leadership qualities, potential to contribute to the wider life of the University, any social and economic circumstances which may affect the applicant and academic merit. Application must be made using the Ben Lexcen Scholarship application form. An interview may be required. Applications will normally close on 31 January.

The Ukrainian Studies Foundation of Australia Endowed Scholarship (I,L)
- $1,000 in 2000, $1,500 from 2001
- 1 year only
The scholarship is available to students undertaking, or proposing to undertake, postgraduate or honours level studies at UNSW on a Ukrainian topic/theme, or comparative Ukrainian/Australian topic/theme. Selection will be based on academic merit and the reasons for undertaking the current and/or proposed studies. Applications will normally close on 31 January.

The University Honours Year Scholarships (I,L)
- $1,000
- 1 year
A number of scholarships will be awarded on the basis of academic merit for students entering an 'add-on' honours year, ie the honours year in a degree course which is normally a pass degree but which has the option of a further year of study at Honours level. Applications close 30 November.

The W.S. and L.B. Robinson Scholarship (L)
- Up to $6,500 pa
- 1 year renewable for the duration of the course subject to satisfactory progress
Applicants must have completed their schooling in Broken Hill or have parents who reside in Broken Hill. Applicants should be undertaking a course related to the mining industry, for example courses in mining engineering, geology, electrical and mechanical engineering, metallurgical process engineering, chemical engineering or science. A letter of application should be sent to Pasminco Mining, PO Box 460, Broken Hill NSW 2880. Applications close 30 September.

Faculty Scholarships

Faculty of Engineering

Computer Science and Engineering

Department of Computer Systems (DoCS) Thesis Scholarship (I,L)
- $2,500
- 1 year
Scholarships are available to students undertaking the final year thesis in the area of computer systems under the supervision of a DoCS academic. Applicants are expected to have a High Distinction result in at least one computer systems subject. Further information is available from Dr Geraint Heiser, Tel (02) 9385 5156. Applications close one week after the Session 2 assessment deadline.
Travel Scholarships

General

The Arthur Anderson Study Abroad Scholarship (L)
- Up to $2,500
The scholarship provides financial assistance to undergraduate students to undertake a period of study/research in the Arthur Anderson offices in Singapore. Applicants must be full-time students undertaking study in law, commerce, or economics. Applicants must normally be intending to undertake the final year of study and to complete the travel prior to completion of the final year. Applications are also open to students undertaking an official exchange program with a university in Asia. Further information and application forms are available from the UNSW International Student Centre, Tel (02) 9385 5333. Applications normally close 31 July in the year prior to the final year of study.

The Association of International Education Japan (AIEJ) Short-Term Student Exchange Promotion Program (Inbound) Peace and Friendship Scholarships (I,L)
- 50,000 yen (settling-in allowance), 100,000 yen per month, plus airfare
- Ten months to one year
Applicants must be accepted by a Japanese University under a student exchange program agreement with UNSW. Students must initially apply directly to a Japanese University through the UNSW International Student Centre, Tel (02) 9385 5333. The Japanese host university will recommend candidates to AIEJ and students must apply as directed by the host university. Applications close in February, May and September each year.

The Association of International Education Japan (AIEJ) Short-Term Student Exchange Promotion Program (Inbound) Scholarships (I,L)
- 50,000 yen (settling-in allowance), 80,000 yen per month, plus airfare
- Six months to one year
Applicants must be accepted by a Japanese University under a student exchange program agreement with UNSW. Students must initially apply directly to a Japanese University through the UNSW International Student Centre, Tel (02) 9385 5333. The Japanese host university will recommend candidates to AIEJ and students must apply as directed by the host university. Applications close in February, May and September each year.

The AT&T Leadership Award (I,L,R,C)
- US$5,000
The award is open to students who will be commencing full-time undergraduate or postgraduate study in the United States between January and September in the year of application. The scholarship is open to students from the following Asia/Pacific countries: Australia, China, Hong Kong, India, Indonesia, Japan, Republic of Korea, Malaysia, Philippines, Singapore, Taiwan and Thailand. Information and applications are available from the U.S. Consulate General, USIS, Level 59 MLC Centre, 19-20 Martin Place, Sydney NSW 2000, Tel (02) 9662 3016. Applications close 15 September.

The Australia-Korea Foundation/National Korean Studies Centre Exchange Scholarships (L)
- Up to $2,500
The scholarships provide financial assistance to undergraduate students who have been accepted as exchange students by a Korean University. Information and applications are available from the Programs Co-ordinator, National Korean Studies Centre, PO Box 218, Hawthorn VIC 3122, Email nksc@swin.edu.au. Applications close early January.

The Australia-Korea Foundation Undergraduate Bursaries (L)
- $1,000
- 1 year
Bursaries are available for students commencing the first year of an undergraduate course intending to study the Korean language. Information and applications are available from the Programs Co-ordinator, National Korean Studies Centre, PO Box 218, Hawthorn VIC 3122, Email nksc@swin.edu.au. Applications close in December.

Churchill Fellowships (L)
- Tuition, travel and living allowances
Churchill Fellowships provide financial support for Australian Citizens to undertake study, training or projects overseas. Fellowships will not normally be awarded for higher academic or formal qualifications. Applicants must be over 18 years of age. Further information and applications are available from the Chief Executive Officer, The Winston Churchill Memorial Trust, 218 Northbourne Ave, Braddon ACT 2612, Tel (02) 6247 8333. Applications close late February.

DAAD - The German Academic Exchange Service Scholarships (L)
Applications forms for the following scholarships are available from the Consulate General of the Federal Republic of Germany, PO Box 204, Woollahra NSW 2025.

One-Semester German Studies Scholarships
- DM1,000 a month living allowance, travel assistance of DM2,500 and the health insurance contribution
- One semester
Applicants must be in their third year of German Studies. Applications close 1 July.

Deutschlandkundlicher Winterkurs
- DM3,500 to assist with travel and living expenses and course fees
Undergraduate and postgraduate students from all fields with at least two years University level German (with a better than B average) may apply for this scholarship. The students should be aged from 19 to 32 and proposing to undertake the 8 week German studies course (in German) at the University of Freiburg. The course provides language instruction and concentrates on historical and cultural aspects of contemporary Germany for students with some knowledge of German and a background in German Studies. Applications close 1 August.

Greek Government Scholarships (L)
- Tuition fees, monthly subsidy plus other allowances
Scholarships are available for undergraduate and postgraduate study in Greece. Applicants must be Australian citizens. Further information is available from the Embassy of Greece, 9 Turanna St, Yarralumla.
The Harvard Travel Scholarships (L)
- $15,000 contribution towards fees, travel and living expenses
- One-off payment
The scholarship will be awarded by the Vice-Chancellor on the basis of recommendations from the Deans of the Faculties. Candidates must have completed at least 2 years full-time (or the part-time equivalent) of an undergraduate course at the UNSW and have an impressive academic record. Award of the scholarship is subject to the recipient gaining entry to the Harvard-Radcliffe Visiting Undergraduate Program. Applications close mid-November for travel in the following year.

The International Exchange Travel Scholarships (L)
- Up to $1,500
- 1 year
The scholarships were established to encourage UNSW students to participate in the University’s formal international exchange programs. Students must be undergraduates embarking on a period of study overseas which will count toward their UNSW degree. Awards will be granted on the basis of academic merit. Further information is available from the UNSW International Student Centre, Tel (02) 9385 5333.

Italian Government Scholarships (L)
- 1 million Italian lira per month
- 2-24 months
Scholarships are open to Australian citizens to undertake research and language studies in Italy. Applicants must be aged under 35 years. Further information is available from the Italian Embassy, 12 Grey St, Deakin ACT 2600, Tel (02) 6273 3333, Fax (02) 6273 4223. Applications close early March.

Japan Airlines Scholarships (L)
- Air travel, insurance, tuition, accommodation, textbooks and a daily allowance
The scholarships are available for undergraduate students to participate in a summer session of Japanese language and cultural studies, home stays in Tokyo and participation at a symposium featuring regional experts. A knowledge of Japanese is not necessary. Further information and applications are available from Level 14, 201 Sussex Street, Sydney NSW 2000, Tel (02) 9272 1151. Applications normally close mid-April.

The Japanese Government (Monbusho) Scholarships (L)
Scholarships are available to Australian Citizens for study in Japan for postgraduate research or five years of undergraduate study. Applicants must be willing to study the Japanese language and receive instruction in Japanese. Further information and applications are available from Monbusho Scholarships, Embassy of Japan, 112 Empire Circuit, Yarralumla ACT 2600, Tel (02) 6272 7268, Fax (02) 6273 1848. Applications close early July.

The Malcolm Chaikin Overseas Exchange Scholarship (L)
- $4,000
- 1 year
Scholarship is available for a third or later year student in a Science or Engineering degree program in the Faculty of Life Sciences, Science and Technology or Engineering. Applicants must have applied for the Malcolm Chaikin Scholarship for 1998 or later, and be undertaking an official overseas exchange program. It is expected that the first scholarship will be awarded for travel in 2000. Applications close 30 September.

The Mitsu Education Foundation Scholarship (L)
A three week scholarship to Japan is available to a young Australian national to help promote goodwill between the two countries. Candidates should be full-time undergraduate students in their first degree course who have not previously been to Japan. The successful student will travel to Japan during November and December. Further information regarding applications and participating institutions is available from info@mitsui.com.au. Application forms close mid-July.

The NSW Travelling Art Scholarship (L)
- $25,000
The scholarship is available to an emerging visual artist to undertake a course of study or training overseas for one or two years. Guidelines and applications are available from the NSW Ministry for the Arts, GPO Box 5341, Sydney NSW 2001, Tel (02) 9228 5533. Applications normally close in July.

Queen's Trust Grants (L)
- Up to $15,000
The Queen’s Trust provides grants to Australian Citizens aged 18-28 years, for the pursuit of excellence in their chosen fields. Projects are supported for the advancement of Australian youth, development of community leadership and/or other skills which will be of benefit to Australia. Information and applications may be obtained from the Queen’s Trust, Tel 1800 033 625. Applications close late April.

The R.C. Sutton/ Jardine Matheson Scholarship (L)
- Up to $1,000
The scholarship is to provide financial assistance to undergraduate students to undertake a period of study/research in the R.C. Sutton/ Jardine Matheson offices in Asia. Applicants must be full-time students undertaking study in law, commerce, or economics. Applicants must normally be intending to undertake their final year of study and to complete the travel prior to completion of the final year. Applications are also open to students undertaking an official exchange program with a university in Asia. Further information and application forms are available from the International Student Centre. Applications normally close 31 July in the year prior to the final year of study.

The Rotary Foundation Ambassadorial Scholarships (L)
The Rotary Foundation offers scholarships to study or train in another country where Rotary clubs are located. Applicants must have completed at least two years of a university or college course, or have completed high school and have been employed for at least two years. Applicants must also be Citizens of a country in which there is a Rotary club. Information regarding scholarship availability, closing dates and applications should be obtained from the applicant’s local Rotary club.
The Russian Scholarships (L)
- Payment of an allowance and medical cover
Scholarships are available to Australian citizens to undertake undergraduate or postgraduate study in journalism, law, economics, international relations or medicine in Russia. Applications normally close in May.

The Ship for World Youth Program (L)
- Economy airfare, accommodation, local trips and meals
- Awarded every second year
The objective of this program is to promote understanding and mutual friendship between the youth of Japan and other parts of the world and to foster the spirit of international cooperation. The successful applicants will visit Japan to participate in the program for the period January to March. Students should be aged from 20 to 29, able to participate in the whole program, be in good physical and mental condition, able to speak English and Japanese, have an interest in and an understanding of Japan, and be engaged in youth activities. The next round of scholarships will be available in 2001. Applications close early July 2000.

