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 11 December 2000, but may be amended without notice by the University Council.

© The University of New South Wales
Contents

Introduction 1
Faculty of Engineering Websites 2

Calendar of Dates 3

Staff 5

Handbook User Guide 15

Faculty Information 17
Some People Who Can Help You 17
Entrance Requirements 17
Units of Credit 18
Enrolment Procedures 18
UNSW Library Facilities 18
Student Equity 18
Equal Opportunity in Education Policy Statement 19
Students With Disabilities 19
Special Government Policies 19
Professional Institutions 20
Student Clubs and Societies 20
General Information 20

Undergraduate Study - Summary of Programs 21
Full-time Programs 21
Combined Degree Programs 21
Concurrent Degree Programs 22
Other Engineering Programs at UNSW 22
Co-op Program 22
Transfer Programs 22
Program Revision 22
General Rules for Progression 22
Honours 23
Industrial Experience Requirements 23
Access to Exam Information 23
General Education Program 23
Bachelor of Engineering Program Rules 24
Bachelor of Science in Industrial Chemistry Course Program Rules 24

Graduate Study Summary of Programs 25
English Language Requirements 25
Research Degrees 25
Doctor of Philosophy PhD 25
Master of Engineering/Master of Science ME/MSc 26
Coursework Masters Degrees 26
Master of Engineering Science MEngSc 26
Graduate Diplomas 27
Graduate Certificate 27
Graduate Courses 27
Research and Project Areas 28
Biomedical Engineering 28
CANCES 28
Chemical Engineering and Industrial Chemistry 28
Civil and Environmental Engineering 29
Computer Science and Engineering 30
Electrical Engineering 31
School of Chemical Engineering and Industrial Chemistry

Undergraduate Study
Program Outlines
3040 Chemical Engineering - Full-time Program
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
3043 and 3013 Combined Chemical Engineering /Industrial Chemistry/
Bachelor of Arts - Full-time Programs
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 - Full-time Program
3146 BE in Civil Engineering BE in Mining Engineering - Full-time Program
477 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 BE MEngSc 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 MEngSc
8612.2000 Geotechnical Engineering
8612.3000 Structural Engineering
8612.4000 Transport Engineering
8612.5000 Water Engineering
8615 Master of Environmental Engineering Science
8617 Master of Engineering Science
8618 Master of Environmental Engineering Science
Graduate Diplomas in Civil and Environmental Engineering
5459 Graduate Diploma
5454 Graduate Diploma
Graduate Certificates in Civil and Environmental Engineering
Graduate Certificate in Civil Engineering 7336
Graduate Certificate in Environmental Engineering 7337

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
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

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

Postgraduate Study

Coursework Programs

ELEC(A-F)S8501 Master of Engineering Science in Electrical Engineering

TELEAS8503 Master of Engineering Science in Telecommunications

Postgraduate Electives

ELEC(A-F)S5458 Graduate Diploma in Electrical Engineering

TELEAS5448 Graduate Diploma in Telecommunications

Entry Qualifications for Graduate Diploma (5458, 5448)

Course Descriptions

School of Geomatic Engineering

Undergraduate Study

Program Outlines

3741 Geomatic Engineering

Combined Programs

Combined Bachelor of Engineering in Geomatic Engineering/Bachelor of Science in Computer Science Program (Program No. 3746)

Combined Bachelor of Engineering (Geomatic Engineering)/Bachelor of Arts Program (Program No. 3747)

BE/MCom Fast Track Program Structure Combined Bachelor of Engineering (Geomatic Engineering)/Master of Commerce Program (Program No. 3748)

Postgraduate Study

8652 Geomatic Engineering / in Geomatic Engineering

8652 Geomatic Engineering (External Mode Delivery)

8652 Geographic Information Systems

8653 Land Administration

8641 Remote Sensing

5492 Graduate Diploma in Geomatic Engineering GradDip

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
- Combined Degree Programs
- Concurrent Degree Programs
- Manufacturing Engineering and Management (BE MCom) Plan
- Mechanical Engineering (BE MCom) Plan

### Postgraduate Study
- 8710 Master of Engineering Science Program
- Manufacturing Engineering (MEngSc) Plan
- Mechanical Engineering (MEngSc) Plan
- 5710 Graduate Diploma Program

## School of Mining Engineering

### Undergraduate Study
- Program Outlines
- 3140 Bachelor of Engineering
  - BE(lining Engineering)/MCom Fast-track Program
- 3142 BE(Mining)/BSc
- 3144 BE(Mining)/BA
- 3146 BE(Civil) BE(Mining) in Civil Engineering and Mining Engineering – Full-time Course

### Postgraduate Study
- Program Outlines
- 8055 Mining Engineering Master of Engineering Science
- Master of Engineering Science (Mining Geomechanics)
- Master of Engineering Science (Mining Industry Management)
- 5040 Mining Engineering Graduate Diploma
- 5045 Mining Engineering Graduate Diploma
- 7335 Graduate Certificate in Mining Engineering

### Course Descriptions

## School of Petroleum Engineering

### Undergraduate Study
- 3045 Petroleum Engineering - Full Time Program (Hons)
- 5031 Petroleum Engineering Full Time / Part Time Internal / External
- Combined Degree Bachelor of Engineering (Petroleum) / Master Commerce
- Open Learning Programs

### Postgraduate Study
- Course Work Programs
- Master of Biomedical Engineering
- Master of Engineering Science
- Graduate Diploma in Biomedical Engineering

### Course Descriptions

## Graduate School of Biomedical Engineering

### Postgraduate Study
- Course Work Programs
- Master of Biomedical Engineering
- Master of Engineering Science
- Graduate Diploma in Biomedical Engineering

### Course Descriptions
Centre for Photovoltaic Engineering 188
Undergraduate Study 188
Postgraduate Study 191
Course Descriptions 193

Faculty Centres 197
Key Centre for Photovoltaic Engineering 197
Photovoltaic Special Research Centre 197
Centre for Third Generation Photovoltaics 197
Centre for Advanced Numerical Computation in Engineering and Science 197
Centre for Applied Polymer Science 197
Centre for Particle and Catalyst Technologies 198
Centre for Remote Sensing and Geographic Information Systems 198
Centre for Water and Waste Technology 198
Energy Research, Development and Information Centre (ERDIC) 199
UNESCO Centre for Membrane Science and Technology 199
Munro Centre for Civil and Environmental Engineering 199
Centre for Postgraduate Studies in Civil and Environmental Engineering 199
UNSW Groundwater Centre 199

Servicing Course Descriptions 201

Conditions for the Award of Degrees 223
First Degrees 223
Higher Degrees 223
Doctor of Philosophy (PhD) 223
Master of Biomedical Engineering (MBiomedE) 225
Master of Business and Technology (MBT) 225
Master of Computer Science (MCompSce) 226
Master of Engineering (ME) and Master of Science (MSc) 227
Master of Engineering (ME) and Master of Science (MSc) without supervision 228
Master of Engineering Science (MEngSc) 229
Master of Environmental Engineering Science (MEnvEngSc) 230
Master of Information Science (MInfSc) 230
Graduate Diploma in Industrial Management (GradDip) 231

Scholarships 233
Undergraduate Scholarships 233
Postgraduate Scholarships 249

Prizes 263
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, Surveying and Spatial Information, Mechanical and Manufacturing Engineering, Mining Engineering and Petroleum Engineering as well as the Graduate School of Biomedical Engineering, the Graduate Programs in Business and Technology and the Key Centre for Photovoltaic Engineering. 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  
www.eng.unsw.edu.au

School of Chemical Engineering and Industrial Chemistry  
www.ceic.unsw.edu.au

School of Civil and Environmental Engineering  
www.civeng.unsw.edu.au

School of Computer Science and Engineering  
www.cse.unsw.edu.au

School of Electrical Engineering and Telecommunications  
www.ee.unsw.edu.au

School of Geomatic Engineering  
www.gmat.unsw.edu.au

School of Mechanical and Manufacturing Engineering  
www.mech.unsw.edu.au

School of Mining Engineering  
www.mining.unsw.edu.au

School of Petroleum Engineering  
www.petrol.unsw.edu.au

Graduate School of Biomedical Engineering  
www.gsbme.unsw.edu.au

Centre for Photovoltaic Engineering  
www.pv.unsw.edu.au
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**

**Session 1**

*(14 weeks)*

<table>
<thead>
<tr>
<th>2001</th>
<th>2002</th>
</tr>
</thead>
<tbody>
<tr>
<td>26 February to 12 April</td>
<td>4 March to 27 March</td>
</tr>
<tr>
<td>23 April to 8 June</td>
<td>8 April to 14 June</td>
</tr>
</tbody>
</table>

**Mid-session recess**

Study period

<table>
<thead>
<tr>
<th>13 April to 22 April</th>
<th>28 March to 7 April</th>
</tr>
</thead>
<tbody>
<tr>
<td>9 June to 14 June</td>
<td>15 June to 20 June</td>
</tr>
<tr>
<td>15 June to 3 July</td>
<td>21 June to 9 July</td>
</tr>
</tbody>
</table>

**Examinations**

<table>
<thead>
<tr>
<th>13 April to 22 April</th>
<th>28 March to 7 April</th>
</tr>
</thead>
<tbody>
<tr>
<td>9 June to 14 June</td>
<td>15 June to 20 June</td>
</tr>
<tr>
<td>15 June to 3 July</td>
<td>21 June to 9 July</td>
</tr>
</tbody>
</table>

**Mid-year recess**

| 4 July to 22 July | 10 July to 28 July |

**Session 2**

*(14 weeks)*

<table>
<thead>
<tr>
<th>23 July to 21 September</th>
<th>29 July to 27 September</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 October to 2 November</td>
<td>8 October to 8 November</td>
</tr>
</tbody>
</table>

**Mid-session recess**

Study period

<table>
<thead>
<tr>
<th>22 September to 30 September</th>
<th>28 September to 7 October</th>
</tr>
</thead>
<tbody>
<tr>
<td>3 November to 8 November</td>
<td>9 November to 14 November</td>
</tr>
<tr>
<td>9 November to 27 November</td>
<td>15 November to 3 December</td>
</tr>
</tbody>
</table>

**Important dates for 2001**

<table>
<thead>
<tr>
<th>January 2001</th>
<th>April 2001</th>
</tr>
</thead>
<tbody>
<tr>
<td>M 1  New Year's Day – Public Holiday</td>
<td>Su 18 Medicine V – Term 1 ends</td>
</tr>
<tr>
<td>Th 11 Medicine V – Term 1 begins</td>
<td>M 26 Medicine V – Term 2 begins</td>
</tr>
<tr>
<td>M 22 Medicine IV – Term 1 begins</td>
<td>F 30 Last day for students to discontinue without failure</td>
</tr>
<tr>
<td>Th 25 AGSM Executive MBA Program - Graduate Certificate in Management – classes end</td>
<td>Session 1 courses</td>
</tr>
<tr>
<td>F 26 Australia Day – Public Holiday</td>
<td>HECS Census Date for Session 1</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>February 2001</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Su 3 AGSM Executive MBA Program – Graduate Certificate in Management - Examinations</td>
<td>April 2001</td>
</tr>
<tr>
<td>M 12 AGSM Executive MBA - program – Session 1 begins</td>
<td>Su 1 Medicine VI – Term 2 ends</td>
</tr>
<tr>
<td>M 19 Medicine VI – Term 2 begins</td>
<td>M 9 Medicine VI – Term 3 begins</td>
</tr>
<tr>
<td>M 26 Session 1 begins – for Faculties other than Medicine, AGSM and University College, ADFA</td>
<td>F 13 Good Friday - Public Holiday</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>March 2001</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>M 5 AGSM MBA Program – Term 1 begins</td>
<td>Mid-session recess ends - for Faculties other than Medicine, AGSM and University College, ADFA</td>
</tr>
<tr>
<td>F 9 Last day applications are accepted from students to enrol in Session 1 courses</td>
<td>Mid-session recess ends - AGSM EMBA program</td>
</tr>
<tr>
<td>Su 11 Medicine IV – Term 1 ends</td>
<td>M 23 Medicine IV - Recess begins</td>
</tr>
<tr>
<td>M 12 Medicine IV – Term 2 begins</td>
<td>W 25 Anzac Day – Public Holiday</td>
</tr>
</tbody>
</table>
Su 29 Medicine IV - Recess ends
M 30 Medicine IV - Term 3 begins

May 2001
S  5 University College, ADFA - Mid-session recess begins
T  8 Publication of the provisional timetable for the June examinations
F 11 AGSM MBA Program - Term 1 ends
M 14 AGSM MBA Program - all classes - Examinations begin
W 16 Last day for students to advise of examination clashes
F 18 AGSM MBA Program - all classes - Examinations end
AGSM Executive MBA Graduate Diploma in Management Program - Session 1 ends
Su 20 Medicine VI - Term 3 ends
M 21 Medicine VI - Term 4 begins
F 25 AGSM Executive MBA Graduate Certificate in Management Program - Session 1 ends
S 26 AGSM Executive MBA Graduate Diploma in Management - Examination
Su 27 Medicine V - Term 2 ends

June 2001
S  2 AGSM EMBA Graduate Certificate in Management Program - Examinations start
M  4 AGSM MBA Program - all classes - Term 2 begins Medicine V - Term 3 begins
F  8 Session 1 ends - for Faculties other than Medicine, AGSM and University College, ADFA
S  9 Study period begins - for Faculties other than Medicine, AGSM and University College, ADFA
Su 10 Medicine IV - Term 3 ends
M 11 Queen's Birthday - Public Holiday
T 12 Medicine IV - Term 4 begins
Th 14 Study period ends - for Faculties other than Medicine, AGSM and University College, ADFA
F 15 Examinations begin - for Faculties other than Medicine, AGSM and University College, ADFA
F 22 University College, ADFA - Session 1 ends
M 25 University College, ADFA - Examinations begin

July 2001
T  3 Examinations end - for Faculties other than Medicine, AGSM and University College, ADFA
W  4 Mid-year recess begins - for Faculties other than Medicine, AGSM and University College, ADFA
F  6 University College, ADFA - Examinations end
Su  8 University College, ADFA - Mid-year recess begins
M 16 AGSM Executive MBA - Graduate Certificate in Management program - Session 2 begins
Su 22 Mid-year recess ends - for Faculties other than Medicine, AGSM and University College, ADFA
University College, ADFA - Mid-year recess ends AGSM MBA Program - all classes - Term 2 ends
M 23 Session 2 begins - for Faculties other than Medicine, AGSM Medicine VI - Term 5 begins
AGSM MBA Program - all classes - Examinations begin
F 27 AGSM MBA Program - all classes - Examinations end

August 2001
F  3 Last day applications are accepted from students to enrol in Session 2 courses
Su  5 Medicine V - Term 3 ends
Medicine IV - Term 4 ends
M  6 AGSM MBA Program - all classes - Term 3 begins
M 13 Medicine IV - Term 5 begins
Medicine V - Term 4 Begins
F 31 HECS Census Date for Session 2
Last day for students to discontinue without failure in Session 2 courses

September 2001
S  1 Courses and Careers Day
Su  2 Medicine VI - Term 5 ends
M  3 Medicine VI - Term 6 begins
Th 13 Closing date for “on time” applications to the Universities Admissions Centre
S 22 Mid-session recess begins - for Faculties other than Medicine, AGSM and University College, ADFA University College, ADFA - Mid-session recess begins
AGSM - Mid-session recess begins
Su 23 Medicine IV - Term 5 ends
M 24 Medicine IV - Term 6 begins
Su 30 Mid-session recess ends - for Faculties other than Medicine, AGSM and University College, ADFA AGSM - Mid-session recess ends