The Sir Charles Mackerras / Australia-Britain Society Music Scholarship (L)
- 8,000 pounds sterling
The scholarship is open to outstanding young conductors, composers and repertoirers, aged between 21 and 30 who are likely to be influential leaders in the field of music, to undertake study in the United Kingdom or the Czech republic for at least six months. Applicants must be Australian Citizens or Permanent Residents. Application forms are available from the British Council, PO Box 88, Edgecliff NSW 2027, Tel (02) 9326 2022, Fax (02) 9327 4868, Email bcsydney@sprint.com. Applications close early November.

The STA Travel Grant (I, L)
- Up to $3,000
Applicants must be undertaking study leading to a degree or diploma of the University and be members of the University Union. The grant is awarded on the basis of significant contribution to the community life of the University involving a leadership role in student affairs and the University Union and the relevance and merit of the proposed travel to the student’s academic program or University Union activities. Applications close mid-April.

The Swedish Institute Guest Scholarships (L, L)
- SEK 7,100 per month living allowance
- 9 months (1 academic year)
The scholarships are open to students and researchers who wish to travel to Sweden for study or research which cannot equally well be pursued in countries other than Sweden. Applicants must establish contact with a Swedish University willing to accept the applicant for the proposed studies. Initial requests for application forms must be made in writing, and should include the applicant's name and address, nationality, educational background, work experience, knowledge of any languages, statement of the purpose of the study or research in Sweden, and a copy of a letter of invitation from a Swedish University Department. Applications are available from the Swedish Institute, Department for Exchanges in Education and Research, Box 7434, SE-103 91, Stockholm, Sweden. Email grantinfo@si.se, Web http://www.si.se. Requests for application forms must reach the Swedish Institute before 1 December.

Swiss Government Scholarships (L)
- Tuition fees, living allowance, medical insurance and assistance with airfares
- 1 academic year
One scholarship is available for art/music and two for other disciplines, to undertake postgraduate study or attend an art school/conservatory in Switzerland. Applicants will be required to pass a language test in German or French. Applicants must be aged under 35. Applications close early October.

The Turkish Government Language & Culture and Higher Education Scholarships (I, L)
Scholarships are available to high school graduates to undertake study at a Turkish University. Students may be required to undertake a one year Turkish language course before commencement of the degree. The scholarships pay a monthly allowance for the duration of the course. Scholarships are also available to university graduates who would like to attend Turkish Language and Culture Summer Courses conducted by the Turkish Studies Centre. Further information is available from the Embassy of the Republic of Turkey, 60 Mugga Way, Red Hill ACT 2603. Applications close 30 May for Language and Culture Scholarships, and 15 July for Higher Education Scholarships.

Yokoyama Scholarship Awards (L)
Assistance may be available for undergraduate and postgraduate study at a Japanese University. Information is available from Mr Masao Iwashita, Secretary-General, Yokoyama Scholarship Foundation, 6F Shiozaki Building, 2-7-1 Hirakawacho, Chiyoda-Ku, Tokyo 102 Japan, Tel +813 3238 2913, Fax +813 5275 1677.

Faculty Travel

Faculty of Engineering

Engineering @ UNSW Exchange Scholarships (L)
Applicants for The UNSW International Exchange Travel Scholarships administered by the International Student Centre will be considered for these awards. There is no separate application form.

Top-Up Engineering @ Exchange Scholarships
- $500
Students undertaking an undergraduate degree in the Faculty of Engineering who are offered an International Exchange Travel Scholarship will also be offered the Top-Up Scholarship.

Engineering @ UNSW Exchange Scholarships
- $1,500
Students undertaking an undergraduate degree in the Faculty of Engineering who were unsuccessful in their application for an International Exchange Travel Scholarship may be eligible for an Engineering @ UNSW Exchange Scholarship. Selection will be based on the application for the International Exchange Travel Scholarship and academic merit.
The scholarship is open to undergraduate or postgraduate students in the School of Mechanical and Manufacturing Engineering at UNSW, whose thesis projects would be enhanced by work in a Japanese organisation in Japan. The scholarship may cover expenses related to a three to six month stay in Japan. Students should use the stay to work on their thesis project with Japanese universities and industry or government research bodies etc. The scholarship is awarded on the basis of academic merit, a demonstrated interest in Japan and an assessment of the progress of the project. Information is available from Professor B.E. Milton, Head of School, Mechanical and Manufacturing Engineering, Tel (02) 9385 4088, Fax (02) 9663 1222, Email b.milton@unsw.edu.au. Applications close at the end of each year.

Vacation Scholarships

Some Schools offer scholarships for the long vacation period from December to February each year. Students should contact the relevant School office for information.

General

The Australian Kidney Foundation Summer Vacation Scholarships (I,L)

- Up to $900
- 6 to 8 weeks

The scholarships are open to undergraduate students who have completed at least one year of full-time study in Medicine or a course related to Biological Science. The proposed research project must be related to the kidney and the urinary tract, and carried out at a university department during the summer vacation period. Applications are available from the Medical Director's Office, Australian Kidney Foundation, GPO Box 9993, Adelaide SA 5001, Tel (08) 8267 4555, Fax (08) 8267 4450, Email ttaylor@terra.net.au. Applications close 15 September.

ANU Summer Research Scholarships (I,L)

- $130 per week, plus full board and travel
- 8-12 weeks

Scholarships are offered to undergraduate students for short research projects in Physics, Chemistry, Astronomy, Biological Sciences, Computer Sciences, Engineering, Medical Sciences, Earth Sciences, Pacific and Asian Studies, Social Sciences and Environmental Sciences, at the Institute of Advanced Studies, ANU. Further information and applications are available from Anna Weidemann, Summer Research Scholarship Program, The Australian National University, Canberra ACT 0200, Tel (02) 6249 3765, Fax (02) 6249 5995, Email schlsec@rsc.anu.edu.au. Applications close late August.

Cooperative Research Centre for Food Industry Innovation Vacation Scholarships (I,L)

- Up to $2000
- 8 to 12 weeks between November and March

The scholarships are open to final year undergraduate students enrolled in courses in one or more of the following disciplines: biochemistry, biotechnology, bioprocess engineering, chemistry, food science, food technology, immunology, microbiology, or molecular biology. Research projects must be related to one of the research programs of the CRC. Application Kits are available from September, and further information is available from Ms M Romeo, Education Officer, CRC for Food Industry Innovation, C/- Department of Biotechnology, UNSW, Sydney NSW 2052, Tel (02) 9385 1298, Fax (02) 9385 1015, Email m.romeo@unsw.edu.au. Applications close early October.

The CSIRO Division of Marine Research Vacation Scholarships (I,L)

- Up to $450 per week plus travel expenses
- 8 weeks between December and February

The TD Research Scholarships are available to postgraduate and undergraduate students who have completed not less than three years of their course. Research projects will be undertaken with the CSIRO Division of Marine Research at either Hobart, Cleveland or Marmion. Applications close early September.

The CSIRO Vacation Scholarships (I,L)

- $420 per week
- 8 to 12 weeks between December and February

The scholarships are open to postgraduate and undergraduate students who have completed not less than three years of a full-time course in Physics, Mathematics, Computer Science, Electrical Engineering, or a closely allied subject. Research projects are carried out under the individual supervision of a research engineer or scientist. Applications are available on the web at http://www.atnf.csiro.au/educate/summer_vacation.html. Applications close early August.

The Dried Fruits Research and Development Council (DFRDC) Studentships (I,L)

- Up to $3,000 for Studentships, up to $1,000 for Student Awards

The Studentships assist students to undertake research projects during the summer vacation period. Further information and applications are available from the Executive Officer, Dried Fruits Research and Development Council, Box 1142, Mildura VIC 3502, Tel (03) 5022 1515, Fax (03) 5023 3321, Email dfrdc@ozland.net.au. Applications close 15 October.

The Heart Foundation Vacation Scholarships

Scholarships are available during the long vacation period for research projects related to cardiovascular function and disease. Applicants should normally have completed at least two years of an appropriate degree course in the biological sciences. Preference will be given to applicants who have had little or no laboratory experience. Applications close early September.

Medical School Vacation Scholarship Scheme - John Flynn Scholarships

- $2,500 pa to cover travel, accommodation, mentor's honorarium, host practice costs, student stipend
- 2 weeks per year for up to four years

Scholarships are available to undergraduate medical students to take up vacation placements in rural and remote communities, country towns or regional centres. Placements may be with a general practitioner, rural hospital, rural/remote Aboriginal Medical Service, or a combination of these. Further information may be obtained by telephoning 1800 801 454.
The National Multiple Sclerosis Society of Australia
Summer Vacation Scholarships (L)

• $200 per week
• 6 to 8 weeks between November and March

The scholarships are open to undergraduate students completing three or four years of a full-time course leading to an honours degree in medicine, science, or the biological or health sciences. Research projects must be relevant to multiple sclerosis and carried out at a university department during the summer vacation period. Applications close mid-August.

The Novo Nordisk Student Research Scholarship (L)

• $1,000 to $1,500
• 6 to 9 weeks over the vacation period

The scholarship is available for diabetes-related research at the Department of Endocrinology, Prince of Wales Hospital and is open to students enrolled at any tertiary institution in Australia. Preference will, however, be given to students enrolled in an undergraduate degree in Science or Medicine at UNSW. Selection will be based on interest in research in diabetes mellitus and academic performance. Further information is available from Associate Professor Bernie Tuch, Prince of Wales Hospital, Tel (02) 9382 4814. Applications close 31 October.

Faculty Vacation Scholarships

Faculty of Engineering

Computer Science and Engineering

The Computer Science and Engineering Vacation Scholarships (L)

• Up to $3,600
• 12 weeks

Vacation scholarships are available to students in the School of Computer Science and Engineering who intend to pursue Honours or postgraduate study. Further information is available from the School of Computer Science and Engineering, UNSW, Tel (02) 9385 4329.
Postgraduate Scholarships

Following are details of scholarships available to postgraduate students at UNSW. The scholarships are listed by Faculty and course (eg scholarships in Science and Technology or Engineering) or whether they are available to undertake travel. If students from more than one Faculty are able to apply the scholarship is listed in the General Scholarships section.

For further information contact:
The Scholarships, Loans and Research Students Office
The University of New South Wales
Sydney 2052 Australia
Tel (02) 9385 3100/3101/1462
Fax (02) 9385 3732
Email scholarships@unsw.edu.au

General Scholarships

Main programs of assistance for postgraduate study

The Australian Postgraduate Awards (APA) (L,R)
- $16,135 pa (1999 rate). Other allowances may also be paid.
- Up to 2 years for a Masters by Research, 3 years for a PhD degree. PhD students may apply for up to 6 months extension in certain circumstances

Applicants must have graduated, or be proposing to graduate in the current academic year, with Honours 1 or equivalent. Students with Permanent Resident status should normally have lived in Australia continuously for 12 months. Applications close 31 October.

The Australian Development Scholarship (ADS) (I)
- Tuition fees, medical cover and airfare.
- Duration of the course

This award is for international students from selected countries only. Information and applications can only be obtained from Australian Diplomatic Posts or Australian Education Centres in the home country. Applications normally close at least 12 months before the year of study.

The International Postgraduate Research Scholarships (IPRS) (I,R)
- Tuition fees and medical cover only
- 2 years for a Masters by Research, 3 years for a PhD degree

Eligibility is confined to postgraduate research students who are citizens of countries other than Australia or New Zealand. Applications close 31 August.