October 2001
M  1 Labour Day - Public Holiday
University College, ADFA - Mid-session recess ends
W 10 Last day for students to advise of examination clashes
Su 14 Medicine V - Term 4 ends
Medicine VI - Term 6 ends
F 19 AGSM Executive MBA Graduate Diploma in Management Program - Session 2 ends
T 23 Publication of the provisional timetable for the November examinations
F 26 AGSM Executive MBA Graduate Certificate in Management - Session 2 ends
University College, ADFA - Session 2 ends
S 27 AGSM Executive MBA Graduate Diploma in Management Program - Examination

November 2001
F  2 Session 2 ends - for Faculties other than Medicine, AGSM and University College, ADFA
S  3 Study period begins - for Faculties other than Medicine, AGSM and University College, ADFA AGSM Executive MBA Graduate Certificate in Management Program - Examination
Su  4 Medicine IV - Term 6 ends
Th  8 Study period ends - for Faculties other than Medicine, AGSM and University College, ADFA
F  9 Examinations begin - for Faculties other than Medicine, AGSM and University College, ADFA AGSM MBA Program - all classes - Term 3 ends
M 12 AGSM MBA Program -all classes - Examinations begin
F 16 University College, ADFA - Examinations end
AGSM MBA Program - all classes - Examinations end
S 17 AGSM - Executive MBA Program - Session 2 begins
M 19 AGSM Executive MBA Graduate Certificate in Management - Summer session begins
T 27 Examinations ends - for Faculties other than Medicine, AGSM and University College, ADFA

December 2001
S 22 AGSM Graduate Certificate in Management - Summer session break
T 25 Christmas Day - Public Holiday
W 26 Boxing Day - Public Holiday
Staff

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, CPEng, FTSE, FRACI, FIEAust

Acting Dean (1.1.01 - .6.01)
Timothy Hesketh, BSc MSc PhD Massey, MIEEE

Presiding Member
Christopher Raymond Daly, BE MSc PhD GradDip(Higher Ed) UNSW, GradDip(Min Ecs), Macq, MAusIMM

Associate Dean (Academic)
Timothy Hesketh, BSc MSc PhD Massey, MIEEE

Acting Associate Dean (Academic)
Francie Shay Khiet Tin Loi, BE PhD Monash, CPEng, MIE Aust.

Associate Dean (International)
Rodney Phillip Chaplin, BSc PhD Adel, CChem, MACS, FRACI

Associate Dean (Research)
Paul J Compton, MSc UNSW

Associate Dean (Education & IT)
Dianne Elizabeth Wiley, BappSc DDIAE, DipEd Armidale CAE, PhD UNSW, CChem, CEng, MRACI, MIChemE

Executive Officer
Robyn Christine Honwood, BA DipEd UNSW

Development Officer
Jeremy Bradshaw, BA(AppComm) UWS

Marketing Officer
Marjorie E Fox, BBus PR/Mktg OUT

Student Liaison Officer
Donna Jayne Bailey

Postgraduate Marketing/Industry Liaison
Robin Nasr BBus Mktg/Advertising UTS

Personal Assistant to the Dean
Maureen Ellen Noonan

Personal Assistant to the Associate Deans
Cheryl Anne Kelly
Executive Assistant
Hemaxi Ghelani

Clerk
Jacqueline Yvonne Alexander

Information Technology Support Unit
Paul Eccleston
Shu Fai Mok

Senior Accountant
Stefan Backman, B Econ Gothborg, CPA

Senior Assistant Accountant
Savita Sardana BSc Delhi
School of Chemical Engineering and Industrial Chemistry

Associate Professor and Head of School
Michael Paul Brungs, BSc PhD UNSW, FSGT

Professors of Chemical Engineering and Industrial Chemistry
Robert Paul Burford, BSc PhD Adel, FPRI(Aust), FRACI, FIM, FIEAust, CChem, MACS
Thomas Paul Davis, BSc PhD Saltford, CChem, MRCs
Anthony Gordon Fane, BSc PhD DIC Lond, CEng, FIChemE, FIEAust, FTSE
Christopher Joseph Dalzell Fell, BSc UNSW, PhD Camb, CEng, FTSE, FIChemE, FIEAustCPE
David Lawrence Trimm, BSc PhD Exe, DIC Lond, CEng, FTSE, FRACI, FIChemE, FIEAust
Mark Sebastian Wainwright, BSc Adel, PhD McMaster, FRACI, FIEAust

Associate Professors
Adesoji Adediran Adesina, BSc Lagos, MASc PhD
Rodney Phillip Chaplin, BSc PhD Adel, CChem, MACs, FRACI
Tuan Quang Pham, BE PhD Camb, MIChemE, AAFST
John Frank Stubington, BE Qld, PhD Camb, CEng, FAIE, FIChemE
Tam Tran, BSc PhD UNSW, MAusIMM, MAIME

Senior Lecturers
Rose Amai, BE PhD UNSW, MIChemE, MIWAQ
Vicki Chen, BSc(Eng) MIT, PhD Minnesota, MAIChe, ACS
Philip Thomas Crisp, BSc PhD Syd, APACI
Johan PA Heuts (Hans), BSc Eindhoven The Netherlands, PhD Sydney
Frank Lucien, BE PhD UNSW
Roya Sheikholeslami, BSc Kansas, MSc PhD British Columbia, PEng, MAIChe, MRCI
Dianne Elizabeth Wiley, BAppSc DDIaE, DipEd Armidale CAE, PhD UNSW, CPChem, 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

Administrative Officer
Vivienne Brennan

Laboratory Manager
John McEwan Starling, BE UNSW

Professional Officers
Van Bong Dang, BSc MAppSc Gunma, MSc UNSW, AIE
Deyan Guang, BE Dalian University, PR China, MSc PhD UNSW
Katia Simeonova Nasev, MSc Higher InstChemTech, Sofia, Grad IEAust

Senior Technical Officers
Elizabeth Dobrinsky, BE Moscow Tech Inst, Grad IEAust
Steve Jacenyik BPharm, SOTE Budapest
Philip McAuley
Jin Song

Technical Officers
Andrew Chau, BE UNSW

Workshop
Paul Brodbank
Philip Thompson

Computer Systems Officer
Andre Cass
Ee Meen Iliife BSc (Comp Sci) UNSW

Student Administration
Vanessa Werfel

Administrative Assistants
Lorraine Bonner
Barbara Carter
John Franklin
Kay French
Ling Lau

Director of Teaching and Learning
Dr Vicki Chen

Postgraduate Coursework Co-Ordinator
Dr Roya Sheikholeslami

Research Program Co-ordinator
Associate Professor John Stubington

Centre for Advanced Macromolecular Design

Director
Professor TP Davis

Centre for Particle and Catalyst Technologies

Director
Dr R Amai

Electrochemical and Minerals Processing Centre

Director, Electrochemical
Professor M Skyllas-Kazacos

Associate Director, Minerals Processing
Associate Professor T Tran

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 NS8W, MEngSc PhD UNSW
Center for Water and Waste Technology

Director
Professor Trevor David Waite

Deputy Director
Associate Professor Nicholas John Ashbolt

Program Managers
Andrew Feitz, BSc PhD UNSW
John Kai-yun Jiang, BE China Textile Uni, ME UNSW
Sven Lundie, BE Karlsruhe, PhD Lüneburg
David Tolmie, BScApp Qld, MBA UNSW, MRACI, MAIChE, CChem, CEng

Business Manager
Lyn Menzies, BSc Syd, GSA

Centre for Postgraduate Studies in Civil and Environmental Engineering

Director
Associate Professor Ronald John Cox

Administrator
Vacant

Centre for Water and Waste Technology

Director
Professor Trevor David Waite

Deputy Director
Associate Professor Nicholas John Ashbolt

Program Managers
Andrew Feitz, BSc PhD UNSW
John Kai-yun Jiang, BE China Textile Uni, ME UNSW
Sven Lundie, BE Karlsruhe, PhD Lüneburg
David Tolmie, BScApp Qld, MBA UNSW, MRACI, MAIChE, CChem, CEng

Business Manager
Lyn Menzies, BSc Syd, GSA

Water Research Laboratory, Manly Vale

Director
Associate Professor Ronald John Cox

Administrator
Vacant
Munro Centre for Civil and Environmental Engineering

Director
Associate Professor Ronald John Cox

Administrator
Vacant

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
David Ross Jeffrey, Bcom QLD, Mcom PhD UNSW
Carroll Morgan (Adjunct), BSc UNSW, PhD Syd, MA Oxford
Ross Quinlan (Adjunct), BSc Syd, PhD Washington, FAAA, FACLS
Claude A Sammut, BSc PhD UNSW

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

Associate Professors
Hossam ElGindy, BE Cairo, BSc Ain Shams, MSc PhD McGill
Ian Gorton (Adjunct), Bsc PhD, Sheffield
Gerard Heiser, BSc Freiburg, MSc Brock, PhD ETH, MIEEE, MACM
Achim G Hoffmann, MSc PhD DSc TU Berlin, MIEEE
Jesse Sheng Jin (Adjunct), BSc J.T.U., MSc C.T.U. Shanghai, PhD Otago, MIEEE, MACM
Albert Nymeyer, BSc CompSc PhD, Newcastle
John Potter, BSc Adel, ME PhD Newcastle
Arthur Ramey, MS Warsaw, PhD SUNY
Kenneth A Robinson, BSc BE Sydney MACM
Arcot Sowmya, BSc Madr., MSc MTech PhD I.I.T. Bombay
Ron van der Meyden, BA MA Syd, PhD Rutgers

Senior Lecturers
Adnan Amin BSc DipCompSc Baghdad, DSc Nancy
Boualem Benatallah, MSc PhD Grenoble
Lucy Chubb (Adjunct), BSc MSc PhD UNSW, MIEEE, MACM
Mahbub Hassan, BSc METU, MSc UVic, PhD Monash
Jayasooriah, BE Sing., MEng N.U.S., PhD UNSW, MIEEE
Sanjay Jha, MEng Lvov, PhD UTS, MIEEE
Jesse Sheng Jin (Adjunct), BSc J.T.U., MSc C.T.U. Shanghai
PhD Otago, MIEEE, MACM
Xuemin Lin, BSc Fudan, PhD U.Q., MACM, MIEEE
Piyoux Maheshwaran, BE ME Roorkee, PhD Manchester, MIEEE, MACM
William Stephen Matheson, BE MEngSc Melb., PhD Br. Col. CEng, MIEEE, MIEEE
Nandan Parameswaran, BE Madr., ME, IIT Kanpur I.T., PhD I.I.Sc. Bangalore
John Plaice, BMath Waterloo, DEA, PhD INPG Grenoble, SMIEEE, MACM
John Shepherd, BSc MSc PhD Melb.
Andrew Taylor, BSc PhD Syd.
Raymond Wong BSc ANU, MPhil HKUST, PhD HKUST
Jingling Xue, BSc MSc Tsinghua, PhD Edinburgh
John Zic, (Adjunct) BE PhD Syd.

Lecturers
Richard Buckland, BEng BSc Macq.
Manuel Chakravarty, Dipl Inf Karlsruhe, PhD Tu, MIEEE, MACM
Oliver Diessel B.Math, B.E., Ph.D. Newcastle
Kai Engelhardt, Dipl Inf PhD Kiel
Timothy D Lambert, BMath N.Cle. (N.S.W.), MSc PhD Manl.
Ashesh Mahdavida, BE MEngSc UNSW
Daniel Woo, BSc BE PhD UNSW

Associate Lecturers
Nasser Esmaili, BSc Eng Kerman
Jahan Hassan, BC Monash
Peter S Ho, BSc UNSW
Daryoush Likitouhi, BE IUST Teheran, ME Asian I.T.
Anthony J Papagelis, BE UNSW

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 Adel., MIEEE
Jerry Vochte loo, BSc PhD UNSW

Executive Officer
Bill Atherton, BSc N.Cle. upon Tyne

Student Office Manager
Cassandra J Nock

Finance Office Manager
Yvonne Balakian

Building & Services Manager
Richard Foster

Business Development Officer
Carroll Graham

Administrative Officers/Assistants
Rita Bautarua
Brad Hall
Nicola Kwan BSc UNSW
Janene Robertson
Trisha Spiteri
Sonia Tja, BSc UNSW

Administrative Assistant to HoS
Ann Baker

Purchasing and Assets Officer
David Pisch

Stores Clerk
Leslie Sharpney

Clerks
Srimathi Edirweera BSc SL, MEngSc UNSW
Catherine Rockwell
Colin Taylor

Professional Officers
Samir Omar, BE Mansoura, CEng MIEEE, SMIEEE MIEEE
Serge Poplavsky, Dipl Ing Bratislava, ME UNSW
Keith W Titmus, BScTech MEngSc UNSW

Computing Support Group
Neill F Brown, BSc UNSW
Walter Guan, BCom BInfotech UQ MSCE
Kieran Jones BA Psych Macq
Peter Litch
Van Dung Ly, BSc UNSW
Slade Matthew BSc Med SYD
Tina Muukkonen, BAppSc UTS
Geoff M Oakley (Manager), BSc UNSW
Chris Petrov BA NTU
Richard Preston, BSc MinfSc UNSW
School of Electrical Engineering and Telecommunications

Professor of Electrical Engineering and Head of School
Branko George Cellier, BSc BE PhD UNSW, FIEEE, MIEEE, MAPPS

Director of Academic Studies
Eliathamby Ambikairajah, BScEng PhD Keele, CEng, FIEE, MIEAust, CEng, MIEEE

Professors of Electrical Engineering
Pak Lim Chu, ME PhD UNSW, CEng, FIEAust, SMIEEE, MIEEE, FOSA
Andrey Savkin, MS PhD Leningrad, MIEEE
Aruna Prasada Seneviratne, BSc PhD Bath
Victor Solo, BSc Qld, BSc, BE UNSW, Phd ANU, IEEE, IMS, ASA, RSS

Associate Professors
- Trevor Robert Blackburn, BSc Adel, PhD Flin, CEng, MAIP, MIEEE
Colin Grantham, BSc PhD N’cile(UK), CEng, FIEE
Timothy Hesketh, MSocEng CapeT, PhD Massey, MIEEE
Chee Yee Kwok, BSc BE PhD UNSW, MIEEE
Peter Douglas Neilson, BScEng PhD UNSW
Hugh Ronald Outhred, BSc BE PhD Syd, AMIEEE, FIEAust, MIEEE
Fazlur Muhammed Rahman, BScEng BUET(Ban), MSc PhD UMIST, MIEEE, AMIEEE, MISA

Senior Lecturers
Andrew Bradley, BEng PhD Plymouth, CEng, MIEEE, MIEEE
David James Clements, BSc Qld, ME PhD N’cile(NSW), MIEEE, MSiam, SigmaXi
Kevan Charles Daly, BSc BE PhD UNSW, CEng, MIEEE, MIEEE
William John Dewar, MScEng Qu, PhD UNSW, MIEEE
Andrew S Dzurack, BSc Syd PhD Camb, MAIP
Gang (Gary) Feng, MEng Nanjing Aerolnist, PhD Melb, SMIEEE
Roland John Kaye, BE MEngSc Melb, PhD Calif, MIEEE
Hassan Mehrpour, BE MSc Boston, PhD UNSW, MIEEE
Saeid Nooshabadi, MTEC, PHD, ITT Delhi
Gang-Ding Peng, BSc Fudan, MSc PhD Jiao Tong, MOSA
Rodica Ramer, BSc ME PhD Bucharest, MIEEE, MAPS
Predrag Rapajic, BE ME PhD Syd, SMIEEE
Iain Murray Skinner, BSc Qld, PhD ANU
David Taubman, BSc BE MS PhD Berkeley, MIEEE

Lecturers
Boshra Dawoud Farah, BScEng Alexandria, Dr-Ing K M Stadt (TUCHEMNITZ), CEng, MIEAust, MIEEE
Edward Douglas Spooner, ME UNSW
Jinhong Yuan BE(Hons) PhD, BeijingInstTech, MIEEE

Associate Lecturer
Ray Eaton, BE(Hons) UNSW, MIEEE

Adjunct Professors
Warwick Harvey Holmes, BSc BE(Hons) MEngSc Syd, FIEAust
SMIEEE SMIREA MAE
Ronald Edward James, BScEng PhD Lond, CEng, CEng, FIEEE, MIEEE, MIMechE, SMIEEE

Emeritus Professors
Neville W Rees, BSc (Hons) UNSW PhD Wales, FIEAust
SMIEEE
Graham A Rigby, BSc (Phys) MSc (EE) Melb, PhD Berkeley, FAATSE FIREAust MIEEE

Visiting Fellows
Israel Korn, BSc, MSc DSc Israel Inst Tech, MIEEE
Robert Radzyner, PhD MEngSc UNSW BE Melb, SMIEEE
SMIEEE
Ramulta Zakarevicius, BSc (Phys) BE(Hons) MEngSc Syd, MIEAust SMIREA SMIREE

Administrative Officers
Shirley Ratinac, BA Macq. Maria V Spano

School Administrative Assistants
Mervat Farah
Gladyis Fong
Cindy Fuller

Professional Officers
Peiyi Chen, BE XIBEI TelecomEngUniv,China
Philip Mark Allen, BE UNSW, MIEEE
Thomas Millett, BAAppSc NSWIT
Karanayil Velu Baburaj, BTECH Calc, MTECH ITT Bombay
Bao Toan Phung, BE W’gong, MEngSc UNSW, PhD UNSW
Kong Been Lee, BE MEngSc ME UNSW, MIEEE, AMIEEE
Christopher Xiaolong Lu, MScEng Beijing, MIEEE

School of Geomatic Engineering

Associate Professor and Head of School
Arthur Harry William Kearsley, BSurv MSurvSc PhD UNSW, MISAust, FIEAust

Associate Professors
Chris Rizos, BSurv PhD UNSW, FINAust
Jean Marc Rueger, DiplIng ETH Zurich, PhD UNSW, ACSM, LSSwitz, MISAust, FIEAust

Senior Lecturers
Shao Wei Han, BSc MSc WTUSM, PhD UNSW
Bruce Raymond Harvey, BSurv GradDipHEd PhD UNSW, MISAust
Ewan Gerald Masters, BSurv PhD UNSW, MISAust

Lecturer
Michael Green, BSurv MEngSc UNSW, DipEd STC, MISAust, Registered Surveyor
Adjunct Associate Professor
Peter James Morgan BSc MSc Melb, PhD Ohio State, MIAust, MIAU, MAGU, MAAAS.

Administrative Officer
Leon Daras, BA UNSW

Administrative Assistant to Head of School
Helva Frangoulis

Clerk
Maria Ponce

Professional Officers
Brian Edward Donnelly, BSurv UNSW, MSurv 'n'cle(NSW), GradDipCompStud Canberra CAE
Philip Hong Lam, BE(GeomEng), MRE UNSW
Jun Zhang, BSc WTUSM

Stores-Field Officer
Alan George Edmunds BSc UTS

Visiting Professors
Bruce Crosby Forster, BSc MSurv Melb, MSc R'dg, PhD UNSW, MIAust, LSvic, MIEE, FIEAust
John Charles Trinder, BSurv PhD UNSW, MSc ITC Delft, FISAOz, FIEAust

Visiting Fellows
Sabapathy Ganeshan, BSc Ceyl
Toshiaki Tsuji, BSc MSc PhD Kyoto
Jiqing Wang, BSc MSc Zhengzhou
Lwen Dai, BSc MSc WTUSM

ARC Postdoctoral Fellow
Jinling Wang, BSc MSc WTUSM, PhD Curtin

---

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, MIEAust

Director of Computing and Research Planning
Eddie Leonardi, BScEng PhD UNSW, CEng, MASME, MIEAust, MASHRAE

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

Director of Laboratories
Graham Lindsay Morrison, BE PhD Melb, FIEAust, CEng

Director of Postgraduate Coursework Teaching
Hartmut Kaebernick, Dipl-ing Dr-ing TU Berlin, CEng, FIEAust, SMSME, VDI

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

Director of Undergraduate 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, MIAIA

Manufacturing Engineering and Management Plan Co-ordinator
Hartmut Kaebernick

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

Mechatronic Engineering Plan Co-ordinator
Richard Adrian Wilgoss, BSc PhD So'ton, CEng, MIEE, 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 Leonardi
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 Oxst
Chakravarti Varadachar Madhusudana, BE Mys, ME IISc, PhD
Monash, CEng, MIEAust, MASME
Philip Mathew, BE PhD UNSW, CEng, MIEAust
R B Randall
R A Wilgoss

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 Banghuet, PhD Nicle (UK), Eur Ing, FRINA, MIEAust
Philip John Holmbe, BE MEngSc UNSW, CEng, MIEAust, MSNAME
Atiye Berman Kayis, BSc MS METU, PhD Istanbul TU
See Seng Leong, BE PhD UNSW, CEng, MIEAust
Ian Lachlan Macaln cross, BE Meib, PhD Monash, MIEAust
JR Page
Hugh Lithgow Stark, BSc PhD Strath, CEng, FIMechE, MIEAust, RPEQ
Khosrow Zarrab, MSc PhD UMIST, MIEAust

1 25% appointment
2 50% appointment

Lecturers
Robert Thomas Casey, BE MSc PhD Qld
Jayantha Katupitiya, BScEng Sri Lanka, PhD Leuven, MASME, MIEE, MIEE
Michal John Tordon, Diping Bratislava, PhD Prague, MIEE
Zoran Vunovic, Diping Belgrade, MSc Cran IT

1 25% appointment

Associate Lecturer
Manul Hasan, BScEng B'desh Engin, MEng Asian IT, PhD UNSW, CEng, MIEAust

Emeritus Professors
Graham de Vahl Davis, AM, BE Syd, PhD Camb, CEng, FIMechE, FIEAust, MASME, FTSE
Brian Edward Milton, BE PhD UNSW, MSc Birm, CEng, FIEAust, FSAEA, MRAeS

Honorary Visiting Professor
John Arthur Reizes, ME PhD UNSW, CEng, FIEAust
Adjunct Professor
Ronald Sekel, MBBS, FRCSE, FRACS(Orth), FA Orth A

Adjunct Associate Professors
Alexander Eric Churches, BE PhD UNSW, ASTC, FIEAust, CEng, FRSA
Khoi Hoang, BE, Phutho Saigon, PhD UNSW
Eleonora Maria Kopainsky, BE PhD UNSW
Ronald Sekel, BE PhD UNSW

Honorary Associate
Dr CH Warman

Honorary Visiting Fellows
Peter Yo Pin Chen, BSc MEngSc ME PhD UNSW ASTC
Prabhat Kumar Pal, BME NCE Bengal, BTech PhD IIT Kharagpur, CEng, FRINA, FIEAust, MIINA, MSTG Hamburg

Administrative Officer
Guilia Pearson

Professional Officers
James Beck, ME Prague
Anthony Gordon Harris, BSc Exe
Alfred Win Lin Hu, BE Rangoon IT, MIEEE
Yelim Kotlyar, BMechEng Moscow Mech Inst
Alexander Lev Litvak, Dipling Odessa, MEngSc UNSW, CEng, MIEAust
Jason Thanh Nhieu, BSc Cheng Kung Nat, MEngSc UNSW, CEng, MIEAust
Russell Norman Overhall, BE UNSW, CEng, MIEAust
Charles James Sanderson, BE, Syd, MScEng UNSW

Computer Systems Officer
David Alexander Hard, BSc Syd

School of Mining Engineering

Professor of Mining Engineering and Head of School
James Maurice Galvin, BSc BE Syd, PhD Wilts, CEng, FAusIMM, FIEAust, FIEAust, MISRM

Kenneth Finlay Chair of Rock Mechanics
Professor
Bruce Kenneth Hebblewhite, BE UNSW, PhD N’cle(UK), DipAICD NE, MAusIMM, MAIME, MISRM

Emeritus Professor of Mining Engineering
Frank Ferdinand Roxborough, BSc PhD Durth, CEng, CEng, FIEAust, FIMM, FAusIMM, FIMinE

Associate Professor
David Clement Lawrence 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 St’ton

Lecturer
Christopher Raymond Daly, BE MSc PhD GradDip(Higher 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, MIExpE

Visiting Fellows
Amal Krishna Bhattacharyya, BSc Glas, MSc Durth, PhD N’cle(UK), CEng, MAmiME, FIMinE, FAusIMM, MAIME, PEng
Stephen Geoffrey Gemell, BE Syd, FAusIMM, AIMMPE
Edmund James Malone, MSc Syd, MBA Macq, FAusIMM, FAIM, MGSA
Anthony Charles Partridge, BSc Leeds, MSc PhD McGill, CEng, MIMM
Venkata Satyanarayana Vutukuri, BScEng Ban, MS Wisconsin, PhD TechSc Poland, MAIME

Administrative Assistants
Carol Bell
Kim Russell

School of Petroleum Engineering

Director
Wolf Val Pinczewski, BE N’cle(NSW), PhD UNSW, CEng, MiChemE

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

Senior Lecturers
Guy Allison, BSc Leeds, DipsocSci Birm
Izzy Kutasov, MS Phys, PhD Phys&Math Yakutsk-Russia
Henry A. Salisch, BSc Quito Poly Inst, MSc Oklahoma, MS Venezuela Central
Patrick Wong, BE ME PhD UNSW

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

Centre for Photovoltaic Engineering

Professor of Electrical Engineering and Head of Centre
Stuart Ross Wenham, BE, BSc, PhD (UNSW), FTS, SMIEEE, FIEAust.

Scientia Professor and Director of Research
Martin Andrew Green, BE, MEngSc (Qld.), PhD (McMaster), FTS, FIEEE, FIEEE, FIAusIMM

Director of Academic Studies and Associate Professor
Christiana B. Honsberg, BEE, MSc, PhD (Delaware)

Associate Professor
Armin Aberle, BSc, MSc, PhD (Freiburg), Dr Habil (Hanover) MIEEE, MDPG

Assistant Professor
Jeffrey E Cotter, BEE, MSc, PhD (Delaware)

Business & Technology Manager
Mark D. Silver, BE (UNSW), GMQ (AGSM)
Administrative Office Manager
Lisa Cahill (on leave to June 2001)
Jenny Noble, BA (Hons) (UNSW)

Financial Officer
Julie Kwan

Administrative Assistant to Director of Research
Jenny Hansen

Education Officer
Robert Largent, AS (USA)

Professional Officer
Gordon Bates, BA Ind.Des. (UTS)

Computer Systems Officer
Lawrence Soria, Assoc.Dip.Comp.Appl. (Wollongong)

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, FIEAust, CPEng (Biomed)

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

Associate Professors
Alberto Pompeo Avolio, BE PhD UNSW
Christopher David Bertram, MA DPhl Ox FIEAust
Anne Simmons, BE MBiomedE UNSW

Adjunct Associate Professor
William Robert Walsh, BA (Chem) BA (Biol) Bucknell, PhD Rutgers
John Campbell Woodward, BE MSc PhD UNSW, MIEEE, MASAIO
Geoff Tansley, BSc PhD Nott’n Trent, CEng FI MechE

Visiting Professors
Gordon Frances Mejls, BSc Adelaide, PhD Adelaide
Arthur Brandwood, BSc Reading, PhD Leeds, MIM CEng
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, MIEAust, MIEEE
Laura Anne Poole-Warren, BSc PhD UNSW

Lecturers
Ross Alexander Odell, BSE Prin, PhD MIT

School Administrator
Sacha Maurice Sadler

Professional Officer
Peter Roman Slowiackzec, BSc Nicle(NSW)

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

(in association with the Faculty of Science and Technology)

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

Visiting Professor
Richard Morrow, PhD Adel
Jiyuan Tu, BE, PhD Stockholm

Manager, Technology Diffusion Program
Amir Eghlimi, BE, MEngSc, PhD

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

CFD Research Consultant
Dr N Al-Khalidy, PhD Poland

Administrative Contact Officers
Rosita Lang
Kate Cox

Centre for Remote Sensing and Geographic Information Systems

(in association with the Faculty of Science and Technology)

Director
Richard Lucas (School of Geography), PhD Brist.

UNSW Groundwater Centre

(in association with the Faculty of Science and Technology)

Director
Dr J Jankowski, MSc PhD Wrocl

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 Meib, MBA Macq

Operations Manager
Marilyn Smith, Mmgt Macq

Co-ordinator MBT Program
Margaret Brennan

Co-ordinator MBT Program - Distance
Liz Woodward, BEd, H.Ed. Syd

Student Services Administrator
Anne Klimowicz B.Bus N’cle (NSW)

Marketing and Development Co-ordinator
Corene Strauss

Literature and Logistics Co-ordinator
Debbie Owen, BA UNSW

Administrative Assistant
Lynda Shenton

Energy Research Development and Information Centre (ERDIC)

Director
Vacant
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 (NAVL) 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 University and Faculty web page, 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 about 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 programmes. 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>Abbreviation</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>UOC</td>
<td>units of credit</td>
</tr>
<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>Engineering</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 Commerce &amp; Economics</td>
<td>Engineering</td>
</tr>
<tr>
<td>ELEC</td>
<td>School of Electrical Engineering and Telecommunications</td>
<td>Commerce &amp; Economics</td>
</tr>
<tr>
<td>FINS</td>
<td>School of Banking and Finance</td>
<td>Engineering</td>
</tr>
<tr>
<td>FUEL</td>
<td>School of Chemical Engineering &amp; Industrial Chemistry</td>
<td>Commerce &amp; Economics</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>Science and Technology</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 &amp; Industrial Chemistry</td>
<td>Commerce &amp; Economics</td>
</tr>
<tr>
<td>INFSS</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>Science and Technology</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>Engineering</td>
</tr>
<tr>
<td>PHPH</td>
<td>School of Physiology and Pharmacology</td>
<td>Medicine</td>
</tr>
<tr>
<td>PHYS</td>
<td>School of Physics</td>
<td>Science and Technology</td>
</tr>
<tr>
<td>PLAN</td>
<td>School of Town Planning</td>
<td>Architecture</td>
</tr>
<tr>
<td>POLS</td>
<td>School of Political Science</td>
<td>Arts &amp; Social Sciences</td>
</tr>
<tr>
<td>POLY</td>
<td>Department of Polymer Science</td>
<td>Engineering</td>
</tr>
<tr>
<td>SAFE</td>
<td>Department of Safety Science</td>
<td>Science and Technology</td>
</tr>
<tr>
<td>SENG</td>
<td>School of Computer Science &amp; Engineering</td>
<td>Engineering</td>
</tr>
<tr>
<td>SOLA</td>
<td>Key Centre for Photovoltaic Engineering</td>
<td>Engineering</td>
</tr>
</tbody>
</table>
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 605, Building K17.
Tel. (02) 9385 6437

**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, Floor, K17 Building, Tel. (02) 9385 6876
or
Ms C Nock, School Office, Ground Floor, K17 Building. Tel. (02) 9385 4728

**School of Electrical Engineering and Telecommunications**
Dr E Ambikairajah, Room G6 or School Office, Electrical Engineering Building, Tel. (02) 9385 4002

**School of Geomatic Engineering**
Mr L Daras, School Office, Room 426, Electrical 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, 5th 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.