Other General Scholarships

Indigenous Researchers Development Scheme (L,R)
- At least $3,000
- Up to 3 years

The Scholarships are awarded to support research projects by Aboriginal and Torres Strait Islander researchers in the biological, mathematical, physical, chemical, engineering, earth and applied sciences and the humanities and social sciences, which are likely to lead to a significant conceptual advance in understanding of a subject or lead to the solution of an important practical problem. Further information and applications are available from the Research Office, UNSW, Tel (02) 9385 7230, Web site http://www.ro.unsw.edu.au. Applications close mid-June.

The Anthony Rothe Scholarship (I,L,R)
- $28,000 pa plus allowances
- Up to 3 years

Applications are open to postgraduate students proposing to undertake a PhD in a field related to the causes, prevention, treatment or cure of leukaemia and allied blood disorders. Information and applications are available from The Secretary, Anthony Rothe Memorial Trust, c/- Brigden & Partners, GPO Box 2564, Sydney NSW 2001. Applications close late August.

The Apex Foundation for Research into Intellectual Disability Research Grants (I,L,R)

Grants may be awarded for new or existing research projects in any discipline concerned with the causes, diagnosis, prevention or treatment of intellectual disability and allied conditions. Applications can be obtained from the Hon. Secretary, Apex Foundation for Research into Intellectual Disability Limited, PO Box 311, Mount Evelyn VIC 3796. Applications close late July.

The Arthritis Foundation of Australia Research & Professional Education Awards (L,R)
- $5,000 - $32,000 pa
- 1 to 3 years

Scholarships, fellowships and grants are available to support research projects into asthma, osteoporosis and other musculoskeletal disorders. Applicants must be enrolled in studies leading to a Masters by Research or PhD. Further information and applications are available from The Arthritis Foundation of Australia, GPO Box 121, Sydney NSW 2001, Tel (02) 9552 6085, Fax (02) 9552 6078. Applications close early June.

The Asthma Foundation of New South Wales Research Scholarships (I,L,R)
- To be determined
- 1 to 3 years

Scholarships are available for research into asthma including the basic medical services or clinical and psychological investigations. Further information is available from The Asthma Foundation of NSW, Unit 1 "Garden Mews", 82-86 Pacific Highway, St Leonards NSW 2065. Applications close in early August.

The Australian Brewers Foundation Alcohol Related Medical Research Postgraduate Scholarships (I,L,R)
- Similar to the NHMRC (see NHMRC entry)
- 1 year

Similar to the NHMRC. Scholarships are available to support research into the medical, social and public health aspects of moderate, hazardous or harmful alcohol consumption. Information and applications are available from ABF-Medical Research Advisory Office, UNSW, Tel (02) 9385 7230, Web site http://www.ro.unsw.edu.au. Applications close mid-June.
Applications normally close late November.

The Australian Coral Reef Society (ACRS) Inc Student Grants (I,L,R,C)
- $1,000 (plus $1,500 Walker prize for the best proposal)
The grant is open to students who are enrolled at an Australian University in a PhD or MSc involving research on coral reefs. Recipients must be a member of, or willing to join the ACRS. Applications normally close late November.

Australian Food Industry Science Centre (AFISC) Scholarships (I,L,R)
- $25,000 pa plus allowances
- Up to 2 years for a Masters by Research, 3 years for a PhD
It is expected that applicants will be of Honours 1 or high 2A standard or equivalent. Graduates from non-food technology disciplines, such as engineering, mathematics and physics, are also encouraged to apply. Further information and applications are available from AFISC, Private Bag 16 Sneydes Road, Werribee VIC 3030, Tel (03) 9742 0111. Applications close early November.

The Australian Federation of University Women (I,L,R,C)
Each year the Federation offers to its members a number of awards for study in Australia and overseas. Details of awards are included in a booklet available from the Australian Federation of University Women Inc, 215 Clarence Street, Sydney NSW 2000, Tel (02) 9299 9588.

The Australian Institute of Nuclear Science and Engineering (AINSE) Postgraduate Research Awards (I,L,R)
- $7,500 supplement to an APA or equivalent scholarship and $5,500 pa for facility costs plus allowances
- Up to 3 years
The Institute offers awards for postgraduate students whose research projects are associated with nuclear science or its applications. Applicants must be eligible for an APA or equivalent scholarship after having completed a Bachelor of Engineering or Bachelor of Science with Honours. At least one month per year must be spent at the Institute at Lucas Heights, NSW. Applications close early December.

The Australian Kidney Foundation Grants and Scholarships (I,L,R)
The AKF supports research into the causes, prevention and treatment of disorders of the kidneys and urinary tract. Programs include Medical Research Seeding Grants, Medical Research Equipment Grants, Biomedical Research Scholarships and Summer Vacation Scholarships. Applications are available from the Medical Director's Office, Australian Kidney Foundation, GPO Box 9993, Adelaide SA 5001, Tel (08) 8267 4555, Fax (08) 8267 4450, Email taylor@terra.net.au. Applications close 30 June.

The Australian and New Zealand Council for the Care of Animals in Research and Teaching (ANZCCART) Student Award (L,R,C)
- $1,000 for attendance at the annual conference
Applicants can be postgraduate students from any discipline. The award provides assistance for a student to attend the annual conference. Applications are available from ANZCCART, PO Box 19, Glen Osmond SA 5064, Tel (08) 8303 7325. Applications close in July.

The Australian Pain Relief Association and Australian Pain Society PhD Scholarship (L,R)
- $16,750 pa plus allowances
- Up to 3 years subject to satisfactory progress
Applicants must hold an Honours 1 degree and be proposing to undertake a PhD in the mechanism, diagnosis, treatment or epidemiological features of acute or chronic (including cancer) pain. Further information and applications are available from the Australian Pain Society Secretariat, PO Box 529, Willoughby NSW 2068, Tel (02) 9439 6744. The award is offered bi-annually. Applications close early November.

The Australian Society for Microbiology (L,R,C)
- $100 - $10,000
The Australian Society for Microbiology (ASM) provides prizes and awards, for study, research and projects related to Microbiology. More information can be obtained from the ASM National Office, Unit 23/20 Commercial Rd, Melbourne VIC 3004, Tel (03) 9867 8699, Fax (03) 9867 8699.

The Australian Spinal Research Foundation Postgraduate Research Awards (I,L,R)
- Equivalent to Australian Postgraduate Award (see APA entry under General)
- Up to 2 years for a Masters by Research or 3 years for a PhD
Applicants must be undertaking a Masters by Research or PhD in an area designed to contribute to an understanding of the anatomical and physiological mechanisms underlying chiropractic care or the clinical efficiency of chiropractic care and management procedures. Information and applications are available from the Australian Spinal Research Foundation, PO Box 1047, Springwood QLD 4127, Tel (07) 3808 4098, Fax (07) 3808 8109, Email t.flack@qut.edu.au. Applications close mid-October.

The Captain Reg Saunders Scholarship (L,R,C)
- $3,000
- Up to 4 years
Applicants must be Aboriginals or Torres Strait Islanders eligible to commence a university degree in the area of psychology, nursing, applied science, social work or education. Further information and applications are available from the Aboriginal Education Program, UNSW, Tel (02) 9385 3805.

The Community Health and Anti-Tuberculosis Association - The Harry Windsor Biomedical and Medical Research Scholarship (L,R)
- $23,997 pa (Medical postgraduates), $16,135 (Biomedical Science graduates) plus allowances
- Up to 3 years
Applicants must be proposing to undertake full-time postgraduate medical research in the areas of tuberculosis, respiratory disease (particularly community aspects) or the health of disadvantaged people. Only original application forms will be accepted and are available from The Executive Officer, Community Health and Anti-Tuberculosis Association, PO Box 200, Rose Bay NSW 2029, Fax (02) 9371 9768. Applications close 1 August.

The Cooperative Research Centre for Eye Research and Technology (CRCERT) Postgraduate Research Scholarship (I,L,R)
- $15,321 - $19,827 pa (depending on the type of research)
- 3 years
The scholarship is available for full-time PhD studies in subjects such as optometry, microbiology, biochemistry, optics, materials...
science, polymer chemistry and immunology. For information about application procedures applicants should initially contact Dr Mark Wilcox, CRCERT, UNSW, Sydney NSW 2052, Tel (02) 9385 0222.

The Clean Air Society of Australia and New Zealand Inc Postgraduate Research Award (L,R,C)
- $5,000 pa
- 1 year, with a possible one year extension

The scholarship is open to students enrolled in a Masters degree program with a significant research component connected with air quality. Applications close early February.

The CSIRO Division of Fisheries Supplementary PhD Awards (L,R)
- $10,000 pa
- Up to 3 years

This scholarship is a supplement to any primary scholarship (eg APA) for PhD study in marine studies, environmental studies, zoology, botany, broadly-based life sciences, economics and mathematics. Applications close early March.

The Dairy Research and Development Corporation (DRDC) Postgraduate Scholarships and Study Awards (L,R)

Awards to undertake full-time postgraduate research degrees are available in a wide range of disciplines including dairy manufacturing, farm research, economics and marketing, and agricultural extension. New and experienced applicants are welcome to apply. Guidelines and applications are available from the Scholarships, Loans and Research Students Office or DRDC, Level 3, 84 William Street, Melbourne VIC 3000, Tel (03) 9602 5300. Applications close 31 October.

The Forest and Wood Products Research and Development Corporation (FWPWRDC) Scholarships (L,R)

- Up to $25,000 pa
- Up to 3 years

The scholarships are open to students undertaking a postgraduate research degree at an Australian University. Selection is based on academic merit and the relevance of the project to FPWRDC programs. Further information and applications are available from the Executive Director, FWPWRDC, PO Box 157, Bond University QLD 4229, Fax (07) 5578 7911. Applications close early April.

The Garnett Passe and Rodney Williams Memorial Foundation Research Scholarships in Otolaryngology (L,R,C)

- $15,364 pa for science graduates, $22,850 pa for medical graduates, plus allowances
- 3 years

Scholarships are available to medical or science graduates for research in Otolaryngology or in related fields of biomedical science. Applicants must be enrolled in a postgraduate degree in Australia or New Zealand. Information and applications are available from the Garnett Passe and Rodney Williams Memorial Foundation, Pelham House, 165 Bouverie St, Carlton VIC 3053, Tel (03) 9349 2622, Fax (03) 9349 2615. Applications close mid-December.

The Gerontology Foundation Grant-In-Aid (L,R,C)

- Up to $5,000 for a specific research project

Grants-In-Aid are awarded to students who have not had their work published in a refereed journal and who have not won any research grants in open competition. The grant supports a proposed scientific investigation topic specified by the Foundation. Information and applications are available from The Executive Officer, Gerontology Foundation of Australia Inc, PO Box 199, Annandale NSW 2038. Applications normally close late July.

The Gowrie Scholarship Trust Fund (L,R)

- $4,000 pa
- 2 years

Applications must be members of the Forces or children (or grandchildren or lineal descendants) of members of the Forces who were on active service during the 1939-45 War. Tenable at tertiary institutions in Australia and overseas. Applications close early October.

The Grains Research and Development Corporation (GRDC) Junior Research Fellowship (L,R)

- $21,000 pa plus up to $3,000 to the supporting institution, some conference/workshop attendance allowances
- Up to 3 years

Applications must be undertaking full-time PhD studies in fields of high priority to the grains industry. Applications close mid-October.

The Great Barrier Reef Marine Park Authority Research Support (L,R)

- $1,000

Applications must be undertaking a full-time Masters or PhD research project that could contribute to planning and managing the Great Barrier Reef Marine Park and to the Reef's ecologically sustainable development. Applications and further information may be obtained from the Executive Officer, Great Barrier Reef Marine Park Authority, PO Box 1379, Townsville QLD 4810, Email k.lally@gbrmpa.gov.au. Applications close mid December.