**Centre for Photovoltaic Engineering**
Ms Lisa Cahill/Mrs Jenny Noble, Room 128, Electrical Engineering Building. Tel. (02) 9385 6155

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 Assumed Knowledge**

Students may be assumed to have knowledge which might be indicated by the following attainments in HSC Examinations.

- **Mathematics**
  - 2u (60-100)
  - 2u and 3u (100-150)
  - 3u and 4u (100-200)

Some First year courses make additional assumptions about prior knowledge.

Students are advised that the lack of specified course assumed knowledge does not preclude their selection to any program but the required standard should be achieved so that success in the University course is not adversely affected.

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

Introductory courses are also available to students who do not have the assumed knowledge in Mathematics, Chemistry or Physics. Remedial English is also available for students who do not have the Assumed Knowledge in English.

**Additional assumed knowledge for Civil, Computer, Environmental and Mechanical and Manufacturing Engineering**

- **Mathematics**
  - 2u (90-100)
- **English**
  - 2u Contemporary (60-100) or
  - 2uG (53-100) or
  - 2u (49-100) or
  - 3u (1-50)
- **Science**
  - 2u Physics (57-100) or
  - 2u Chemistry (60-100) or
  - 3u (90-150) or
  - 4u (1-200)

**Additional assumed knowledge for Electrical Engineering**

- **Mathematics**
  - 2u (90-100)
- **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 assumed knowledge for Geomatic Engineering
Mathematics
2u (90–100)
and
English
2u Contemporary (60–100) or
2uG (60–100) or
2u (49–100) or
3u (150)

Additional assumed knowledge 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 assumed knowledge 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)

Units of Credit

UNSW uses a system of units of credit for all courses offered to both undergraduate and postgraduate students. These units of credit are intended to provide a guide for students to the total time commitment required to satisfy requirements in the course. The system means that a course will have the same units of credit value irrespective of which faculty’s program it is counting towards.

Each year of full-time study comprises 48 units. Students are able to determine the value of courses taken from other faculties when planning their programs of study. The student load for a course is calculated by dividing the units of credit for a course by the total units of credit for that year of the program. Student load is used to determine both HECS and overseas student fees. Students who take more than the standard load for that year of a program will pay more HECS.

Old subject measures have been replaced by new units of credit. Every effort has been made to ensure the accuracy of the units of credit values shown for all subjects. However, if any inconsistencies between old and new units measure cause concern, students are advised to check with their School office for clarification before making course selections based on the unit values shown in this handbook.

Enrolment Procedures

All students re-enrolling or enrolling in graduate courses should obtain a copy of the free leaflet Re-Enrolling 1999 available from School offices and NewSouth W. This leaflet provides detailed information on enrolment procedures and fees, enrolment timetables, enrolment in non-award subjects, locations and hours of Cashiers and late enrolments.

Re-enrolment forms must be lodged with the appropriate School Office by the start of the third week in December. Enrolment at the University will not be authorised until the re-enrolment form has been checked and the program approved. Students not intending to re-enrol should advise the School. Leave for up to one year is usually granted to students in good standing.

It is the responsibility of students to enrol in a program consistent with the rules governing re-enrolment and admission to the degree.

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 laws require 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:
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 are branches representing the main interests within the profession, e.g., 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 aspects 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 (CEVSO)
- 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
- Petroleum Engineering Society

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**

<table>
<thead>
<tr>
<th>Field</th>
<th>Code</th>
</tr>
</thead>
<tbody>
<tr>
<td>Aerospace Engineering</td>
<td>3610</td>
</tr>
<tr>
<td>Chemical Engineering</td>
<td>3040</td>
</tr>
<tr>
<td>Civil Engineering</td>
<td>3620</td>
</tr>
<tr>
<td>Computer Engineering</td>
<td>3645</td>
</tr>
<tr>
<td>Electrical Engineering</td>
<td>3640</td>
</tr>
<tr>
<td>Environmental Engineering</td>
<td>3625</td>
</tr>
<tr>
<td>Geomatic Engineering</td>
<td>3741</td>
</tr>
<tr>
<td>Manufacturing Engineering and Management</td>
<td>3663</td>
</tr>
<tr>
<td>Mechanical Engineering</td>
<td>3680</td>
</tr>
<tr>
<td>Mechatronic Engineering</td>
<td>3685</td>
</tr>
<tr>
<td>Mining Engineering</td>
<td>3140</td>
</tr>
<tr>
<td>Naval Architecture</td>
<td>3700</td>
</tr>
<tr>
<td>Petroleum Engineering</td>
<td>3045</td>
</tr>
<tr>
<td>Photovoltaics &amp; Solar Energy</td>
<td>3642</td>
</tr>
<tr>
<td>Software Engineering</td>
<td>3648</td>
</tr>
<tr>
<td>Telecommunications</td>
<td>3643</td>
</tr>
</tbody>
</table>

### Bachelor of Science
**BSc**

<table>
<thead>
<tr>
<th>Field</th>
<th>Code</th>
</tr>
</thead>
<tbody>
<tr>
<td>Industrial Chemistry</td>
<td>3100</td>
</tr>
</tbody>
</table>

This full-time program is designed to be taken over a period of four years.

### Bachelor of Science (Technology)
**BSc(Tech)**

<table>
<thead>
<tr>
<th>Field</th>
<th>Code</th>
</tr>
</thead>
<tbody>
<tr>
<td>Chemical Engineering</td>
<td>3050</td>
</tr>
<tr>
<td>Industrial Chemistry</td>
<td>3110</td>
</tr>
</tbody>
</table>

### Combined Degree Programs

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

### Bachelor of Engineering Bachelor of Science
**BE BSc**

<table>
<thead>
<tr>
<th>Field</th>
<th>Code</th>
</tr>
</thead>
<tbody>
<tr>
<td>Aerospace Engineering</td>
<td>3611</td>
</tr>
<tr>
<td>Chemical Engineering</td>
<td>3042</td>
</tr>
<tr>
<td>Civil Engineering</td>
<td>3730</td>
</tr>
<tr>
<td>Computer Engineering</td>
<td>3726</td>
</tr>
<tr>
<td>Electrical Engineering</td>
<td>3725</td>
</tr>
<tr>
<td>Environmental Engineering</td>
<td>3628</td>
</tr>
</tbody>
</table>

### Bachelor of Engineering Bachelor of Arts
**BE BA**

(5 years duration) in:

<table>
<thead>
<tr>
<th>Field</th>
<th>Code</th>
</tr>
</thead>
<tbody>
<tr>
<td>Aerospace Engineering</td>
<td>3612</td>
</tr>
<tr>
<td>Computer Engineering</td>
<td>3722</td>
</tr>
<tr>
<td>Civil Engineering</td>
<td>3621</td>
</tr>
<tr>
<td>Electrical Engineering</td>
<td>3720</td>
</tr>
<tr>
<td>Environmental Engineering</td>
<td>3626</td>
</tr>
<tr>
<td>Geomatic Engineering</td>
<td>3747</td>
</tr>
<tr>
<td>Manufacturing Management</td>
<td>3665</td>
</tr>
<tr>
<td>Mechanical Engineering</td>
<td>3682</td>
</tr>
<tr>
<td>Mechatronic Engineering</td>
<td>3687</td>
</tr>
<tr>
<td>Naval Architecture</td>
<td>3702</td>
</tr>
<tr>
<td>Photovoltaics and Solar Energy</td>
<td>3642</td>
</tr>
<tr>
<td>Software Engineering</td>
<td>3646</td>
</tr>
<tr>
<td>Telecommunications</td>
<td>3643</td>
</tr>
</tbody>
</table>

### Bachelor of Engineering Bachelor of Laws
**BE LLB**

(6 years duration) in:

<table>
<thead>
<tr>
<th>Field</th>
<th>Code</th>
</tr>
</thead>
<tbody>
<tr>
<td>Civil Engineering</td>
<td>4775</td>
</tr>
<tr>
<td>Environmental Engineering</td>
<td>4777</td>
</tr>
</tbody>
</table>

### Bachelor of Engineering Bachelor of Engineering
**BE BE**

(5 years duration) in:

<table>
<thead>
<tr>
<th>Field</th>
<th>Code</th>
</tr>
</thead>
<tbody>
<tr>
<td>Civil Engineering and Mining Engineering</td>
<td>3146</td>
</tr>
<tr>
<td>Chemical Engineering and Petroleum Engineering</td>
<td>3046</td>
</tr>
<tr>
<td>Civil Engineering Environmental Engineering</td>
<td>3631</td>
</tr>
</tbody>
</table>

### Bachelor of Science Bachelor of Science
**BSc BSc**

(5 years duration) in:

<table>
<thead>
<tr>
<th>Field</th>
<th>Code</th>
</tr>
</thead>
<tbody>
<tr>
<td>Industrial Chemistry</td>
<td>4102</td>
</tr>
<tr>
<td>Photovoltaics and Solar Energy</td>
<td>3642</td>
</tr>
</tbody>
</table>

### Bachelor of Engineering Master of Engineering Science

(4 1/2 years duration) in:

<table>
<thead>
<tr>
<th>Field</th>
<th>Code</th>
</tr>
</thead>
<tbody>
<tr>
<td>Civil Engineering</td>
<td>3623</td>
</tr>
<tr>
<td>Environmental Engineering</td>
<td>3628</td>
</tr>
</tbody>
</table>

Programs in all Engineering disciplines and in Industrial Chemistry will be developed in 2001. Contact the relevant School Office.
Bachelor of Engineering Master of Engineering
Programs in all Engineering disciplines and in Industrial Chemistry will be developed in 2001. Contact the relevant School Office.

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 Engineering 3728
Electrical Engineering 3727
Mechanical Engineering 3683
Chemical Engineering 3048
Telecommunications 3723
Mechatronics TBA

Fast Track Programs Bachelor of Engineering Master of Commerce
Accelerated progression into a Master of Commerce program following a BE is possible from any of the engineering programs, permitting the BE and MCom to be completed in 5 years. Entry to the BE MCom is approved at the end of Year 3 of a BE program for students with weighted average exceeding 65%. Three electives from the Faculty of Commerce and Economics are taken in Year 4, followed by the MCom in Year 5.

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, Computer Engineering, Electrical Engineering, Environmental Engineering, Manufacturing Engineering and Management, Mechanical Engineering, Mechatronic Engineering, Mining Engineering, Petroleum Engineering, Photovoltaics and Solar Energy and Naval Architecture.
Co-op scholars are selected largely on the basis of academic attainment, personal skills and motivation. 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 part 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 programs, students are not necessarily granted exemption from the same number of courses as they have completed in 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. A student’s academic standing is deemed to be one of:
   • Good Standing
   • Referral
   • Probation 1 or 2
A student’s standing will deteriorate if 50% or more of courses are failed in any session, and may improve if courses are passed. Eventually, standing may deteriorate to a point where a student will be excluded from the Program in which they are enrolled.
Any student not in good standing should discuss the situation with the Academic Adviser in the relevant school, and may be required to talk to a counsellor in the Carers and Counselling Unit.

3. Students must satisfy the relevant prerequisite and corequisite requirements. This will usually necessitate students completing or attempting all courses of a particular year or stage before proceeding to a course in the next part of a program. Further details are available from Schools.

- A prerequisite course is one which must be completed prior to enrolment in the course for which it is prescribed.
- A corequisite course is one which must either be completed successfully before or be studied concurrently with the course for which it is prescribed.

4. Only in exceptional circumstances will students be allowed to enrol in a program containing courses from more than two consecutive years of the program or totalling more than 27 units of credit. Students repeating courses will be expected to choose a program that includes previously failed courses and limits their Units of Credit. Details of these limits are available from School offices and may only be exceeded with the express permission of the Head of School. A failed elective may be replaced by another elective.

5. Notwithstanding the above, before students can enrol in any non-standard programs, such program must meet with the approval of the Head of School. A non-standard program is one which involves enrolment in courses from more than one year or stage, or comprises courses which are not normally included in the program for a particular year.

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 Science Cross Faculty Standing Committee or its delegated authorities. 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 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 student's 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:

- undertake an additional fifty-six (56) hours of study which
- 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 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 students 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 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. And the Test of written English (TWE) 5.0
2. International English Language Testing Service (IELTS) 6.0 in each sub-band
3. Combined Universities Language Test (CULT) 65%
4. UNSW Institute of Languages, English Entry Course (UEEC)C (grade point = 6.5).

---

### Research Degrees

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

**PhD**

<table>
<thead>
<tr>
<th>Field</th>
<th>Code</th>
</tr>
</thead>
<tbody>
<tr>
<td>Biomedical Engineering</td>
<td>1710</td>
</tr>
<tr>
<td>Chemical Engineering</td>
<td>1010</td>
</tr>
<tr>
<td>Civil and Environmental Engineering</td>
<td>1630</td>
</tr>
<tr>
<td>Computer Science and Engineering</td>
<td>1650</td>
</tr>
<tr>
<td>Electrical Engineering</td>
<td>1640</td>
</tr>
<tr>
<td>Geomatic Engineering</td>
<td>1681</td>
</tr>
<tr>
<td>Industrial Chemistry</td>
<td>1016</td>
</tr>
<tr>
<td>Mechanical and Manufacturing Engineer</td>
<td>1862</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Field</th>
<th>Code</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mineral Processing and Extractive Metallurgy</td>
<td>1046</td>
</tr>
<tr>
<td>Mining Engineering</td>
<td>1050</td>
</tr>
<tr>
<td>Petroleum Engineering</td>
<td>1017</td>
</tr>
</tbody>
</table>

**ME**

<table>
<thead>
<tr>
<th>Field</th>
<th>Code</th>
</tr>
</thead>
<tbody>
<tr>
<td>Biomedical Engineering</td>
<td>2675</td>
</tr>
<tr>
<td>Chemical Engineering</td>
<td>2150</td>
</tr>
<tr>
<td>Civil Engineering</td>
<td>2650</td>
</tr>
<tr>
<td>Computer Science and Engineering</td>
<td>2665</td>
</tr>
<tr>
<td>Electrical Engineering</td>
<td>2660</td>
</tr>
<tr>
<td>Geomatic Engineering</td>
<td>2721</td>
</tr>
<tr>
<td>Mechanical and Manufacturing Engineer</td>
<td>2692</td>
</tr>
<tr>
<td>Mining Engineering</td>
<td>2060</td>
</tr>
<tr>
<td>Petroleum Engineering</td>
<td>2156</td>
</tr>
</tbody>
</table>

**MSc**

<table>
<thead>
<tr>
<th>Field</th>
<th>Code</th>
</tr>
</thead>
<tbody>
<tr>
<td>Biomedical Engineering</td>
<td>2795</td>
</tr>
<tr>
<td>Chemical Engineering</td>
<td>2010</td>
</tr>
<tr>
<td>Civil Engineering</td>
<td>2750</td>
</tr>
<tr>
<td>Computer Science and Engineering</td>
<td>2765</td>
</tr>
<tr>
<td>Electrical Engineering</td>
<td>2760</td>
</tr>
<tr>
<td>Industrial Chemistry</td>
<td>2016</td>
</tr>
<tr>
<td>Mineral Processing and Extractive Metallurgy</td>
<td>2046</td>
</tr>
<tr>
<td>Mining Engineering</td>
<td>2060</td>
</tr>
<tr>
<td>Mechanical and Manufacturing Engineer</td>
<td>2781</td>
</tr>
</tbody>
</table>

---

### 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 usually at Honours level 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 two academic sessions. 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.

Applicants 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

MBlomedE
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 8710
Mechanical Engineering 8710
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

MEnvEngSc
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
Petroleum Engineering

MEnvEngSc
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. HECS Scholarship’s may
be available in certain Programs (under certain conditions) for Australian residents and citizens.

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 candidacy 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 upon enquiry. HECS Scholarship’s may be available in certain Programs (under certain conditions) for Australian residents and citizens.

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

#### Internal Mode Delivery

<table>
<thead>
<tr>
<th>Program</th>
<th>Code</th>
</tr>
</thead>
<tbody>
<tr>
<td>Biomedical Engineering</td>
<td>5445</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>5710</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>5710</td>
</tr>
<tr>
<td>Mining and Mineral Engineering</td>
<td>5040</td>
</tr>
<tr>
<td>Remote Sensing</td>
<td>5496</td>
</tr>
<tr>
<td>Industrial Management</td>
<td>5457</td>
</tr>
<tr>
<td>Manufacturing Engineering</td>
<td>5455</td>
</tr>
<tr>
<td>Mining Management</td>
<td>5057</td>
</tr>
<tr>
<td>Petroleum Engineering</td>
<td>5031</td>
</tr>
</tbody>
</table>

#### External Mode Delivery

<table>
<thead>
<tr>
<th>Program</th>
<th>Code</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 upon enquiry.

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

#### Internal Mode Delivery

<table>
<thead>
<tr>
<th>Program</th>
<th>Code</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mining Engineering</td>
<td>7335</td>
</tr>
</tbody>
</table>

#### External Mode Delivery

<table>
<thead>
<tr>
<th>Program</th>
<th>Code</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
- Bioprostheses
- 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

Industrial Computational Fluids and Heat Transfer
- Complex turbulent flows and turbulence modelling
- Forced convection and radiative heat transfer
- Two-phase flows: gas/particle; fluid/particle; water/steam
- Mineral processing flows
- Erosion, particulate deposition and electrostatic precipitation
- Computational wind engineering
- Airconditioning and fire modelling
- Computational (automatic) design
- Computational aerodynamics and turbomachinery

Environmental Modelling
- Atmospheric dynamics
- Numerical weather prediction
- Climate variability
- Atmosphere-ocean interactions
- Atmospheric Boundary layer studies
- Meso-scale numerical modelling
- Atmospheric-Land interactions
- Wind erosion, soil moisture and wind breaks
- Air quality

Finite Element Structural Analysis
- Mechanical and manufacturing engineering
- Large-scale static, dynamic and nonlinear FE analysis
- Constitutive modelling for metals, adhesives and carbon fibre composites
- Computational fracture mechanics
- Material properties via inverse FE analysis
- Biomedical analysis
- Adaptive solution methodology and sparse matrix algorithms

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. Aluminium 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 polymer composites 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 drying, 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; thermochemistry 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

Civil and Environmental Engineering

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

Engineering Construction and Management


Systems studies, systems engineering

Construction management

Project management

Contracts, quality and risk management

Management of people

Engineering economics. Financial management

Time management. Asset management. Maintenance management

Marketing, strategic management

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

Atmosphere/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
Embayment 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 fuzzi-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 modelling  
Database implementation & performance modelling  
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  
Formal specifications  
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 processing  
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
Wireless networks

(vi) Communications Systems
Radar and navigational aids
Land & Satellite Mobile Communications
Mobile satellite communications
Mobile networks

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

(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 studies
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
Nano metro fabrication and quantum computing.

Systems and Control
Multivariable Control, simulation, modelling, expert systems in control design, advanced control of power plant, computer aided design and optimal control
Robotics: signal, pattern, image and scene, analysis and processing, adaptive control, hierarchical control.
Robust control, computation issues in control, adaptive control.
Digital and adaptive control, real-time computing, non-linear control
Biomedical engineering, biological signal analysis, physiological systems modelling and analysis, 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.
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
Hybrid control systems.

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 sop 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
Active steering
Metal spinning
Welding research

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 modelling 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


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, monobore 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:


The School of Petroleum Engineering has established leading-edge research facilities to improve the understanding of processes and mechanics 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 modelling 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

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
Head of School
Associate Professor Michael Brungs

Administrative Officer
Vivienne Brennan

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/MBiomed E allows advanced standing in the Masters of Biomedical Engineering. New combined programs BE/BA (8043) and BSc/BA (3103) have been proposed and programs should be available in Session 1, 2001.

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 students study 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>HPW</th>
<th>UOC</th>
</tr>
</thead>
<tbody>
<tr>
<td>Session 1</td>
<td>Session 2</td>
</tr>
<tr>
<td>S1</td>
<td>S2</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Stage1</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 or</td>
<td></td>
<td></td>
</tr>
<tr>
<td>CHEM1031 Higher Chemistry 1C</td>
<td>6</td>
<td>0</td>
</tr>
<tr>
<td>CHEM1021 Chemistry 1B or</td>
<td></td>
<td></td>
</tr>
<tr>
<td>CHEM1041 Higher Chemistry 1D</td>
<td>0</td>
<td>6</td>
</tr>
<tr>
<td>MATH1131 Mathematics 1A or</td>
<td></td>
<td></td>
</tr>
<tr>
<td>MATH1141 Higher Mathematics 1A</td>
<td>6</td>
<td>0</td>
</tr>
<tr>
<td>MATH1231 Mathematics 1B or</td>
<td></td>
<td></td>
</tr>
<tr>
<td>MATH1241 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 or</td>
<td></td>
<td></td>
</tr>
<tr>
<td>PHYS1111 Fundamentals of Physics</td>
<td>6</td>
<td>0</td>
</tr>
<tr>
<td>CEIC1030 Communications and Business Skills or</td>
<td></td>
<td></td>
</tr>
<tr>
<td>PHYS1229 Concepts in Engineering Physics</td>
<td>0</td>
<td>6</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Total</th>
<th>HPW Session 1</th>
<th>24</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>HPW Session 2</td>
<td>24</td>
</tr>
<tr>
<td></td>
<td>Units of Credit Session 1</td>
<td>24</td>
</tr>
<tr>
<td></td>
<td>Units of Credit Session 2</td>
<td>24</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Stage2</th>
<th>CEIC2011 Instrumental Analysis - Theory</th>
<th>3</th>
<th>0</th>
<th>3</th>
<th>0</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>CEIC2012 Instrumental Analysis- Practical</td>
<td>0</td>
<td>3</td>
<td>0</td>
<td>3</td>
</tr>
<tr>
<td></td>
<td>CEIC2020 Introduction to Numeric Methods</td>
<td>3</td>
<td>0</td>
<td>3</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td>CEIC2110 Material and Energy Balances</td>
<td>3</td>
<td>0</td>
<td>3</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td>CEIC2120 Fluid Flow</td>
<td>3</td>
<td>0</td>
<td>3</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td>CEIC2130 Heat Transfer</td>
<td>0</td>
<td>3</td>
<td>0</td>
<td>3</td>
</tr>
<tr>
<td></td>
<td>CHEN2050 Chemical Engineering Practice 1</td>
<td>0</td>
<td>3</td>
<td>0</td>
<td>3</td>
</tr>
<tr>
<td></td>
<td>CHEN2061 Introduction to Process Chemistry 1</td>
<td>6</td>
<td>0</td>
<td>6</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td>CHEN2062 Introduction to Process Chemistry 2</td>
<td>0</td>
<td>3</td>
<td>0</td>
<td>3</td>
</tr>
<tr>
<td></td>
<td>CHEN2140 Mass Transfer</td>
<td>0</td>
<td>3</td>
<td>0</td>
<td>3</td>
</tr>
<tr>
<td></td>
<td>ELEC0809 Electrical Engineering1C</td>
<td>2</td>
<td>0</td>
<td>3</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td>MATH2020 Mathematics 2A</td>
<td>2</td>
<td>0</td>
<td>3</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td>MATH2030 Mathematics 2B</td>
<td>0</td>
<td>2</td>
<td>0</td>
<td>3</td>
</tr>
<tr>
<td></td>
<td>MATH2899 Applied Statistics CE</td>
<td>0</td>
<td>3</td>
<td>0</td>
<td>3</td>
</tr>
<tr>
<td></td>
<td>General Education</td>
<td>0</td>
<td>2</td>
<td>0</td>
<td>3</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Total</th>
<th>HPW Session 1</th>
<th>22</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>HPW Session 2</td>
<td>24</td>
</tr>
<tr>
<td></td>
<td>Units of Credit Session 1</td>
<td>24</td>
</tr>
<tr>
<td></td>
<td>Units of Credit Session 2</td>
<td>24</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Stage3</th>
<th>BIOT3100 Fermentation Processes</th>
<th>0</th>
<th>2</th>
<th>0</th>
<th>3</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>CEIC3070 Process Control</td>
<td>0</td>
<td>4</td>
<td>0</td>
<td>4</td>
</tr>
<tr>
<td></td>
<td>CEIC3010 Reaction Engineering</td>
<td>0</td>
<td>3</td>
<td>0</td>
<td>4</td>
</tr>
<tr>
<td></td>
<td>CEIC3110 Thermodynamics</td>
<td>3</td>
<td>0</td>
<td>3</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td>CHEN3021 Systems Modelling and Analysis</td>
<td>2</td>
<td>0</td>
<td>3</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td>CHEN3022 Process Modelling and Optimisation</td>
<td>0</td>
<td>3</td>
<td>0</td>
<td>3</td>
</tr>
<tr>
<td></td>
<td>CHEN3031 Advanced Transport Phenomena</td>
<td>0</td>
<td>3</td>
<td>0</td>
<td>3</td>
</tr>
<tr>
<td></td>
<td>CHEN3062 Unit Ops &amp; Pressure Vessels</td>
<td>6</td>
<td>0</td>
<td>6</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td>CHEN3065 Plant &amp; Equipment Design</td>
<td>0</td>
<td>4</td>
<td>0</td>
<td>4</td>
</tr>
<tr>
<td></td>
<td>CHEN3067 Process Design &amp; Economics</td>
<td>3</td>
<td>0</td>
<td>3</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td>CHEN3068 Process Design &amp; Safety</td>
<td>0</td>
<td>3</td>
<td>0</td>
<td>3</td>
</tr>
<tr>
<td></td>
<td>CHEN3080 Chemical Engineering Practice 2</td>
<td>3</td>
<td>0</td>
<td>3</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td>General Education course/s</td>
<td>4</td>
<td>0</td>
<td>6</td>
<td>0</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Total</th>
<th>HPW Session 1</th>
<th>21</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>HPW Session 2</td>
<td>22</td>
</tr>
<tr>
<td></td>
<td>Units of Credit Session 1</td>
<td>24</td>
</tr>
<tr>
<td></td>
<td>Units of Credit Session 2</td>
<td>24</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Stage4</th>
<th>CEIC4070 Automation Science</th>
<th>3</th>
<th>0</th>
<th>4</th>
<th>0</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>CEIC4101 Professional Electives Advanced</td>
<td>0</td>
<td>3</td>
<td>0</td>
<td>3</td>
</tr>
<tr>
<td></td>
<td>CEIC4102 Professional Electives Extended</td>
<td>0</td>
<td>3</td>
<td>0</td>
<td>3</td>
</tr>
<tr>
<td></td>
<td>CEIC4106 Professional Elective - Extended</td>
<td>0</td>
<td>3</td>
<td>0</td>
<td>3</td>
</tr>
<tr>
<td></td>
<td>CEIC4120 Management and Plant Operation</td>
<td>0</td>
<td>5</td>
<td>0</td>
<td>6</td>
</tr>
<tr>
<td></td>
<td>CHEN4031 Environmental Management 1</td>
<td>3</td>
<td>0</td>
<td>3</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td>CHEN4081 Design Project</td>
<td>6</td>
<td>0</td>
<td>8</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td>CHEN4091 Research Project Theory</td>
<td>3</td>
<td>0</td>
<td>3</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td>CHEN4092 Research Project Practice</td>
<td>0</td>
<td>10</td>
<td>0</td>
<td>12</td>
</tr>
<tr>
<td></td>
<td>General Education course/s</td>
<td>2</td>
<td>0</td>
<td>3</td>
<td>0</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Total</th>
<th>HPW Session 1</th>
<th>20</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>HPW Session 2</td>
<td>21</td>
</tr>
<tr>
<td></td>
<td>Units of Credit Session 1</td>
<td>24</td>
</tr>
<tr>
<td></td>
<td>Units of Credit Session 2</td>
<td>24</td>
</tr>
</tbody>
</table>
### 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

<table>
<thead>
<tr>
<th>HPW</th>
<th>UOC</th>
</tr>
</thead>
<tbody>
<tr>
<td>S1</td>
<td>S2</td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Stage 4**

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Name</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>ACCT5901</td>
<td>Accounting: A User's Perspective</td>
<td>3 0</td>
</tr>
<tr>
<td>CEIC4102</td>
<td>Professional Electives</td>
<td>3 0</td>
</tr>
<tr>
<td>CEIC4110</td>
<td>Plant Management and Operation</td>
<td>0 4  0</td>
</tr>
<tr>
<td>CHEN4093</td>
<td>Research Project Theory</td>
<td>4 0</td>
</tr>
<tr>
<td>CHEN4094</td>
<td>Small Research Project Practice</td>
<td>0 8  0</td>
</tr>
<tr>
<td>CHEN4031</td>
<td>Environmental Management</td>
<td>3 0</td>
</tr>
<tr>
<td>CHEN4081</td>
<td>Design Project</td>
<td>6 0</td>
</tr>
<tr>
<td>ECON5103</td>
<td>Business Economics</td>
<td>0 3</td>
</tr>
</tbody>
</table>

Total **HPW Session 1** 19

<table>
<thead>
<tr>
<th>Units of Credit Session 1</th>
<th>24</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Stage 5

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Name</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>ACCT5901</td>
<td>Accounting: A User's Perspective</td>
<td>3 0</td>
</tr>
<tr>
<td>CEIC4102</td>
<td>Professional Electives</td>
<td>3 0</td>
</tr>
<tr>
<td>CEIC4110</td>
<td>Plant Management and Operation</td>
<td>0 4  0</td>
</tr>
<tr>
<td>CEIC4103</td>
<td>Professional Electives</td>
<td>0 3  0</td>
</tr>
<tr>
<td>CHEN4093</td>
<td>Research Project Theory</td>
<td>4 0</td>
</tr>
<tr>
<td>CHEN4031</td>
<td>Environmental Management</td>
<td>3 0</td>
</tr>
<tr>
<td>CHEN4081</td>
<td>Design Project</td>
<td>6 0</td>
</tr>
<tr>
<td>ECON5103</td>
<td>Business Economics</td>
<td>0 3</td>
</tr>
</tbody>
</table>