The Harold G. Conde Memorial Fellowship (L,R,C)

- $5,000 pa subject to the availability of funds
- Up to 3 years

Applicants should be honours graduates. The Fellowship is a supplementary award to be held in conjunction with another scholarship and is for postgraduate study or research in a field related to the electricity industry. Applications close early April.

The Julian Small Foundation Annual Research Grant (L,R)

- Up to $5,000

Applications are open to postgraduate and undergraduate students undertaking research and involved in the study of law, or industrial relations. Selection will be based on a research proposal which outlines how the research will advance thinking and practice in the area of employment law and industrial relations in Australia. Applications close mid-August.

The June Opie Fellowship (L,R,C)

- NZD$12,000
- 1 year

The award is administered by the University of Auckland and is available to Citizens and Permanent Residents of Australia, Canada and New Zealand, and is designed as an incentive for students of high academic achievement who have a severe disability. It is primarily intended for those who plan to undertake postgraduate study with a view to preparing themselves for a role in the professions, in politics or more particularly in university teaching and research and who have disability issues as a continuing interest. Applications close with the University of Auckland in late October.
Land and Water Resources Research and Development Corporation (LWRRDC) Postgraduate Research Scholarships (L,R)

- $20,000 pa plus $5,000 for operating expenses
- 2 years for Masters, 3 years for a PhD degree

General Research Scholarships are available for research that will lead to better management, sustainable use and conservation of land, water and vegetation resources in Australia. Irrigation Research Scholarships are specifically for research that will lead to better management, sustainable use and conservation of natural resources in Australia. Applications are available from the Scholarships, Loans and Research Students Office or LWRRDC, GPO Box 2182, Canberra ACT 2601, Tel (02) 6257 3379. Applications close early October.

The Lionel Murphy Postgraduate Scholarship (L,R,C)

- $15,000 pa for study in Australia, up to $30,000 for study overseas
- 1 year

Applicants must be intending to undertake a postgraduate degree in Law, Science, Legal Studies or other appropriate discipline. Preference will be given to applicants who propose to study the law and legal system in a social context, science/law or international law. Information and application forms are available from The Lionel Murphy Foundation, GPO Box 4545, Sydney NSW 2001, Tel (02) 9223 5151, Fax (02) 9223 5267. Applications close mid-September.

The MBF Health Research Awards- Postgraduate Research Scholarships

- Similar to NHMRC guidelines

The scholarships are open to students undertaking an MD or PhD in the areas of preventative health care, disease/drug management, evaluation of health care delivery outcomes, health policy evaluation and public health promotion/communication. Applications are available from The Executive Assistant, Research Team, Medical Benefits Fund of Australia Ltd, 97-99 Bathurst St, Sydney NSW 2000, Tel (02) 9323 9158, Fax (02) 9323 9168. Applications close late February.

The Meat and Livestock Australia (MLA) Studentships and Junior Research Fellowships (L,R,C)

- $15,888 pa for study in a Masters or Diploma, $20,000 for a PhD in Australia or US$17,500 for study overseas, plus airfares, insurance and allowances
- 2 years for Studentships (Masters or Diploma), 3 years for Junior Research Fellowships (PhD)

Applicants should be proposing to undertake research in disciplines relevant to the Australian meat and livestock industry. Applications close late September.

The Menzies Research Scholarship in Allied Health Sciences (L,R)

- Up to $24,000 pa
- 2 years

The scholarship is awarded to stimulate research in the non-medical allied health disciplines. Applicants should be full-time students, who have completed the first stage of a PhD program. Applications are available from The Menzies Foundation, 210 Clarendon St, East Melbourne VIC 3002, Fax (03) 9417 7049. Applications close late June.

The Minerals Council of Australia Student Research Award (L,R)

- $500 plus travel and accommodation for the Environmental Workshop

The award is open to scholars who have completed or are undertaking postgraduate studies, and is aimed at encouraging excellence in student research and communication in the field of environmental management in mining. The award will be judged on a paper written for and presented at the Minerals Council of Australia's Environmental Workshop. Nominations close early May.

The National Health and Medical Research Council (NHMRC) Training Scholarship for Aboriginal Health Research (L,R)

- $16,135 - $23,997 pa (depending on qualifications)
- Up to 3 years

Applicants must be undertaking an undergraduate or postgraduate degree which includes, or leads to, research relevant to Aboriginal health. Applications will be assessed in terms of previous qualifications and experience. Consideration will be given to prior knowledge and experience of Aboriginal culture and health. Applications close early August.

The National Health and Medical Research Council (NHMRC) Dora Lush Biomedical Postgraduate Scholarships (L,R)

- $16,135 pa, $20,997 for HIV/AIDS research, $17,888 for special initiative scholars, plus allowances
- Up to 3 years

Applicants must have completed a Science degree with Honours, or equivalent, at the time of submission of the application. Current APA holders or students enrolled in the final year of an Honours degree at the time of application are not eligible. Applications close early August.

The National Health and Medical Research Council (NHMRC) Medical and Dental Postgraduate Scholarships (L,R)

- $23,997 pa plus allowances
- Up to 3 years

The scholarships are open to medical and dental graduates to undertake full-time research. Applications are particularly encouraged for research in the following special initiative areas: Aboriginal health and disease, prostate cancer, alcohol and substance abuse, nursing and allied health services, dementia, schizophrenia, injury and HIV/AIDS. Applications close early August.

The National Health and Medical Research Council (NHMRC) Public Health Postgraduate Scholarships (L,R)

- $23,997 pa (medical/dental graduates), $16,135 pa (other graduates), $20,822 pa for HIV/AIDS research, $17,888 pa for special incentive scholars, plus allowances
- Up to 3 years

The scholarships are open to medical/dental or health related graduates to obtain training in public health research. Applications are particularly encouraged for research in the following special initiative areas: Aboriginal health and disease, prostate cancer, alcohol and substance abuse, nursing and allied health services, dementia, schizophrenia, injury and HIV/AIDS. Applications close early August.
The National Heart Foundation of Australia Postgraduate Medical and Science Research Scholarships (L,R)
- $17,637 pa (science), $23,257 pa (medical) plus $1,200 departmental allowance
- Up to 3 years subject to satisfactory progress
Scholarships are available to science or medical graduates for research in cardiovascular function, disease or related problems. Applicants must usually reside in Australia. Further information and applications are available from the Medical Director, National Heart Foundation, PO Box 2, Woden ACT 2606. Medical applications close in May and Science applications close in October.

The National Tertiary Education Union (NTEU) Scholarship for the Study of Industrial Relations and Unionism in Australian Tertiary Education (I,L,R)
- $5,000 pa
- Up to 3 years
Applicants must have made or intend to make an application for candidacy for a Masters by Research or PhD in a topic which covers some aspect of industrial relations, policy issues and/or unionism related to Australian tertiary education. Further information is available from NTEU, PO Box 1323, South Melbourne VIC 3205, Tel (03) 9254 1910. Applications close early November.

The National Multiple Sclerosis Society of Australia Postgraduate Research Scholarships (L,R)
- Same as NHMRC scholarship stipends for medical and biomedical graduates
- Up to 2 years
Scholarships are available to medical graduates (or to appropriately qualified science graduates or health professional(s)) enrolled in a postgraduate research degree. Applications close early November.

The NSW Government offers a number of scholarships and awards to writers, artists and scholars living in NSW. Further information is available from the New South Wales Ministry for the Arts, GPO Box 5341, Sydney NSW 2000, Tel (02) 9228 3533, Fax (02) 9228 4722.

The Pig Research and Development Corporation (PRDC) Postgraduate Top-Up Scholarships (L,R)
- Up to a maximum of $21,000 as a supplement to other scholarships, plus allowances
Applicants must be eligible for another scholarship and be undertaking research relevant to increasing the competitiveness of the Australian pig industry. Applications close mid-December.

The Postgraduate Equity Scholarships (L,C)
- Substitution of HECS for tuition fees
- Duration of the course if eligibility criteria continue to be satisfied
These scholarships allow postgraduate students enrolled in full-fee courses to pay HECS for their course rather than course fees. Students granted the scholarship must still pay Student Activity Fees. Students who have previously completed a postgraduate course in Australia at the same or higher level are not eligible. Applications for Session One close 28 January. Applications for Session Two close 15 July.

Financial Need HECS Substitution Scholarships
Applicants must be in receipt of a full allowance from the Department of Social Security (DSS), Department of Veteran Affairs, or AUSTUDY.

HECS Substitution Scholarships for Women
A limited number of scholarships are provided to women enrolling in postgraduate courses after a period of absence from study and/or employment who are seeking to extend their professional experience in order to re-enter the workforce. Preference will be given to women enrolling in courses which have a low female enrolment. Selection will take into account the applicant's academic merit, her personal statement, including details of a well-planned future career path, and referee's support. The scholarship is tenable for the duration of the course.

The Re-Entry Scholarship for Women (I,L,R,C)
- $16,135 pa (equivalent to the Australian Postgraduate Award)
- 1 year
Applicants must be women who have been out of full-time paid professional employment for a period of time and who wish to take up or resume a full-time research or coursework program of postgraduate study. Priority will be given to applicants wishing to update their research skills or to those who wish to gain further experience in order to return to employment in industry, business or education. Applicants must be able to demonstrate a well-planned career path. A letter of application and curriculum vitae should be forwarded to the Scholarships, Loans and Research Students Office, UNSW. Applications close 31 October.

The River Basin Management Society Ernest Jackson Memorial Research Grants (I,L,R)
- Up to $2,000
The scholarship assists PhD and Masters students undertaking research in the field of river basin management. PhD, Masters and 4th year Honours students are encouraged to apply. Further information is available from RBMS, PO Box 113, Forest Hill VIC 3131, Tel (03) 9816 6896. Applications close in April.

The Ronald Henderson Postgraduate Scholarships (L,R)
- $5,000 pa as a supplement to an APA
- Up to 2 years for Masters by Research, 3 years for a PhD
The scholarships are open to graduates who intend to commence Masters or PhD studies in social economics, and who obtain an APA or equivalent university postgraduate award. Applicants may be proposing study in qualifications in economics, commerce or arts. Further information and applications are available from the Ronald Henderson Research Foundation, 5th Floor, 165 Flinders Lane, Melbourne VIC 3000, Tel (03) 9654 8299, Fax (03) 9650 7501, Email lance@creativeaccess.com.au. Applications close in late October.

The RSPCA Alan White Scholarship (I,L,R)
- $2,500
Applicants should be undertaking original research to improve the understanding and welfare of animals. Applicants must have a sound academic record and demonstrate a major commitment animal welfare issues. A letter of application including two referees and academic transcripts, should be sent to the Executive Officer, RSPCA Australia, PO Box E369, Queen Victoria Terrace, Canberra ACT 2600, Tel (02) 62311437. Applications close mid-March.

The Rural Allied Health Placement Grants (L,R)
- Up to $500
Grants are available to students undertaking a postgraduate course in dietetics or psychology (Masters). Applications are available from the NSW Health Rural Health Support Unit, Tel (02) 6640 2302, Fax (02) 6640 2499, Email rhsu@nor.com.au, Web www.nor.com.au/community/rhsu. Session One applications close 15 May. Session Two closing dates are available in August.
The Rural Allied Health Scholarships (L)

- $5,750
Scholarships are available to students in any year of a postgraduate course in dietetics or psychology (Masters). Applications are available from the NSW Health Rural Health Support Unit, Tel (02) 6640 2302, Fax (02) 6640 2499, Email rhsu@nor.com.au, Web www.nor.com.au/community/rhsu. Applications close late September.

The Rural Industries Research and Development Corporation (RIRDC) Postgraduate Scholarships (L,R)

- $21,500 pa plus $3,500 to the host institution
- Up to 3 years
The scholarships are available for postgraduate study in rural research and development in areas of interest to the Corporation. Applicants must hold an Honours 1 or 2/1 degree in an appropriate discipline. Applications from mature age students with rural industry experience are particularly encouraged. Applications close in early November.

The Social Policy Research Centre (SPRC) Postgraduate Research Scholarship (L,R)

- $16,135 pa (equivalent to the APA), plus allowances
- 3 years for a PhD
Applicants should hold a Bachelors Degree with at least Honours 2/1 in any of the fields of study relevant to social policy. The successful candidate will be enrolled in a relevant School of the University but will undertake research at the Centre. Prospective applicants must contact the School in which they wish to enrol. Application packages are available from the Administrator, Social Policy Research Centre, UNSW, Tel (02) 9385 3833. Applications close late November.

The State Librarian's Metcalfe Scholarship at UNSW (L,R,C)

- At least $2,000
The scholarship is open to suitably qualified applicants to undertake a Masters or PhD in the areas of librarianship, marketing or technology. Selection will be based on academic merit, the outline for the proposed area of study and demonstrated interest in librarianship. Applications normally close 30 November.

The Sugar Research and Development Corporation (SRDC) Postgraduate Scholarships (L,R)

- $22,000 pa plus $3,000 to the host institution
- Up to 3 years
The scholarships are available to foster research in disciplines compatible with the SRDC's research priorities. Applicants should hold an Honours degree or equivalent and have a strong motivation to make a professional career in the sugar industry. Further information and applications are available from the Executive Director, Sugar Research and Development Corporation, PO Box 12050, Brisbane Elizabeth St. QLD 4002, Tel (07) 3210 0495, Fax (07) 3210 0506. Applications close mid-September.

The Sydney Gay and Lesbian Business Association Scholarship (L, R, C)

- $1,500
- 1 year
The scholarship is provided to encourage the participation of gay men and lesbians in business and management careers. Scholarships are available to full-time students in Commerce or the AGSM. Applicants must be gay or lesbian. Applications normally close 15 April.

The Telstra Research Laboratories Postgraduate Research Fellowship (L,R)

- University departments may apply for the Fellowships for one or more of their PhD students who are undertaking research relevant to the telecommunications industry in the fields of electrical engineering, computer science, science, psychology, social science or economics or other appropriate course. Further information is available from the Fellowship Applications Officer, Telstra Research Laboratories, Box 249, Rosebank MDC, Clayton VIC 3169, Email c.zaman@trl.telstra.com.au. Applications close late September.

The Ukrainian Studies Foundation of Australia Endowed Scholarship (L,L)

- $1,000 in 2000, $1,500 from 2001
- 1 year only
The scholarship is available to students undertaking, or proposing to undertake, postgraduate or honours level studies at UNSW on a Ukrainian topic/theme, or comparative Ukrainian/Australian topic/theme. Selection will be based on academic merit and the reasons for undertaking the current and/or proposed studies. Applications will normally close on 31 January.

United Uranium Trust Fund Scholarship

This scholarship is available for the study of nuclear science and technology at the Australian Nuclear Science and Technology Organisation (ANSTO) or other designated institution. Applicants must be Permanent Residents of Australia. Further information is available from ANSTO on telephone (02) 9543 3111.

VSDC Deafness Projects (L)

Tertiary Education Deafness Projects may be awarded to deaf students undertaking tertiary courses related to deafness, deaf education, or fields which will advance the interests of deaf people. Applicants must be Permanent Residents of Australia. Further information is available from the VSDC-Services for Deaf Children, PO Box 6466, St Kilda Rd Central, Melbourne VIC 3004. Applications close mid-May.

The Wenkart Foundation Grants (L,R)

- Up to $22,000 pa
- 2 years with the possibility of renewal
Applicants must be undertaking full-time research in clinical, biomedical or health related clinical sciences. Applications close mid-May.

The Zonta International Amelia Earhart Awards (L,L,R)

- US$6,000
- 1 year
Applicants must be women who have completed one year graduate study in an aero-space related science or engineering degree. Further information and applications are available from Zonta International, 557 West Randolph St, Chicago, Illinois 60661-2206, USA, Tel +1 312 930 5848, Fax +1 312 930 0951. Applications close early November.
Faculty Scholarships

Faculty of Engineering

The CRC for Waste Management and Pollution Control Research Scholarships (L,R)
- Up to $22,000 pa or $6,000 pa top-up, plus allowances
- Up to 3 years
Several scholarships are available for students to undertake ME or PhD research in waste management and pollution control. Applicants should hold a relevant degree with at least Honours 2/1 (or equivalent). Interested applicants should contact Dr J.S. Nielsen, Tel (02) 9385 5796.

The Faculty of Engineering Research Scholarships (L,R)
- $16,135 pa (equivalent to an APA) plus allowances
- Up to 3 years
The scholarships are open to students proposing to enrol in a full-time PhD program in the School of Civil Engineering, Computer Science and Engineering, Electrical Engineering, Geomatic Engineering or Mechanical and Manufacturing Engineering, or the Graduate School of Biomedical Engineering. Applicants must have completed, or expect to complete, a Bachelor of Engineering degree with Honours 1 or 2/1 from a recognised institution. Applications are available from the Dean's Office, Faculty of Engineering, Rm 508 Geography and Surveying Building, Tel (02) 9385 5456.

Travel Scholarships

Students in receipt of postgraduate scholarships not listed below may, if the scholarships conditions allow, spend a period of time overseas undertaking research relevant to their Australian qualification.

General Travel

AAUW Educational Foundation Awards (I,L,R,C)
The American Association of University Women (AAUW) offers a range of scholarships and fellowships for full-time study in the United States. Additional information may be obtained from the Association's Website http://www.aauw.org

AAUW Educational Foundation International Fellowships (I,L,R,C)
- US$16,000
- 1 year
The American Association of University Women (AAUW) offers Fellowships for full-time postgraduate study or research in the United States for one academic year. Applicants must be females who have earned the equivalent of a United States Bachelor's degree and who are not US Citizens or Permanent Residents. Applicants can be preparing to undertake study in a broad range of disciplines including arts and humanities, physical and biological sciences, social sciences, law, economics, political sciences, or studies important to changing the lives of women and girls. International fellows can also qualify for a supplemental grant (US$5,000-$7,000) to support a community action project designed to improve the lives of women and girls for study in the fellow's home country in the year immediately following the fellowship year. Application packs are available from the AAUW Educational Foundation, Customer Centre, Dept 141, N. Dodge St, Iowa City, IA 52243-4030 USA. Applications close mid-January for the Fellowship year commencing in July.

The ACSANZ Postgraduate Awards for Canadian Studies (I,L,R)
- Up to $2,800 towards a research trip to Canada
The Association for Canadian Studies in Australia and New Zealand will offer grants to postgraduate students wishing to undertake a short research trip to Canada. Applicants must be enrolled in a Masters or Doctoral degree at an Australian or New Zealand university. Grants will be for research into all areas of academic enquiry that have a distinctly Canadian orientation, for example in the humanities, social and political sciences and some branches of the health and environmental sciences. Information and applications are available from the Academic Relations Officer, Canadian High Commission, Commonwealth Avenue, Canberra, ACT 2600, Tel (02) 6273 3844, Fax (02) 6270 4083, Email co.cnbra@cnbra01.x400.gc.ca. Applications close late September.

The Asian Studies Library Awards (ASLA) (L,R)
- $250 to $800 in a lump sum
Applicants must be undertaking a Masters by Research or PhD. The award provides a contribution towards the travel costs to centres with Asian collections to undertake library research. Further information and application forms are available from the Project Co-ordinator, Asian Studies Library Awards, Collection Management Division, Library ANU, Canberra ACT 2600. Applications close mid-June.
The Association of International Education Japan (AIEJ) Short-Term Student Exchange Promotion Program (Inbound) Scholarships (L,R,C)

- 50,000 yen (settling-in allowance), 80,000 yen per month, plus airfare
- Six months to one year

Applicants must be accepted by a Japanese University under a student exchange program agreement with UNSW. Students must initially apply directly to a Japanese University through the UNSW International Student Centre, Tel (02) 9385 5333. The Japanese host university will recommend candidates to AIEJ and students must apply as directed by the host university. Applications close in February, May and September each year.

The Association of International Education Japan (AIEJ) Short-Term Student Exchange Promotion Program (Inbound) Peace and Friendship Scholarships (I,L,R,C)

- 50,000 yen (settling-in allowance), 100,000 yen per month, plus airfare
- Ten months to one year

Applicants must be accepted by a Japanese University under a student exchange program agreement with UNSW. Students must initially apply directly to a Japanese University through the UNSW. The Japanese host university will recommend candidates to AIEJ and students must apply as directed by the host university. Applications close in February, May and September each year.

Association of University Women Educational Foundation-Charles & June Ross International Fellowship (L,R,C)

- US$15,400
- 1 year

The fellowship is available to Australian women who have graduated from an Australian University and who are proposing to undertake one year of full-time postgraduate study or research in the United States. Applicants must be members of the Australian Federation of University Women or AAUW and intend to return to Australia to pursue their professional career. Information and applications are available from the Australian Federation of University Women, 251 Clarence Street, Sydney NSW 2000, Tel (02) 9299 9888.

The AT&T Leadership Award (I,L,R,C)

- US$5,000
- 1 year

The award is open to students who will be commencing full-time undergraduate or postgraduate study in the United States between January and September in the year of application. The scholarship is open to students from the following Asia/Pacific countries: Australia, China, Hong Kong, India, Indonesia, Japan, Republic of Korea, Malaysia, Philippines, Singapore, Thailand. Information and applications are available from the U.S. Consulate General, USIS, Level 59 MLC Centre, 19-20 Martin Place, Sydney NSW 2000, Tel (02) 9662 3016. Applications close 15 September.

The Australian Academy of Science International Exchange Programs (L,R)

The Academy administers exchange programs which support collaborative research between professional Australian scientists and technologists with countries such as the UK, France, Germany, Taiwan, China, Korea and Japan. The programs provide funds for living and travelling costs. Applicants must be Australian citizens who hold a PhD degree or equivalent. Information is available from International Programs, The Australian Academy of Science, Fax (02) 6257 4620, Email is@science.org.au, Web http://www.science.org.au/internalexchange/contscix.htm.

The Australia-Korea Foundation Awards (L,R,C)

The AKF provides assistance to Korean language graduates who will be undertaking teacher training in the Korean language, or for work-experience programs. Information and applications are available from the Programs Co-ordinator, National Korean Studies Centre, PO Box 218, Hawthorn VIC 3122, Email nksc@swin.edu.au.

The Australian Bicentennial Scholarships and Fellowships Scheme (L,R,C)

- 4,000 pounds sterling
- At least 3 months

Awards are available for study or research in the United Kingdom in any discipline, where it can be demonstrated that there is an advantage to be gained from a period of study in the U.K. Applications must be enrolled as postgraduate students at an Australian higher education institution and who are usually resident in Australia. Applications are available from the Secretary, Sir Robert Menzies Centre for Australian Studies, University of London, 28 Russell Square, London WC1B 5DS, UK, Tel +44 171 580 5876, Fax +44 171 580 9627, Email McIntyre@ass.ac.uk. Applications close early November.

The Australian Federation of University Women (AFUW) (I,L,R,C)

Each year the Federation offers to its members a number of awards for study in Australia and overseas. Details of awards are included in a booklet available from the Australian Federation of University Women Inc, 215 Clarence Street, Sydney NSW 2000, Tel (02) 9299 9888.