Total **HPW Session 1** 12

<table>
<thead>
<tr>
<th>Units of Credit Session 2</th>
<th>24</th>
</tr>
</thead>
<tbody>
<tr>
<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**

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Name</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>CEIC1020</td>
<td>Introduction to Chemical Engineering</td>
<td>0 6</td>
</tr>
<tr>
<td>CHEM1101</td>
<td>Fundamentals of Chemistry 1A or Higher Chemistry 1C</td>
<td>6 0  6</td>
</tr>
<tr>
<td>CHEM1021</td>
<td>Chemistry 1B or Higher Chemistry 1D</td>
<td>0 6</td>
</tr>
<tr>
<td>COMP1011</td>
<td>Computing 1A</td>
<td>6 0</td>
</tr>
<tr>
<td>COMP1021</td>
<td>Computing 1B</td>
<td>0 6</td>
</tr>
</tbody>
</table>

Total **HPW Session 1** 24

<table>
<thead>
<tr>
<th>Units of Credit Session 1</th>
<th>24</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
</tr>
</tbody>
</table>

#### Stage 2

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Name</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>CEIC2011</td>
<td>Instrumental Analysis - Theory</td>
<td>3 0</td>
</tr>
<tr>
<td>CEIC2110</td>
<td>Material and Energy Balances</td>
<td>3 0</td>
</tr>
<tr>
<td>CEIC2120</td>
<td>Fluid Flow</td>
<td>3 0</td>
</tr>
<tr>
<td>CEIC2130</td>
<td>Heat Transfer</td>
<td>0 3</td>
</tr>
<tr>
<td>CHEN2050</td>
<td>Chemical Engineering Practice</td>
<td>0 3</td>
</tr>
<tr>
<td>CHEN2061</td>
<td>Introduction to Process Chemistry 1</td>
<td>6 0</td>
</tr>
<tr>
<td>CHEN2062</td>
<td>Introduction to Process Chemistry 2</td>
<td>0 3</td>
</tr>
<tr>
<td>CHEN2140</td>
<td>Mass Transfer</td>
<td>0 3</td>
</tr>
<tr>
<td>COMP2011</td>
<td>Data Organisation</td>
<td>5 0</td>
</tr>
<tr>
<td>MATH2020</td>
<td>Mathematics 2A</td>
<td>2 0</td>
</tr>
<tr>
<td>MATH2030</td>
<td>Mathematics 2B</td>
<td>0 2</td>
</tr>
<tr>
<td>MATH1081</td>
<td>Discrete Maths</td>
<td>0 6</td>
</tr>
<tr>
<td>MATH2699</td>
<td>Applied Statistics CE</td>
<td>0 3</td>
</tr>
</tbody>
</table>

Total **HPW Session 1** 24

<table>
<thead>
<tr>
<th>Units of Credit Session 2</th>
<th>24</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
</tr>
</tbody>
</table>

#### Stage 3

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Name</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>CEIC3070</td>
<td>Process Control</td>
<td>0 4</td>
</tr>
<tr>
<td>CEIC3101</td>
<td>Reaction Engineering</td>
<td>0 3</td>
</tr>
<tr>
<td>CEIC3110</td>
<td>Thermodynamics</td>
<td>3 0</td>
</tr>
<tr>
<td>CEIC4103</td>
<td>Professional Elective</td>
<td>3 0</td>
</tr>
<tr>
<td>CHEN3020</td>
<td>Systems Modeling and Analysis</td>
<td>3 0</td>
</tr>
<tr>
<td>CHEN3022</td>
<td>Process Modeling and Optimisation</td>
<td>0 3</td>
</tr>
<tr>
<td>CHEN3031</td>
<td>Advanced Transport Phenomena</td>
<td>0 3</td>
</tr>
<tr>
<td>CHEM3065</td>
<td>Unit Ops &amp; Pressure Vessels</td>
<td>6 0</td>
</tr>
<tr>
<td>CHEN3068</td>
<td>Plant &amp; Equipment Design</td>
<td>0 4</td>
</tr>
<tr>
<td>CHEN3080</td>
<td>Chemical Engineering Practice</td>
<td>3 0</td>
</tr>
<tr>
<td>COMP2021</td>
<td>Digital Systems Structures</td>
<td>5 0</td>
</tr>
<tr>
<td>COMP2041</td>
<td>Software Construction: Techniques and Tools</td>
<td>0 5</td>
</tr>
</tbody>
</table>

Total **HPW Session 1** 24

<table>
<thead>
<tr>
<th>Units of Credit Session 2</th>
<th>24</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
</tr>
</tbody>
</table>

#### Stage 4

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Name</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>CEIC4012</td>
<td>Instrumental Analysis- Practical</td>
<td>0 3</td>
</tr>
<tr>
<td>CEIC4104</td>
<td>Professional Elective Extended</td>
<td>3 0</td>
</tr>
<tr>
<td>CHEN3067</td>
<td>Process Design &amp; Economics</td>
<td>3 0</td>
</tr>
<tr>
<td>CHEN3068</td>
<td>Process Design &amp; Safety</td>
<td>0 3</td>
</tr>
<tr>
<td>COMP*</td>
<td>Computing Elective</td>
<td>5 0</td>
</tr>
<tr>
<td>COMP*</td>
<td>2 x Computing Electives</td>
<td>5 6</td>
</tr>
<tr>
<td>COMP*</td>
<td>2 x Computing Electives</td>
<td>5 6</td>
</tr>
</tbody>
</table>

Total **HPW Session 1** 21

<table>
<thead>
<tr>
<th>Units of Credit Session 2</th>
<th>24</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
</tr>
</tbody>
</table>

#### Stage 5

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Name</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>CEIC4070</td>
<td>Automation Science</td>
<td>3 0</td>
</tr>
<tr>
<td>CEIC4101</td>
<td>Professional Electives Advanced</td>
<td>3 0</td>
</tr>
<tr>
<td>CEIC4102</td>
<td>Professional Electives Extended</td>
<td>0 6</td>
</tr>
<tr>
<td>CEIC4106</td>
<td>Professional Elective</td>
<td>0 3</td>
</tr>
<tr>
<td>CEIC4120</td>
<td>Management and Plant Operation</td>
<td>0 5</td>
</tr>
</tbody>
</table>

Total **HPW Session 1** 22

<table>
<thead>
<tr>
<th>Units of Credit Session 2</th>
<th>24</th>
</tr>
</thead>
<tbody>
<tr>
<td></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 in the section ‘Graduate School of Biomedical Engineering’.

#### Stage 1

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>S1</th>
<th>S2</th>
<th>UOC</th>
</tr>
</thead>
<tbody>
<tr>
<td>BIOM1001</td>
<td>Professional Biomedical Studies</td>
<td>2</td>
<td>0</td>
<td>3</td>
</tr>
<tr>
<td>CEIC1020</td>
<td>Introduction to Chemical Engineering</td>
<td>6</td>
<td>0</td>
<td>6</td>
</tr>
<tr>
<td>CHEM1011</td>
<td>Fundamentals of Chemistry 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>0</td>
</tr>
<tr>
<td>MATH1131</td>
<td>Mathematics 1A</td>
<td>0</td>
<td>6</td>
<td>0</td>
</tr>
<tr>
<td>MATH1231</td>
<td>Mathematics 1B</td>
<td>0</td>
<td>6</td>
<td>0</td>
</tr>
<tr>
<td>MECH1030</td>
<td>Engineering Drawing and Solid Modelling</td>
<td>3</td>
<td>0</td>
<td>3</td>
</tr>
<tr>
<td>PHYS1169</td>
<td>Physics for Engineering</td>
<td>6</td>
<td>0</td>
<td>6</td>
</tr>
<tr>
<td></td>
<td>General Education</td>
<td>0</td>
<td>2</td>
<td>0</td>
</tr>
</tbody>
</table>

#### Stage 2

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>S1</th>
<th>S2</th>
<th>UOC</th>
</tr>
</thead>
<tbody>
<tr>
<td>BIOM9XXX</td>
<td>Biomed Eng Elective</td>
<td>0</td>
<td>3</td>
<td>0</td>
</tr>
<tr>
<td>CEIC2011</td>
<td>Instrumental Analysis - Theory</td>
<td>3</td>
<td>0</td>
<td>3</td>
</tr>
<tr>
<td>CEIC2012</td>
<td>Instrumental Analysis - Practical</td>
<td>0</td>
<td>3</td>
<td>0</td>
</tr>
<tr>
<td>CEIC2020</td>
<td>Introduction to Numeric Methods</td>
<td>3</td>
<td>0</td>
<td>3</td>
</tr>
<tr>
<td>CEIC2110</td>
<td>Material and Energy Balances</td>
<td>3</td>
<td>0</td>
<td>3</td>
</tr>
<tr>
<td>CEIC2120</td>
<td>Fluid Flow</td>
<td>3</td>
<td>0</td>
<td>3</td>
</tr>
<tr>
<td>CEIC2130</td>
<td>Heat Transfer</td>
<td>0</td>
<td>3</td>
<td>0</td>
</tr>
<tr>
<td>CHEN2050</td>
<td>Chemical Engineering Practice 1</td>
<td>0</td>
<td>3</td>
<td>0</td>
</tr>
<tr>
<td>CHEN2061</td>
<td>Introduction to Process Chemistry 1</td>
<td>6</td>
<td>0</td>
<td>6</td>
</tr>
<tr>
<td>CHEN2062</td>
<td>Introduction to Process Chemistry 2</td>
<td>0</td>
<td>3</td>
<td>0</td>
</tr>
<tr>
<td>CHEN2140</td>
<td>Mass Transfer</td>
<td>0</td>
<td>3</td>
<td>0</td>
</tr>
<tr>
<td>ELEC0809</td>
<td>Electrical Engineering 1C</td>
<td>2</td>
<td>0</td>
<td>3</td>
</tr>
<tr>
<td>MATH2020</td>
<td>Engineering Mathematics 2A</td>
<td>2</td>
<td>0</td>
<td>3</td>
</tr>
<tr>
<td>MATH2030</td>
<td>Engineering Mathematics 2B</td>
<td>0</td>
<td>2</td>
<td>0</td>
</tr>
</tbody>
</table>

#### Stage 3

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>S1</th>
<th>S2</th>
<th>UOC</th>
</tr>
</thead>
<tbody>
<tr>
<td>BIOM9420</td>
<td>Clinical Laboratory Science</td>
<td>3</td>
<td>0</td>
<td>6</td>
</tr>
<tr>
<td>BIOT3100</td>
<td>Fermentation Processes</td>
<td>0</td>
<td>3</td>
<td>0</td>
</tr>
<tr>
<td>CEIC3070</td>
<td>Process Control</td>
<td>0</td>
<td>4</td>
<td>0</td>
</tr>
<tr>
<td>CEIC3010</td>
<td>Reaction Engineering</td>
<td>0</td>
<td>3</td>
<td>0</td>
</tr>
<tr>
<td>CEIC3110</td>
<td>Thermodynamics</td>
<td>3</td>
<td>0</td>
<td>3</td>
</tr>
<tr>
<td>CHEN3021</td>
<td>Systems Modelling and Analysis</td>
<td>2</td>
<td>0</td>
<td>3</td>
</tr>
</tbody>
</table>

### Biomedical Electives

#### Preferred electives

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>S1</th>
<th>S2</th>
<th>UOC</th>
</tr>
</thead>
<tbody>
<tr>
<td>BIOM9311</td>
<td>Mass Transfer in Medicine</td>
<td>0</td>
<td>3</td>
<td>0</td>
</tr>
<tr>
<td>BIOM9321</td>
<td>Physiol.Fluid Mechanics</td>
<td>0</td>
<td>3</td>
<td>0</td>
</tr>
<tr>
<td>BIOM9332</td>
<td>Biocompatibility</td>
<td>0</td>
<td>3</td>
<td>0</td>
</tr>
<tr>
<td>BIOM9613</td>
<td>Medical Instrumental</td>
<td>3</td>
<td>0</td>
<td>6</td>
</tr>
<tr>
<td>BIOM9440</td>
<td>Biomedical Practical Measurement</td>
<td>0</td>
<td>3</td>
<td>0</td>
</tr>
</tbody>
</table>

#### Other electives

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>S1</th>
<th>S2</th>
<th>UOC</th>
</tr>
</thead>
<tbody>
<tr>
<td>BIOM9027</td>
<td>Medical Imaging</td>
<td>0</td>
<td>3</td>
<td>0</td>
</tr>
<tr>
<td>BIOM9060</td>
<td>Biomedical Systems Analysis</td>
<td>3</td>
<td>0</td>
<td>6</td>
</tr>
<tr>
<td>BIOM9450</td>
<td>Clinical Information Sys</td>
<td>0</td>
<td>3</td>
<td>0</td>
</tr>
<tr>
<td>BIOM9601</td>
<td>Biomed Applic of Microcomputers 1</td>
<td>3</td>
<td>0</td>
<td>6</td>
</tr>
<tr>
<td>BIOM9602</td>
<td>Biomed Applic of Microcomputers 2</td>
<td>0</td>
<td>3</td>
<td>0</td>
</tr>
<tr>
<td>BIOM9541</td>
<td>Mechanics of the human body</td>
<td>3</td>
<td>0</td>
<td>6</td>
</tr>
<tr>
<td>BIOM9621</td>
<td>Biolog. Signal Analysis</td>
<td>3</td>
<td>0</td>
<td>6</td>
</tr>
<tr>
<td>BIOM9551</td>
<td>Biomechanics of Physical Rehabilitation</td>
<td>3</td>
<td>0</td>
<td>6</td>
</tr>
<tr>
<td>BIOM9701</td>
<td>Dynamics of cardiovascular system</td>
<td>3</td>
<td>0</td>
<td>6</td>
</tr>
<tr>
<td>ANAT2511</td>
<td>Fundamentals of Anatomy</td>
<td>0</td>
<td>6</td>
<td>0</td>
</tr>
</tbody>
</table>
CHEMICAL ENGINEERING AND INDUSTRIAL CHEMISTRY

3100 Industrial Chemistry - Full-time Program

Bachelor of Science
BSc

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>Code</th>
<th>Subject</th>
<th>UOC</th>
<th>Session 1</th>
<th>Session 2</th>
</tr>
</thead>
<tbody>
<tr>
<td>CEIC1010</td>
<td>Introduction to the Chemical Industry</td>
<td>3</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>CEIC1020</td>
<td>Introduction to Chemical Engineering</td>
<td>6</td>
<td>6</td>
<td>6</td>
</tr>
<tr>
<td>CHEM1011</td>
<td>Fundamentals of Chemistry A or B</td>
<td>6</td>
<td>0</td>
<td>6</td>
</tr>
<tr>
<td>CHEM1031</td>
<td>Higher Chemistry 1A</td>
<td>6</td>
<td>0</td>
<td>6</td>
</tr>
<tr>
<td>CHEM1021</td>
<td>Chemistry 1B or B</td>
<td>6</td>
<td>0</td>
<td>6</td>
</tr>
<tr>
<td>CHEM1041</td>
<td>Higher Chemistry 1D</td>
<td>6</td>
<td>0</td>
<td>6</td>
</tr>
<tr>
<td>MATH1113</td>
<td>Mathematics 1A or B</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>MATH1223</td>
<td>Mathematics 1B or B</td>
<td>6</td>
<td>0</td>
<td>6</td>
</tr>
<tr>
<td>MATH1241</td>
<td>Higher Mathematics 1B</td>
<td>6</td>
<td>0</td>
<td>6</td>
</tr>
<tr>
<td>MECH1000</td>
<td>Engineering Drawing and Solid Modelling</td>
<td>3</td>
<td>3</td>
<td>0</td>
</tr>
<tr>
<td>PHYS1001</td>
<td>Engineering Physics 1 or 1</td>
<td>6</td>
<td>0</td>
<td>6</td>
</tr>
<tr>
<td>PHYS1111</td>
<td>Fundamentals of Physics</td>
<td>6</td>
<td>0</td>
<td>6</td>
</tr>
<tr>
<td>CEIC1030</td>
<td>Communications and Business Skills or B</td>
<td>6</td>
<td>0</td>
<td>6</td>
</tr>
<tr>
<td>PHYS1111</td>
<td>Concepts in Engineering Physics</td>
<td>6</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

<table>
<thead>
<tr>
<th>Code</th>
<th>Subject</th>
<th>UOC</th>
<th>Session 1</th>
<th>Session 2</th>
</tr>
</thead>
<tbody>
<tr>
<td>CEIC2011</td>
<td>Instrumental Analysis -Theory</td>
<td>3</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>CEIC2012</td>
<td>Instrumental Analysis - Practical</td>
<td>3</td>
<td>0</td>
<td>3</td>
</tr>
<tr>
<td>CEIC2020</td>
<td>Introduction to Numeric Methods</td>
<td>3</td>
<td>0</td>
<td>3</td>
</tr>
<tr>
<td>CEIC2110</td>
<td>Material and Energy Balances</td>
<td>3</td>
<td>0</td>
<td>3</td>
</tr>
<tr>
<td>CEIC2120</td>
<td>Fluid Flow</td>
<td>3</td>
<td>0</td>
<td>3</td>
</tr>
<tr>
<td>CEIC2130</td>
<td>Heat Transfer</td>
<td>3</td>
<td>0</td>
<td>3</td>
</tr>
<tr>
<td>CHEM2021</td>
<td>Organic Chemistry</td>
<td>6</td>
<td>0</td>
<td>6</td>
</tr>
<tr>
<td>CHEM2039</td>
<td>Inorganic Chemistry</td>
<td>6</td>
<td>0</td>
<td>6</td>
</tr>
<tr>
<td>INDG2040</td>
<td>Physical Process Chemistry</td>
<td>6</td>
<td>0</td>
<td>6</td>
</tr>
<tr>
<td>MATH2020</td>
<td>Mathematics 2A</td>
<td>2</td>
<td>0</td>
<td>3</td>
</tr>
<tr>
<td>MATH2030</td>
<td>Mathematics 2B</td>
<td>2</td>
<td>0</td>
<td>3</td>
</tr>
<tr>
<td>MATH2899</td>
<td>Applied Statistics CE</td>
<td>3</td>
<td>0</td>
<td>3</td>
</tr>
<tr>
<td></td>
<td>General Education</td>
<td>2</td>
<td>0</td>
<td>3</td>
</tr>
</tbody>
</table>

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

Stage 3

<table>
<thead>
<tr>
<th>Code</th>
<th>Subject</th>
<th>UOC</th>
<th>Session 1</th>
<th>Session 2</th>
</tr>
</thead>
<tbody>
<tr>
<td>BIOT3100</td>
<td>Fermentation Processes</td>
<td>2</td>
<td>0</td>
<td>3</td>
</tr>
<tr>
<td>CEIC3070</td>
<td>Process Control</td>
<td>4</td>
<td>0</td>
<td>4</td>
</tr>
<tr>
<td>CEIC3010</td>
<td>Reaction Engineering</td>
<td>3</td>
<td>0</td>
<td>4</td>
</tr>
<tr>
<td>CEIC3110</td>
<td>Thermodynamics</td>
<td>3</td>
<td>0</td>
<td>3</td>
</tr>
<tr>
<td>CHEM3829</td>
<td>Organic Chemistry</td>
<td>6</td>
<td>0</td>
<td>6</td>
</tr>
<tr>
<td>INDG3051</td>
<td>Process Chemistry and Operations</td>
<td>4</td>
<td>0</td>
<td>4</td>
</tr>
<tr>
<td>INDG3110</td>
<td>Industrial &amp; Environmental Chemistry</td>
<td>6</td>
<td>0</td>
<td>6</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 4

<table>
<thead>
<tr>
<th>Code</th>
<th>Subject</th>
<th>UOC</th>
<th>Session 1</th>
<th>Session 2</th>
</tr>
</thead>
<tbody>
<tr>
<td>CEIC4070</td>
<td>Automation Science</td>
<td>0</td>
<td>4</td>
<td>0</td>
</tr>
<tr>
<td>CEIC4105</td>
<td>Professional Electives Extended</td>
<td>0</td>
<td>4</td>
<td>0</td>
</tr>
<tr>
<td>CEIC4120</td>
<td>Management and Plant Operation</td>
<td>0</td>
<td>6</td>
<td>0</td>
</tr>
<tr>
<td>INDG4061</td>
<td>Process Design A</td>
<td>0</td>
<td>4</td>
<td>0</td>
</tr>
<tr>
<td>INDG4062</td>
<td>Process Design B</td>
<td>0</td>
<td>4</td>
<td>0</td>
</tr>
<tr>
<td>INDG4091</td>
<td>Research Project Theory</td>
<td>0</td>
<td>4</td>
<td>0</td>
</tr>
<tr>
<td>INDG4092</td>
<td>Research Project Practice</td>
<td>0</td>
<td>4</td>
<td>0</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>Code</th>
<th>Subject</th>
<th>UOC</th>
<th>Session 1</th>
<th>Session 2</th>
</tr>
</thead>
<tbody>
<tr>
<td>ACCT5901</td>
<td>Accounting: A users Perspective</td>
<td>3</td>
<td>0</td>
<td>6</td>
</tr>
<tr>
<td>CEIC4120</td>
<td>Management and Plant Operation</td>
<td>0</td>
<td>5</td>
<td>0</td>
</tr>
<tr>
<td>ECON5103</td>
<td>Business Economics</td>
<td>0</td>
<td>3</td>
<td>0</td>
</tr>
<tr>
<td>INDG4093</td>
<td>Small Research Project Theory</td>
<td>0</td>
<td>6</td>
<td>0</td>
</tr>
<tr>
<td>INDG4094</td>
<td>Small Research Project Practice</td>
<td>0</td>
<td>8</td>
<td>0</td>
</tr>
<tr>
<td>INDG4061</td>
<td>Process Design A</td>
<td>4</td>
<td>0</td>
<td>4</td>
</tr>
<tr>
<td>INDG4062</td>
<td>Process Design B</td>
<td>0</td>
<td>4</td>
<td>0</td>
</tr>
<tr>
<td>INFS5988</td>
<td>Business Information Systems</td>
<td>3</td>
<td>0</td>
<td>6</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>Code</th>
<th>Subject</th>
<th>UOC</th>
<th>Session 1</th>
<th>Session 2</th>
</tr>
</thead>
<tbody>
<tr>
<td>Commerce Elective</td>
<td></td>
<td>3</td>
<td>0</td>
<td>6</td>
</tr>
<tr>
<td>Commerce Elective</td>
<td></td>
<td>3</td>
<td>0</td>
<td>6</td>
</tr>
<tr>
<td>Commerce Elective</td>
<td></td>
<td>3</td>
<td>0</td>
<td>6</td>
</tr>
<tr>
<td>Commerce Elective</td>
<td></td>
<td>3</td>
<td>0</td>
<td>6</td>
</tr>
<tr>
<td>Commerce Elective</td>
<td></td>
<td>3</td>
<td>0</td>
<td>6</td>
</tr>
<tr>
<td>Commerce Elective</td>
<td></td>
<td>3</td>
<td>0</td>
<td>6</td>
</tr>
<tr>
<td>Commerce Elective</td>
<td></td>
<td>3</td>
<td>0</td>
<td>6</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

<table>
<thead>
<tr>
<th>Code</th>
<th>Course Description</th>
<th>HPW</th>
<th>UOC</th>
</tr>
</thead>
<tbody>
<tr>
<td>CHEM101</td>
<td>Introduction to Chemical Engineering</td>
<td>0</td>
<td>6</td>
</tr>
<tr>
<td>COMP101</td>
<td>Computing 1A</td>
<td>6</td>
<td>6</td>
</tr>
<tr>
<td>CHEM102</td>
<td>Computing 1B</td>
<td>0</td>
<td>6</td>
</tr>
<tr>
<td>CHEM103</td>
<td>Fundamentals of Chemistry 1A or</td>
<td>6</td>
<td>6</td>
</tr>
<tr>
<td>CHEM104</td>
<td>Higher Chemistry 1C</td>
<td>6</td>
<td>6</td>
</tr>
<tr>
<td>MATH113</td>
<td>Mathematics 1A or</td>
<td>0</td>
<td>6</td>
</tr>
<tr>
<td>MATH114</td>
<td>Higher Mathematics 1A</td>
<td>6</td>
<td>6</td>
</tr>
<tr>
<td>MATH121</td>
<td>Mathematics 1B or</td>
<td>6</td>
<td>6</td>
</tr>
<tr>
<td>MATH124</td>
<td>Higher Mathematics 1B</td>
<td>0</td>
<td>6</td>
</tr>
<tr>
<td>PHYS116</td>
<td>Physics 1 (Chem &amp; Mech Eng) or</td>
<td>6</td>
<td>6</td>
</tr>
<tr>
<td>PHYS111</td>
<td>Fundamentals of Physics</td>
<td>6</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

<table>
<thead>
<tr>
<th>Code</th>
<th>Course Description</th>
<th>HPW</th>
<th>UOC</th>
</tr>
</thead>
<tbody>
<tr>
<td>CHEM210</td>
<td>Instrumental Analysis - Theory</td>
<td>0</td>
<td>3</td>
</tr>
<tr>
<td>CHEM211</td>
<td>Instrumental Analysis - Practical</td>
<td>0</td>
<td>3</td>
</tr>
<tr>
<td>CHEM212</td>
<td>Material and Energy Balances</td>
<td>3</td>
<td>0</td>
</tr>
<tr>
<td>CHEM213</td>
<td>Fluid Flow</td>
<td>3</td>
<td>0</td>
</tr>
<tr>
<td>CHEM214</td>
<td>Heat Transfer</td>
<td>0</td>
<td>3</td>
</tr>
<tr>
<td>CHEM215</td>
<td>Organic Chemistry</td>
<td>0</td>
<td>6</td>
</tr>
<tr>
<td>COMP201</td>
<td>Data Organisation</td>
<td>5</td>
<td>0</td>
</tr>
<tr>
<td>INDN204</td>
<td>Physical Process Chemistry</td>
<td>6</td>
<td>0</td>
</tr>
<tr>
<td>MATH202</td>
<td>Mathematics 2A</td>
<td>2</td>
<td>0</td>
</tr>
<tr>
<td>MATH203</td>
<td>Mathematics 2B</td>
<td>0</td>
<td>2</td>
</tr>
<tr>
<td>MATH109</td>
<td>Discrete Maths</td>
<td>0</td>
<td>6</td>
</tr>
<tr>
<td>MATH899</td>
<td>Applied Statistics CE</td>
<td>0</td>
<td>3</td>
</tr>
</tbody>
</table>

**Total**

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

#### Stage 3

<table>
<thead>
<tr>
<th>Code</th>
<th>Course Description</th>
<th>HPW</th>
<th>UOC</th>
</tr>
</thead>
<tbody>
<tr>
<td>CHEM205</td>
<td>Process Control</td>
<td>0</td>
<td>4</td>
</tr>
<tr>
<td>CHEM210</td>
<td>Reaction Engineering</td>
<td>0</td>
<td>3</td>
</tr>
<tr>
<td>CHEM311</td>
<td>Thermodynamics</td>
<td>3</td>
<td>0</td>
</tr>
<tr>
<td>CHEM410</td>
<td>Professional Electives Extended</td>
<td>2</td>
<td>0</td>
</tr>
<tr>
<td>CHEM206</td>
<td>Inorganic Chemistry and Structure</td>
<td>6</td>
<td>0</td>
</tr>
<tr>
<td>COMP201</td>
<td>Digital Systems Structures</td>
<td>5</td>
<td>0</td>
</tr>
<tr>
<td>COMP204</td>
<td>Software Construction: Techniques and</td>
<td>0</td>
<td>5</td>
</tr>
<tr>
<td></td>
<td>Tools</td>
<td></td>
<td>0</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 |

### 3043 and 3103
**Combined Chemical Engineering/Industrial Chemistry/Bachelor of Arts - Full-time Programs**

Bachelor of Engineering/Bachelor of Arts BE/BA (3043)

Bachelor of Science/Bachelor of Arts BSc/BA (3103)

These programs are still in PENDING status but should be available to students in Session 1, 2001.

The combined program of five years full-time study enables a student in the school to qualify for the award of the degrees of Bachelor of Engineering/Science and Bachelor of Arts. With these programs students can add their choice of an Arts major to the standard professionally accredited Chemical Engineering/Industrial Chemistry program. It provides flexibility in course choice within the full Arts program and enables students to obtain the breadth of education offered by the Arts and Social sciences. Since Engineering and Arts programs can have a common content, such as mathematics and physics, approximately two additional sessions of study are required to gain the additional qualifications of Bachelor of Arts. In general this additional study is taken concurrently with the BE/BSc program and both can be completed within 10 sessions.

The programs are open to all students who satisfy both the Chemical Engineering/Industrial Chemistry and Arts entry conditions. Students may enter directly in Year 1 or may apply to transfer from the normal engineering program after completion of at least one year if they have a credit or higher average or the permission of the Head of School.

The BE/BSc BA programs are administered by the School of Chemical Engineering and Industrial Chemistry. 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 School of Chemical Engineering and Industrial Chemistry must approve the final program timetable.

1. Students must complete 60 units of credit in the BA program with no more than 24 units of credit obtained at Level 1 (i.e. 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 of 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 Studies
   - 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 course. Students must also complete a minor sequence of 24 units of credit on one of the other areas listed above.

3. Except for courses completed as part of the Environmental Studies 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/BSc programs 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 the program 3040 BE in Chemical Engineering, 3100 BSc in Industrial Chemistry except that they are exempt from the General Studies requirement of the BE/BSc program. However, students will not be eligible for graduation for the BE/BSc 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/BSc 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 an honours year. It should be noted that entry into a particular BA Honours program will require completion of courses additional to those specified under rules 1-4.

8. The total units of credit in the combined program is 5 \( \times \) 48 = 240.

---

**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
  - Industrial Chemistry

- **MSc**
  - Chemical Engineering
  - Industrial Chemistry

- **ME**
  - Chemical Engineering

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 48 units of credits. Students with a recognised 4 year BE or BSc degree OR students with a recognised 3 year BE or BSc plus satisfactory evidence of other academic or professional attainments will be permitted to enrol.