The British Aerospace Australia Chevening Scholarship (L,R,C)

- Tuition fees, maintenance allowance, airfare
- 1 year

The scholarship is available for study in an approved, one-year MSc course in aerospace engineering at a British university. Applicants must hold, or expect to complete before October, an Honours 1 or 2/1 degree. Application forms are available from the British Council, PO Box 88, Edgecliff NSW 2027, Tel (02) 9326 2022, Fax (02) 9327 4868. Applications close late October.

The British Chevening Scholarships (L,R,C)

- Tuition fees, maintenance allowance and return airfare
- 3 months to 1 year

The awards are intended for outstanding graduates and young professionals with the potential to rise to senior positions in the private or public sectors and will contribute to Australian-British relations and understanding. The awards are tenable for postgraduate study at British universities. Application forms are available from the British Council, PO Box 88, Edgecliff NSW 2027, Tel (02) 9326 2022, Fax (02) 9327 4868. Applications close in October.

British Council Postgraduate Bursaries (L,R)

- Return economy airfare plus monthly stipend of 450 pounds
- 3 months

Scholarships are available for students enrolled in a full-time PhD who are proposing to spend three months at a British University or similar institution to take advantage of British expertise, equipment or data. Applications should be received by the British Council a minimum of 6 months prior to departure. Further information and applications are available from the British Council, PO Box 88, Edgecliff NSW 2027, Tel (02) 9326 2022, Fax (02) 9327 4868.
The Cambridge Commonwealth Trust Scholarships (L,R,C)

The Cambridge Commonwealth Trust administers several scholarships for Australian Citizens to undertake postgraduate study at the University of Cambridge. Scholarship application forms should be requested from the University of Cambridge when applying for admission. Application forms and copies of the Graduate Studies Prospectus are available from The Board of Graduate Studies, 4 Mill Lane, Cambridge CB2 1RZ, United Kingdom. By submitting one Scholarship Application Form, applicants will be considered for all the Trust's scholarships for which they are eligible. Information on how to apply is available from the Honorary Secretary, Australian Committee of the Cambridge Australia Trust, GPO Box 59, Canberra ACT 2601, Tel (02) 6248 7744, Fax (02) 6248 6287, Web http://www.anu.edu.au/cabs/scholarships/cambridge/cambridge-austrust.html. Applications for admission to Cambridge close 31 January and scholarship applications close 30 April in the following year.

The Cancer Research Fellowship Programme (I,L,R)

- Travel expenses and living allowances
- 1 year

Applicants should be engaged in research in medicine or the allied sciences and intending to pursue a career in cancer research. The awards are tenable at the International Agency for Research on Cancer in France, or any other suitable institution abroad. Areas of research include epidemiology, biostatistics, environmental and viral carcinogenesis and mechanisms of carcinogenesis. Applications are available from the International Agency for Research on Cancer, 150 cours Albert-Thomas, 69372 Lyon Cedex 08, France, Tel +33 73 84 85, Fax +33 73 85 75. Applications normally close in December.

Churchill Fellowships (L)

- Tuition, travel and living allowances

Churchill Fellowships provide financial support for Australian Citizens to undertake study, training or projects overseas. Fellowships will normally be awarded for higher academic or formal qualifications however. Applicants must be over 18 years of age. Further information and applications are available from the Chief Executive Officer, The Winston Churchill Memorial Trust, 218 Northbourne Ave, Braddon ACT 2612, Tel (02) 6247 8333. Applications close late February.

The Commonwealth Scholarship and Fellowship Plan (CSFP) (L,R,C)

- Varies for each country. Generally covers travel, living expenses, tuition fees, books and equipment, approved medical expenses
- Usually 2-3 years depending on the country

CSFP provides opportunities for Commonwealth Citizens who hold an undergraduate degree. Applications close at different times depending on the country in which the study is proposed.

The Coral Sea Scholarship (L,R,C)

- $3,000 per month, plus $2,500 travel entitlement
- Up to 3 months

The award is for applicants holding a tertiary qualification who are proposing study in the United States, to investigate a problem or opportunity relevant to Australian business or industry. Applicants must be Australian Citizens (Permanent Residents are not eligible). Further information and applications are available from the Fulbright Home Page, http://sunsite.anu.edu.au/education/fulbright, or by contacting the Program Officer, Australian-American Educational Foundation, GPO Box 1559, Canberra ACT 2601, Tel (02) 6247 9351, Email rachel@aaf.anu.edu.au. Applications close 30 September.

DAAD- The German Academic Exchange Service Scholarships (I,L,R,C)

Application forms and information (including closing dates) for the following scholarships are available from the Embassy of the Federal Republic of Germany, 119 Empire Circuit, Yarralulma, Canberra ACT 2600.

One-Year Scholarships

- Monthly allowance between DM1,000 and DM1,700, airfares, health and accident insurance, and tuition fees
- 1 year

Scholarships are available for graduate studies in Germany. Applicants must be aged 32 or under and hold a Bachelors degree (or equivalent). A working knowledge of German is required of those who study arts, others may receive additional language training prior to the commencement of the scholarship. Applications normally close in September.

Research Grants

- Monthly stipend of DM1,700, health insurance contribution and travel assistance of DM2,500
- 2 to 6 months

PhD students can apply for assistance to undertake a short period of research in Germany. Applicants must be aged 32 or under.

Information Visits by Groups of Professors and Students

Groups (minimum of 10 persons, maximum of 20 persons) of professors and students can apply for assistance to visit Germany with the intention of increasing the knowledge of specific German topics. The program offers support in making travel and study arrangements and may include some financial assistance (based on the length of the stay and the number of persons undertaking the study tour). The period of stay must be between 7 and 21 days. No tours will be organised for July or August.

Deutschlandkundlicher Winterkurs

- Course fees, DM3,500 to assist with travel and living expenses, health insurance
- 8 weeks (3 January - 21 February)

Undergraduate and postgraduate students from all fields with at least two years university-level German may apply for this scholarship. Applicants must be Australian or New Zealand Citizens, aged from 19 to 32 and proposing to undertake a German Studies course (In German) at the Albert-Ludwigs University of Freiburg. The course provides language instruction and concentrates on historical and cultural aspects of contemporary Germany for students with a background in German Studies. Applications usually close in early August.

East West Center Graduate Degree Fellowship (I,L,R,C)

- Accommodation, monthly stipend of US$600, tuition fees, health insurance plus allowances
- 12 months with a possible one year extension

The Fellowships are available for postgraduate study at the University of Hawaii, preferably at Masters level. Citizens of the United States and Asian or Pacific countries are eligible to apply. Potential applicants must request an application package direct from the East West Centre, Awards Services Officer, Burns Hall 2066, 1601 East-West Road, Honolulu Hawaii 96848-1601, USA, Tel +1 808 944 7735, Fax +1 808 944 7730. Applications close early October.

The English-Speaking Union (NSW Branch) Scholarship (L,R,C)

- Up to $8,000

The scholarship assists graduates who, at the outset of their careers, are seeking to further their education overseas. The scholarship is open to Australian citizens living in NSW or the ACT, whose intention it is to return to Australia after undertaking study overseas. Further
consideration may be given to studies in health care and related sectors with an outstanding record of achievement. Special Applicants should be active in the public, business or voluntary sectors with an outstanding record of achievement. Special consideration may be given to studies in health care and related community issues. Applications are available on written request from the Harkness Fellowship, PO Box 836, Belconnen ACT 2606. Applications close early September.

The Harkness Mid-Career Fellowships (L,R,C)
- Professional travel allowance
- 7-12 months
The Mid-career Fellowships are provided to support study and practical experience. Applicants should be active in the public, business or voluntary sectors with an outstanding record of achievement. Special consideration may be given to studies in health care and related community issues. Applications are available from Sylvia Browning, CHERE, University of Sydney, Level 6, Building F, 88 Mallett St, Camperdown NSW 2050, Tel (02) 9351 0900, Fax (02) 9351 0930, Web http://www.cmwf.org Applications close late September.

The Italian Government Scholarships (L)
- 1 million Italian lira per month
- 2 to 24 months
Scholarships are open to Australian citizens to undertake research and language studies in Italy. Applicants must be aged under 35 years. Further information is available from the Italian Embassy, 12 Grey St, Deakin ACT 2600, Tel (02) 6273 3533, Fax (02) 6273 4223. Applications close early March.

The Japanese Government (Monbusho) Scholarships (L)
Scholarships are available to Australian Citizens for study in Japan for postgraduate research or five years of undergraduate study. Applicants must be willing to study the Japanese language and receive instruction in Japanese. Further information and applications are available from Monbusho Scholarships, Embassy of Japan, 112 Empire Circuit, Yarralumla ACT 2600, Tel (02) 6272 7268, Fax (02) 6273 1848. Applications close early July.

The Kobe Steel Postgraduate Scholarship (L,R,C)
- Maintenance allowance of at least 7,000 pounds sterling plus tuition fees and travelling expenses
- Up to 2 years with the possibility of extension
The scholarship is tenable at St Catherine's College, Oxford University. The scholarship will be awarded to outstanding individuals who display qualities of leadership, excellence in sport as well as academic ability. Students should have a past or future interest in Japan. Applications close mid-October.

The Korean Government Scholarships (L)
- Tuition fees, living allowance, travel and other allowances
- Duration of course
Scholarships are available to Australian citizens for Masters or PhD study in Korea. Preference will be given to applicants with a knowledge of the Korean language. Information and applications are available from the Embassy of the Republic of Korea, 113 Empire Circuit, Yarralumla ACT 2600, Tel (02) 6273 3044, Fax (02) 6293 4839. Applications close early May.

The Lady Davis Fellowship Trust (L,R,C)
The Lady Davis Trust provides awards for study, research, or teaching at graduate, post-doctoral or professorial levels at the Hebrew University or the Technion (Israel Institute of Technology). Information is available from the Australian Friends of the Hebrew University, 36 Hawthorn Road, South Caulfield VIC 3162, Tel (03) 9272 5511. Applications normally close in November.
The Laporte Centenary Scholarship (L,R)
- Airfare, living allowance, tuition fees
- 3 to 6 months

The scholarship is tenable for postgraduate research in the United Kingdom. Candidates should be undertaking a postgraduate qualification in a science-based discipline, preferably in the practical application of special chemicals. Applications are available from the Secretary, Sir Robert Menzies Centre for Australian Studies, University of London, 28 Russell Square, London WC1B 5DS, UK, Tel +44 171 580 5876, Fax +44 171 580 9627, Email mcintyre@ sas.ac.uk. Applications close early November.

Learn Arabic in Cairo Scholarship (L,J,R,C)
- Course fees, AU$70 per month living allowance
- 8 months

Scholarships are available to undertake the Arabic as a Foreign Language course in Cairo. Applications are available from the Embassy of the Republic of Egypt, 1 Darwin Avenue, Yarralumla ACT 2600, Tel (02) 6273 4437, Fax (02) 6273 4279. Applications close 1 July.

The Lionel Murphy Postgraduate Scholarship (L,R,C)
- $15,000 pa for study in Australia, up to $30,000 for study overseas
- 1 year

Applicants must be intending to undertake a postgraduate degree in Law, Science, Legal Studies or other appropriate discipline. Preference will be given to applicants who are proposing study of the law and legal system in a social context, science/law or international law. Information and application forms are available from the Lionel Murphy Foundation, GPO Box 4545, Sydney NSW 2000, Tel (02) 9223 5151, Fax (02) 9223 5267. Applications close mid-September.

The Lloyd's Register of Shipping Chevening Scholarship (L,R,C)
- Tuition fees, maintenance allowance, airfare
- 1 year

Two scholarships are available to graduates with proven academic merit and leadership potential, to pursue a postgraduate course at a British University. One scholarship is for a one-year MSc course in Marine Engineering/Naval Architecture, and the other is for a one-year MSc course in Environmental Sciences. Applicants must hold, or expect to complete before October, an Honours 1 or 2:1 degree. Application forms are available from the British Council, PO Box 88, Edgecliff NSW 2027, Tel (02) 9326 2022, Fax (02) 9327 4868. Applications close late October.

The Meat Research Corporation (MRC) Studentships and Junior Research Fellowships (L,R,C)
- $15,888 pa for study in a Masters or Diploma, $20,000 for a PhD in Australia or US$17,500 for study overseas, plus airfares, insurance and allowances
- 2 years for Studentships (Masters or Diploma), 3 years for Junior Research Fellowships (PhD)

Applicants should be proposing to undertake research in disciplines relevant to the Australian meat and livestock industry. Applications normally close late September.

The Menzies Scholarships (L,R,C)

The Menzies Scholarships are intended to provide funds for Australian Citizens (aged 21 to 45) who wish to travel to Britain to undertake a course of research and to write a paper on a subject of concern and importance to the relationship between the Australian and British communities. Tertiary qualifications are preferred but the awards are not restricted to graduates or students. Information and applications are available from the Australia-Britain Society, GPO Box 551, Sydney NSW 2000, Tel (02) 9223 5244. Applications normally close October.

Nanyang Technological University Singapore Research Scholarships (L,J,R)
- Tuition fees plus $51,400-$51,500 per month allowance
- 2 years for a Masters, 3 years for a PhD degree

Research scholarships are available to graduates with good Honours degrees to undertake postgraduate study. Information and application forms are available from The Registrar, Nanyang Technological University, Email geong@ntu.edu.sg, Fax +65 7911604.

The NSW Ministry for the Arts Scholarships (L)
- $5,000 - $25,000 (depending on the award)

The NSW Government offers a number of scholarships and awards to writers, artists and scholars living in NSW. Further information is available from The New South Wales Ministry for the Arts, GPO Box 5341, Sydney NSW 2000, Tel (02) 9228 3533, Fax (02) 9228 4722.

The Oxford Nuffield Medical Fellowship (L,R)
- Between 27,525 and 31,945 pounds sterling pa (subject to tax), plus travel expenses
- 2 years with a possible one year extension

The awards are available for research in a clinical medicine or medical science department of the University of Oxford. The appointee is required to return to Australia for at least 3 years to perform work similar to that carried out in the United Kingdom during the tenure of the Nuffield fellowship. Further information is available from Australian Academy of Science, GPO Box 783, Canberra ACT 2601, Tel (02) 6247 5777, Fax (02) 6257 4620. Applications close mid-March.

Overseas Research Students Awards Scheme (United Kingdom) (L,J,R)
- Difference in tuition fees for a 'home' and an 'overseas' student

The ORS Scheme provides partial remission of tuition fees to overseas students of outstanding merit and research potential. The awards are open to graduates who will be commencing full-time research studies at a participating institution in the United Kingdom, and who will be liable to pay tuition fees at the overseas student rate. Information and applications must be obtained directly from the Registrar or Secretary of the institution students are applying to in the United Kingdom. Applications normally close in April in the year of tenure.

Queen's Trust Grants (L)
- Up to $15,000

The Queen's Trust provides grants to Australian Citizens aged 18-28 years, for the pursuit of excellence in their chosen fields. Support is provided for projects studying the advancement of Australian youth, development of community leadership and/or other skills which will be of benefit to Australia. Information and applications may be obtained from the Queen's Trust, Tel 1800 033 625. Applications close in late April.

The Rhodes Scholarship (L,J,R)
- Tuition fees, assistance with travel expenses, up to $17,500 allowance
- 2 years, with a possible one year extension

The scholarship is tenable for postgraduate study at Oxford University. Applicants must be aged between 19 and 25 and have an honours degree or equivalent. Selection for the scholarship will be based on academic and personal achievements and community
The Robert Gordon Menzies Scholarship to Harvard (L,R,C)
- Up to $25,000 towards tuition fees, living expenses or travel costs (students who enrol in the Harvard Business School may be eligible for an additional $12,000)
- 1 year

The scholarships are tenable at one of the Harvard University graduate schools. Applicants must be an Honours graduate of an Australian university who intend to return to Australia after studies at Harvard or to represent Australia overseas. Applicants must be eligible for, and have applied for admission to a degree program in a graduate school of Harvard University. The scholarships are awarded on the basis of academic excellence and personal qualities such as leadership and public duty. Applications and additional information may be obtained from the Administrative Officer, Council and Board Secretariat, ANU, Canberra ACT 0200. Requests for application forms must reach the Swedish Institute before 1 December.

Swiss Government Scholarships (L,R,C)
- Tuition fees, living allowance, medical insurance and assistance with airfares
- 1 academic year

One scholarship is available for art/music and two for other disciplines, to undertake postgraduate study or attend an art school/conservatory in Switzerland. Applicants will be required to pass a language test in German or French. Applicants must be aged under 35. Applications close early October.

The STA Travel Grant (L,L,R,C)
- Up to $3,000

The scholarship is open to an outstanding young conductor, composer or repetiteur, aged between 21 and 30 who is likely to be an influential leader in the field of music, to undertake study in the United Kingdom or the Czech republic for at least six months. Applicants must also be Citizens of a country in which there is a Rotary club. Information regarding scholarship availability, closing dates and applications should be obtained from the applicant's local Rotary club.

Rotary Foundation Ambassadorial Scholarships (L)

The Rotary Foundation offers scholarships to study or train in another country where Rotary clubs are located. Applicants must have completed at least two years of a university or college course, or have completed high school and have been employed for at least two years. Applicants must also be Citizens of a country in which there is a Rotary club. Information regarding scholarship availability, closing dates and applications should be obtained from the applicant's local Rotary club.

The Russian Scholarships (L,R,C)
- Payment an allowance and medical cover

Scholarships are available to Australian citizens to undertake undergraduate or postgraduate study in journalism, law, economics, international relations or medicine in Russia. Applications normally close in May.

The Sir Charles Mackerras / Australia-Britain Society Music Scholarship (L)
- 8,000 pounds sterling

The scholarship is open to an outstanding young conductor, composer or repetiteur, aged between 21 and 30 who is likely to be an influential leader in the field of music, to undertake study in the United Kingdom or the Czech republic for at least six months. Application forms are available from the British Council, PO Box 88, Edgecliff NSW 2027, Tel (02) 9326 2022, Fax (02) 9327 4868, Email bcseydney@sprint.com. Applications close early November.

The STA Travel Grant (L,L,R,C)
- Up to $3,000

The scholarship is open to students/researchers who wish to travel to Sweden for studies/research which cannot equally well be pursued in countries other than Sweden. Applicants must establish contact with a Swedish University willing to accept the applicant for the proposed studies. Initial requests for application forms must be made in writing, including the applicant's name and address, nationality, educational background and work experience, knowledge of any languages, statement of the purpose of study/research in Sweden, and a copy of a letter of invitation from a Swedish University Department. Requests for applications should be sent to the Swedish Institute, Department for Exchanges in Education and Research, Box 7434, SE-103 91, Stockholm, Sweden, Email grantinfo@si.se, Web http://www.si.se. Requests for application forms must reach the Swedish Institute before 1 December.

The Tokyo Metropolitan Government Foreign Student Scholarship Program (L,R,C)
- 200,000 yen per month, tuition and travel expenses, plus allowances
- Up to 2.5 years

Scholarships are available for a Masters degree or postgraduate research at Tokyo Metropolitan University, or Tokyo Metropolitan Institute of Technology. Applicants must be aged under 35 years, be Australian Citizens from New South Wales, and be graduates of a university in NSW. Applications close early April.

The Turkish Government Language & Culture and Higher Education Scholarships (L,L)

Scholarships are available to high school graduates to undertake study at a Turkish University. Students may be required to undertake a one year Turkish language course before commencement of the degree. The scholarships pay a monthly allowance for the duration of the course. Scholarships are also available to university graduates who would like to attend Turkish Language and Culture Summer Courses conducted by Turkish Studies Centre. Further information is available from the Embassy of the Republic of Turkey, 60 Mugga Way, Red Hill ACT 2603. Applications close 30 May for Language and Culture Scholarships, and 15 July for Higher Education Scholarships.

University College London Scholarships

The University College London offers various scholarships to students from overseas, who hold an offer of admission to a full-time programme of study at UCL. Applicants must be self-financing and liable to pay tuition fees at the rate for overseas students. Information and applications are available from the International Office, University College London, Gower St, London WC1E 6BT, UK, Tel +44 171 380 7708, Fax +44 171 380 7380, Email international@ucl.ac.uk.

Yokoyama Scholarship Awards (L,R,C)

Assistance may be available for undergraduate and postgraduate study at a Japanese University.

Information is available from Mr Masao Iwashita, Secretary-General, Yokoyama Scholarship Foundation, 6F Shiozaki Building, 2-7-1 Hirakawacho, Chiyoda-Ku, Tokyo 102 Japan, Tel +813 3238 2913, Fax +813 5275 1677.
Faculty Travel Scholarships

Faculty of Engineering

Mechanical and Manufacturing Engineering

The NSK Silver Jubilee Scholarship for Study in Japan

• Up to $15,000 for study in Japan
• From 3 to 6 months

The scholarship is open to undergraduate or postgraduate students in the School of Mechanical and Manufacturing Engineering at UNSW, whose thesis projects would be enhanced by work in a Japanese organisation in Japan. The scholarship may cover expenses related to a three-six month stay in Japan (eg travel expenses, living costs, fees etc), for students to work on their thesis project with industry, universities, or government research bodies etc. The scholarship is awarded on the basis of academic merit, a demonstrated interest in Japan and an assessment of their progression on their project. Information is available from Professor B.E. Milton, Head of School, Mechanical and Manufacturing Engineering, Tel (02) 9385 4088, Fax (02) 9663 1222, Email B.Milton@unsw.edu.au. Applications normally close at the end of each year.
The following information summarises prizes awarded by the University. Prizes are grouped by level as follows: Undergraduate, common Undergraduate/Postgraduate, Postgraduate. Within these groups prizes are listed under the faculty, school or department in which they are awarded. Prizes which are not specific to any school are listed under General. Law prizes are awarded only for students enrolled in the LLB or Jurisprudence programs.

Information regarding the establishment of new prizes may be obtained from the Student Information and Systems Office.

Prize information is normally provided in the following format:
- Prize value
- Conditions

### Undergraduate Prizes

<table>
<thead>
<tr>
<th>Prize Information</th>
<th>Prize Details</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>General Category for Prizes</strong></td>
<td></td>
</tr>
<tr>
<td><strong>School of Chemical Engineering and Industrial Chemistry</strong></td>
<td></td>
</tr>
</tbody>
</table>
| **The Heinz Harant Challenge Prize** | $1000 (bi-annual prize)
For an original piece of assessable work submitted in the program of completing a General Education course |
| **The Abbott Laboratories Pty Limited Prize** | $500
For the best performance in Year 4 of the Bachelor of Engineering in Chemical Engineering program |
| **The Spirit of Reconciliation Prize** | $150
For the best piece of work with an Aboriginal theme, emphasising the importance of reconciliation, undertaken by a student in any faculty |
| **The Australasian Corrosion Association (NSW Branch) Award** | $150 and 1 year membership of the Association
For the best performance in INDC3041 Corrosion in the Chemical Industry |
| **The Australian Institute of Energy (AIE) Prize** | $150
For the best performance in a course selected by the Head of School |
| **The Bristol-Myers Squibb Prize** | $200
For the best performance in CHEN4030 Environmental Pollution Control |
| **The Cargill Australia Prize** | $500
For the best performance in CHEN4120 Process Plant Management and Operation |
| **The John Fraser Memorial Award** | $130
For the best performance in Year 1 or part-time equivalent of a Bachelor program offered by the Faculty of Engineering |
The Dow Corning / Millenium Inorganic Chemicals Prize

• $500
For the best performance in the Environmental Management component of CHEN4100 Professional Electives

The Dow Corning Prize

• $300
For the best performance in CHEN4081 Design Project

The Fuel Technology Staff Prize

• $200
For the best performance in FUEL4090 Fuel and Energy Research Project

The Goodman Fielder Ingredients Prize

• $250
For the best performance in CHEN3090 Chemical Engineering Applications

The National Starch & Chemical Prize

• $500
For the best performance in POLY3010 Polymer Science

The Norman Prize in Chemical Engineering

• $1000
For the best project (CHEN4090 Research Project) in the final year in Fuel Technology in the Bachelor of Engineering in Chemical Engineering program

The Simon Carves Australia Prize

• $200
For the best performance in CHEN3060 Process Plant Engineering

The Australian Institute of Traffic Planning and Management Prize

• $200, 1 year free subscription to AITPM and a plaque
For the best performance in CIVL4844 Transport Major in the Bachelor of Engineering in Civil Engineering program

The Baulderstone Hornibrook Prize

• $500
For the best performance in Engineering Construction and Management in the Bachelor of Engineering in Civil Engineering program

The Crawford Munro Memorial Prize

• $300
For the best performance in CIVL3705 Water Resources in the Bachelor of Engineering in Civil Engineering program

The Jeffery and Katauskas Prize

• $500
For the best performance in CIVL3402 Geotechnical Engineering 1 in the Bachelor of Engineering in Civil Engineering or Bachelor of Environmental Engineering program
The PPK Environment and Infrastructure Prize
• $1500
For high achievement and commitment to the ideals of Civil or Environmental Engineering in Year 2 of the Bachelor of Engineering in Civil or Environmental Engineering.
Open to all students in Year 2 of the Bachelor of Engineering in Civil or Environmental Engineering who are not in receipt of a scholarship.

The Sydney Water Gold Medal
• $200 and a gold medal
For the highest aggregate in CIVL4017 Water Engineering (Major) in the Bachelor of Engineering in Environmental Engineering program.

The TDA Timber Engineering Prize
• Books worth approximately $150
For the best performance in Timber Engineering or a Timber Related Project in the Bachelor of Engineering in Civil Engineering or Bachelor of Engineering in Environmental Engineering program.

The Welding Technology Institute of Australia Prize
• A set of technical notes worth approximately $500 and 1 year membership to the Institute
For the best performance in CIVL4403 Materials Engineering 2

School of Geomatic Engineering

The Australian Photogrammetric and Remote Sensing Society (NSW) Prize
• $150
For the best performance in Photogrammetric courses in the Bachelor of Surveying or Bachelor of Engineering in Geomatic Engineering program

The BHP Hatch Prize in Surveying
• $2000
For the best overall performance by a Year 3 student proceeding to Year 4 in the Bachelor of Surveying or Bachelor of Engineering in Geomatic Engineering program

The Institution of Surveyors New South Wales Incorporated Prize
• Books valued at approximately $200 and an inscribed plaque
For the best performance by a graduating student in the Bachelor of Surveying or the Bachelor of Engineering in Geomatic Engineering program

The Electricity Supply Engineers’ Association Prize
• $200
For the best overall performance including proficiency in Electric Power Distribution in Year 3 full-time or equivalent part-time stages of the Bachelor of Engineering in Electrical Engineering program

The energyAustralia Electrical Energy 3rd Year Prize
• $500
For the best combined performance in courses in Electric Power Engineering in Year 3 of the Bachelor of Engineering in Electrical Engineering program

The energyAustralia Electrical Energy 4th Year Prize
• $500 and a silver medal
For the best combined performance in final year courses and thesis offered by the Department of Electric Power Engineering

The Institution of Electrical Engineers UK Prize
• $250, an IEE certificate and 2 years Associate Membership of the IEE
For the best performance in the final year thesis/project in the Bachelor of Engineering in Electrical Engineering program

The J Douglas Maclurcan Prize
• Book voucher worth $60
For an outstanding performance in the field of Control Systems in the final year of the Bachelor of Engineering in Electrical Engineering program

The Photovoltaics Prize (Applied Photovoltaics)
• $500
For the best performance in ELEC4540 Applied Photovoltaics in the Bachelor of Engineering program

The Photovoltaics Thesis Prize
• $500
For the best performance in an undergraduate thesis in the area of Photovoltaics in the Bachelor of Engineering program

The Board of Surveyors Medal
• A medal
For an outstanding performance in the final year of the Bachelor of Surveying or Bachelor of Engineering in Geomatic Engineering program

The Consulting Surveyors’ NSW Prize in Land Development
• $500
For the best performance in GMAT7612 Land Management and Development Project 1 and GMAT8612 Land Management and Development Project 2 in the Bachelor of Engineering in Geomatic Engineering program

The Institution of Surveyors NSW Prize in Land Development
• $500
For the best performance in GMAT7612 Land Management and Development Project 1 and GMAT8612 Land Management and Development Project 2 in the Bachelor of Engineering in Geomatic Engineering program

The Institution of Surveyors New South Wales Incorporated Prize
• Books valued at approximately $200 and an inscribed plaque
For the best performance by a graduating student in the Bachelor of Surveying or the Bachelor of Engineering in Geomatic Engineering program
The Landlnfo First Year Prize

• $1000
For the best performance in all Year 1 courses in the Bachelor of Engineering in Geomatic Engineering program.

The Landlnfo Second Year Prize

• $1000
For the best performance in all Year 1 courses in the Bachelor of Engineering in Geomatic Engineering program.

The R S Mather Memorial Prize

• $250
For an outstanding performance in Geodesy courses in the Bachelor of Surveying or Bachelor of Engineering in Geomatic Engineering program.

The School of Geomatic Engineering Prize

• $1000
For the best overall performance by a Year 2 student proceeding to Year 3 in the Bachelor of Surveying or the Bachelor of Engineering in Geomatic Engineering program.

School of Mechanical and Manufacturing Engineering

The Atlas Copco Prize

• $200
For the best overall performance in the Bachelor of Engineering in Mechanical Engineering program.

The Baird Publications Prize I

• A book voucher worth $200
For the best performance by a student in a Year 3 course in the Bachelor of Engineering in Naval Architecture program, selected by the Head of School.

The Baird Publications Prize II

• Computer software worth approximately $250
For the best performance by a student in a Year 3 course in the Bachelor of Engineering in Naval Architecture program, selected by the Head of School.

The Carrier Air Conditioning Pty Limited Prize

• $250
For the best performance in a course selected by the Head of School.

The Computer-based Engineering Design Prize

• $100
For the best undergraduate thesis making a contribution to computer-based Engineering design in the School of Mechanical and Manufacturing Engineering.

The David Carment Memorial Prize

• $500 and a bronze medal
For the best overall performance in the final year of the Bachelor of Engineering in Naval Architecture program.

The John Harrison Prize

• $100
For the best performance in a course selected by the Head of School.

The Pacific Power Award

• $250
For the best performance in MECH4740 Thermal Power Plants.

The RE Jeffries Memorial Prize

• $500
For the best overall performance in the final year of the Bachelor of Engineering in Manufacturing Engineering and Management program.

The RAA Bryant Prize

• To be determined
A student graduating with First Class Honours and the University Medal in Mechanical Engineering.

The Royal Institution of Naval Architects (Australian Division) Prize

• $250
For the best ship design by a student in the final year of the Bachelor of Engineering in Naval Architecture program.

The RS Components Prize for Engineering Excellence

• A gift voucher or instruments valued at $500
For the best performance in the final year of the Mechatronic Engineering program.

The Spruson and Ferguson Prize

• $250
For the best performance in MECH3100 Machine Systems Design in the Bachelor of Engineering program.

The Warwick Slade Royal Aeronautical Society Prize

• Graduate membership in the society to the top team; a medal to the top student from the team
For the top team performance in AERO4100 Aerospace Design by students proceeding to the degree of Bachelor of Engineering in Aerospace Engineering.
School of Mining Engineering

The Stan Sawyer Memorial Prize
• $400
For the best performance in an Honours thesis on a topic relating to coal mining in the Bachelor of Engineering in Mining Engineering program

The Western Mining Corporation Limited Melbourne Prize
• $200
For the best overall performance in the Bachelor of Engineering in Mining Engineering program

The Western Mining Corporation Limited Perth Prize
• $150
For the best overall performance in the final year of the Bachelor of Engineering in Mining Engineering program

School of Petroleum Engineering

The AusIMM/Santos Prize
• $500
For the best performance in Year 3 of the Bachelor of Engineering in Petroleum Engineering program

The ESSO Australia Prize for an Outstanding Contribution in a Non-Technical Course
• $500
For the best performance in PTRL4010 Communication Skills and Business Practices for Engineers in Year 4 of the Bachelor of Engineering in Petroleum Engineering program

The ESSO Australia Prize for Excellence in a Core Technical Course
• $500
For the best performance in PTRL3001 Reservoir Rock Properties and Fluid Flow in Porous Media in Year 3 of the Bachelor of Engineering in Petroleum Engineering program

The Fletcher Challenge Prize for a High Achieving Student in the Area of Drilling Engineering
• $500
For the best performance in PTRL3009 Fundamentals in Drilling Engineering in Year 3 of the Bachelor of Engineering program

The Shell Development (Australia) Pty Ltd Prize
• $500
For the best performance in CHEN4030 Safety and Environment

The Woodside Energy Prize for Outstanding Performance in Natural Gas Engineering
• $500
For an outstanding performance in PTRL4005 Natural Gas Engineering in Year 4 of the Bachelor of Engineering program
Undergraduate and Postgraduate Prizes

School of Electrical Engineering and Telecommunications

The Steve Robinson Memorial Prize

- $500
For the best performance in ELEC9507 Solar Cells and Systems and ELEC9509 Photovoltaics in the Bachelor of Engineering, Master of Engineering Science or Doctor of Philosophy program.

Postgraduate Prizes

School of Civil Engineering and Environmental Science

The Maunsell Project Report Prize

- $500
For the best performance in CIVL8909 or CIVL9909 Project Report (9 credits) or GEOL9504 or GEOL9604 Project Report (9 credits) in the Master of Engineering Science or Master of Applied Science program.

The Maunsell Waste Management Prize

- $500
For the best aggregate score in CIVL8872/9872 Solid Waste Management and CIVL8881/CIVL9881 Hazardous Waste Management in the Master of Engineering Science or Master of Applied Science program.

School of Mechanical and Manufacturing Engineering

The MESA Maintenance Prize

- $350
For the best performance in MECH4150/MECH9150 Design and Maintenance Components.
The University of New South Wales • Kensington Campus
This Handbook has been specifically designed as a source of detailed reference information for first year, re-enrolling undergraduate and postgraduate students.

Separate Handbooks are published for:
- Arts and Social Sciences
- Built Environment
- College of Fine Arts
- Commerce and Economics
- Engineering
- Law
- Medicine
- Science
- Australian Graduate School of Management (AGSM)
- Australian Taxation Studies Program (ATA)
- University College
- Australian Defence Force Academy (ADFA)
- General Education.

For further information about the University – its organisation; staff members; description of disciplines; scholarships; prizes and so on, consult the University Calendar (Summary Volume). For further information on student matters, consult the UNSW Student Guide.