Whilst the program is aimed at maximum flexibility, four courses (6UOC) from the list of Post-Graduate Courses at CEIC (CEIC81xx, CEIC82xx and CEIC83xx) will be considered as core courses for the total of 24 UOC. **Not all courses are offered in any one session.** Students may choose to register in two more postgraduate courses at CEIC from the above list or instead may choose the CEIC 8320 (12 UOC) which is a project on relevant aspects of process industries, supervised by academic members of staff. A list of current research areas and supervisors will be given to enrolling students.

The remainder of 12 UOC can be taken as electives, which may be given as one-week intensive programs or can be taken from other Schools at the University.

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

List of Courses (6 UOC)

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
</tr>
</thead>
<tbody>
<tr>
<td>CEIC8101</td>
<td>Reaction Engineering and Catalysis</td>
</tr>
<tr>
<td>CEIC8102</td>
<td>Process Control</td>
</tr>
<tr>
<td>CEIC8103</td>
<td>Particle and Separation Technology</td>
</tr>
<tr>
<td>CEIC8104</td>
<td>Topics in Polymer Technology</td>
</tr>
<tr>
<td>CEIC8201</td>
<td>Minerals Engineering I</td>
</tr>
<tr>
<td>CEIC8202</td>
<td>Minerals Engineering II</td>
</tr>
<tr>
<td>CEIC8204</td>
<td>Topics in Business Management in Chemical Engineering</td>
</tr>
<tr>
<td>CEIC8205</td>
<td>Fuel and Energy Engineering I</td>
</tr>
<tr>
<td>CEIC8209</td>
<td>Fuel and Energy Engineering II</td>
</tr>
<tr>
<td>CEIC8203</td>
<td>Environmental Management</td>
</tr>
<tr>
<td>CEIC8301</td>
<td>Electrochemical Engineering</td>
</tr>
<tr>
<td>CEIC8302</td>
<td>Process Heat Transfer</td>
</tr>
<tr>
<td>CEIC8303</td>
<td>Fouling in Process Industries and Equipment</td>
</tr>
<tr>
<td>CEIC8310</td>
<td>Computing Studies in the Process Industries</td>
</tr>
<tr>
<td>CEIC8311</td>
<td>Instrumental Analysis in the Process Industries</td>
</tr>
<tr>
<td>CEIC8312</td>
<td>Safety and Communications in the Process Industries</td>
</tr>
<tr>
<td>CEIC8313</td>
<td>Environmental Technology</td>
</tr>
<tr>
<td>CEIC8320</td>
<td>Process Engineering Project for M.EngSc program only</td>
</tr>
<tr>
<td>CEIC8330</td>
<td>Process Engineering Project in the Petroleum Industry</td>
</tr>
<tr>
<td>CEIC8331</td>
<td>Process Engineering: Natural Gas and Light Hydrocarbons to Petrochemicals</td>
</tr>
<tr>
<td>CEIC8332</td>
<td>Process Engineering in the Food Industry</td>
</tr>
<tr>
<td>CEIC8335</td>
<td>Advanced Computer Methods in the Process Industries</td>
</tr>
<tr>
<td>CEIC8336</td>
<td>Environmental Chemistry in the Process Industries</td>
</tr>
<tr>
<td>CEIC8337</td>
<td>Particle Characterisation in the Process Industries</td>
</tr>
<tr>
<td>CEIC8341</td>
<td>Membrane Technology in the Process Industries</td>
</tr>
<tr>
<td>CEIC8342</td>
<td>Energy Management in the Process Industries</td>
</tr>
<tr>
<td>CEIC8350</td>
<td>Industrial Water and Wastewater Engineering</td>
</tr>
</tbody>
</table>
Course Descriptions

Descriptions of all courses are presented in 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 included is included in the chapter “Handbook Guide”, appearing earlier in this book.

Note that not all Graduate courses are offered every year. Contact School for further details.

Please note all courses are measured in whole credit points. 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. A full-time enrolment for one year is defined as 48 units of credit (24 per semester). A course has the same unit of credit value and generates the same load for HECS and fees irrespective of the program or stage in which it is taken.

CEIC0010
Mass Transfer and Material Balances
Staff Contact: Associate Professor Michael Brungs
UOC3 HPW3 S1
Prerequisites: CEIC0010, IND4120

CEIC0030
Environmental Protection in the Process Industries
Staff Contact: Dr Phillip Crisp
UOC6 HPWO S1 S2
Prerequisites: CEIC0010, IND4120

CEIC0050
Atmospheric Process Chemistry
Staff Contact: Dr Phillip Crisp
UOC3 HPW3 S1
Prerequisites: CHEM1101, CHEM1201 or CHEM1011 and CHEM1021 or CHEM1031 and CHEM1041

CEIC1010
Introduction to the Chemical Industry
Staff Contact: Dr Frank Lucien
UOC3 HPW3 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: Dr Frank Lucien
UOC6 HPW6 S2

CEIC1030
Communication & Business Skills
Staff Contact: Dr Frank Lucien
UOC6 HPWO 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: Associate Professor Michael Brungs
UOC3 HPW3 S1

CEIC2012
Instrumental Analysis - Prac
Staff Contact: Associate Professor Michael Brungs
UOC3 HPW3 S2
Prerequisites: 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: Associate Professor Tuan Pham
UOC3 HPW3 S1
Prerequisites: CEIC1020, MATH1231 or MATH1241, PHYS1169 or PHYS1171
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 & Energy Balances
Staff Contact: Dr Dianne Wiley
UOC3 HPW3 S1
Prerequisites: CEIC1020
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: Associate Professor Rose Amal
UOC3 HPW3 S1
Prerequisites: CEIC1020, PHYS1169 or PHYS1111

CEIC2130
Heat Transfer
Staff Contact: Associate Professor Rose Amal
UOC3 HPW3 S2
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: Professor Neil Foster
UOC3 HPW3 S1 S2
Prerequisites: CEIC2110, CHEN2062

CEIC3070
Process Control
Staff Contact: Dr Jie Bao
UOC4 HPW4 S2
Prerequisites: 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 models, 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 Vicki Chen
UOC3 HPW3 S1
Prerequisites: CEIC2110, CHEN2062

CEIC4070
Laboratory Automation Science
Staff Contact: Dr Jie Bao
UOC4 HPW4 S1
Prerequisites: CEIC3070

CEIC4101
Professional Electives Advanced
Staff Contact: Associate Professor Tam Tran
UOC3 HPW3 S1
Prerequisites: All stage 3 courses
To be chosen from offerings in: Advanced Reaction Engineering; Advanced Process Control; Advanced Particle and Separation Processes and Advanced Polymers.

CEIC4102
Professional Electives Extended
Staff Contact: Associate Professor Tam Tran
UOC3 HPW3 S2
Prerequisites: All stage 3 courses
To be chosen from offerings in: Biochemical Processing 1; Business Management in Chemical Engineering A; Environmental Management 2A; 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 Extended
Professional Electives
Staff Contact: Associate Professor Tam Tran
UOC3 HPW3 S2
Prerequisites: All stage 3 courses
To be chosen from offerings in: Biochemical Processing 1; Business Management in Chemical Engineering A; Environmental Management 2A; 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 Extended
Professional Electives
Staff Contact: Associate Professor Tam Tran
UOC3 HPW3 S2
Prerequisites: All stage 3 courses
To be chosen from offerings in: Biochemical Processing 1; Business Management in Chemical Engineering A; Environmental Management 2A; 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 Extended Professional Electives  
Staff Contact: Associate Professor Tam Tran  
Prerequisite/s: All stage 3 courses  
To be chosen from offerings in: Business Management in Chemical B; Advanced Reaction Engineering; Advanced Process control; Advanced Polymers; Minerals Engineering - Practice; Environmental Management 2B.

CEIC4106 Extended Professional Electives  
Staff Contact: Associate Professor Tam Tran  
Prerequisite/s: All stage 3 courses  
To be chosen from offerings in: Business Management in Chemical Engineering B; Advanced Reaction Engineering; Minerals Engineering - Practice; Environment Management 2B, Fuel & Energy 2.

CEIC4120 Management and Plant Operation  
Staff Contact: Professor Thomas Davis  
UOC6 HPW0 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.

CEIC8101 Reaction Engineering and Catalysis  
Staff Contact: Associate Professor Adesoji Adesina  
Enrolment Requires School approval  
UOC6 HPW3  
This course covers in-depth considerations of the analysis and design of non-isothermal reactors, treatment of variable-density systems, non-catalytic gas-solid reactions (application to minerals processing, pharmaceutics and microelectronic processing), kinetics of heterogeneous reactions, diffusion and reaction in porous crystals, design of fixed bed reactors, trickle-bed and slurry bed reactors. In addition, there will be a project component on an individual basis. The individual study project is to be chosen in the areas identified by codes M-Minerals and U-Waste Processing and pollution control (see School for details).

CEIC8102 Process Control  
Staff Contact: Dr Jie Bao  
Enrolment Requires School approval  
UOC6 HPW3  
Concepts of linear Multi-Input Multi-Output (MIMO) systems, state-space representation of process systems, linear spaces and linear operators, controllability and observability analysis, Lyapunov stability analysis, stability of interconnected systems, linear optimal control, frequency-domain analysis and controller synthesis for MIMO process systems. Introduction to model predictive control, system identification, robust control, decentralised control. In addition, there will be a project component on an individual basis. The individual study project is to be chosen in the areas identified by codes A-Artificial Intelligence, F-Computer Modelling and Design and Q-Process Control advanced (see School for details).

CEIC8103 Particle & Separation Technology  
Staff Contact: Associate Professor Rose Amal  
Enrolment Requires School approval  
UOC6 HPW3  
The course covers lectures and demonstrations on: Particle characterisation and preparation using the latest techniques, floc characterisation and its relevance in separation techniques. There will also be relevant lectures on other aspects of separation technologies, theory and practice, novel applications to industry and environment management. In addition, there will be a project component on an individual study basis. The individual study project is to be chosen in the areas identified by codes O-Particle systems, D-Catalysis and S-Separations (mem., super., mass trans and diff. Oper) (see School for details).

CEIC8104 Topics in Polymer Technology  
Staff Contact: Associate Professor Tam Tran  
Enrolment Requires School approval  
UOC6 HPW3  
In past years this course has focussed upon three main areas (a) reaction engineering and catalyst aspects of polyolefins; (b) advanced free radical polymerisation; (c) polymers for biomedical applications. The lectures will also cover new methods of polymerisation, new polymers and new applications. In addition, there will be a project component on an individual study basis. The individual study project is to be chosen in the areas identified in code P-Polymer processing (see School for details).

CEIC8201 Minerals Engineering 1  
Staff Contact: Associate Professor Tam Tran  
Enrolment Requires School approval  
UOC6 HPW3  
Lectures/Tutorials - Principles and applications of physical mineral processing, hydrometallurgy and electrometallurgy covering comminution, flotation, solid/liquid separation, dewatering, leaching, solvent extraction, purification and separation processes, electro-winning/refining and waste processing. Emphasis is placed on throughput and process calculations for the design of mineral processing plants. In addition, there will be a project component on an individual study basis. The individual study project is to be chosen in the areas identified by codes M-Minerals and U-Waste Processing and pollution control (see School for details).

CEIC8203 Environmental Management  
Staff Contact: Associate Professor Dr Rose Amal and Dr G Bricket  
Enrolment Requires School approval  
UOC6 HPW3  
Basics: soil chemistry, occupational diseases, smogs andacid rain, toxic elements and compounds, toxic waste disposal, industrial accidents, atmospheric structure and chemistry, greenhouse warming, the Ozone hole, nuclear energy and other alternative energy sources, water and air analysis, occupational health. Processes: Drinking water treatment (current practice and new technologies), sewerage treatment (ocean and inland, primary, secondary and tertiary treatment), solid waste management (landfill, thermal processes and recycling), introduction to clean production. Management Issues: Sustainability, decision making, environmental management system (ISO14001), life cycle analysis, material and flux analysis. Case Studies: Topics chosen from industry Site Visits: to various sewage treatment plants and the NSW waste service liquid waste treatment plan, Lidcombe. In addition, there will be relevant lectures on other aspects of separation technologies, theory and practice, novel applications to industry and environment management. In addition, there will be a project component on an individual study basis. The individual study project is to be chosen in the areas identified by Code J-Environmental and U-Waste Processing and pollution control (see School for details).
CEIC8204
Topics in Business Management in Chemical Engineering
Staff Contact: Professor Robert Burford and Dr Diane Wiley
Enrolment Requires School approval
UOC6 HPW3
The aims of this course are to introduce issues which affect business decisions encountered by management in the chemical industry. Topics include domestic and export markets, market growth, the lemming effect and product life cycles. The distinction between issues and problems using PVC and the chlorine debate is discussed. Factors affecting plant life: scale up, retrofitting, competing technologies etc. Environmental and compliance issues including green chemistry. The petrochemical industry and in particular the polymer manufacturing industry is used to illustrate the main areas. Industry speakers and site visits are used to maintain relevance and topicality. In addition, there will be a project component on an individual study basis. The individual study project is to be chosen in the areas identified by codes C-Business Management/Inf Tech and G-Design (at least 3 to 4 students per project) (see School for details).

CEIC8205
Fuel and Energy Engineering
Staff Contact: Associate Professor John Stubington
Enrolment Requires School approval
UOC6 HPW3
Current energy resources and alternatives for the future. Basic principles of fuel conversion processes: gasification, carbonisation, oil refining etc. Introduction to combustion of solid, liquid and gaseous (fossil) fuels. In addition, the above will also include a project component on an individual study basis. The individual study project is to be chosen in the areas identified by Code U-Waste Processing and pollution control (see School for details).

CEIC8206
Minerals Engineering II
Staff Contact: School Office
Enrolment Requires School approval
UOC6 HPW3
Practice - This part of the course involves a metallurgical testwork program where students will be required to conduct tests to determine conditions for optimising processing options. Students are required to process an ore using mineral processing equipment to determine optimum design criteria for processing the raw material given into final products. In addition, there will be a project component on an individual study basis. The individual study project is to be chosen in the areas identified by codes M-Minerals and U-Waste Processing and pollution control (see School for details).

CEIC8209
Fuel and Energy Engineering II
Staff Contact: Associate Professor Tuan Pham
Enrolment Requires School approval
UOC6 HPW3
Fundamentals of combustion science and engineering. Fuel plant technology. Energy management and technologies for the efficient use of fuel. In addition, the above will also include a project component on an individual study basis. The individual study project is to be chosen in the areas identified by Code U-Waste Processing and pollution control (see School for details).

CEIC8301
Electrochemical Engineering
Staff Contact: Professor Maria Skyllas-Kazacos
Enrolment Requires School approval
UOC6 HPW3
This course will cover basic and advanced concepts in electrochemistry and electrochemical reactor design including current-voltage relationships, activation and mass-transfer controlled processes, limiting current, electrode material selection, current and voltage distribution as a function of electrode geometry and cell design. Specific examples will be used from important industrial electrochemical applications including aluminium smelting, the chlor-alkali process, electrotitating and batteries and fuel cells. The course may also include a project component on an individual study basis. The individual study project is to be chosen in the areas identified by Code I-Electrochemical processes (see School for details).

CEIC8302
Process Heat Transfer
Staff Contact: Dr Roya Sheikholeslami
Enrolment Requires School approval
UOC6 HPW3
The course will cover operation and design of process equipment such as heat recovery units, packed beds, dryers, regenerators, economizers, evaporators, thermal desalination systems, compact heat exchangers, and etc. Both practical and fundamental aspects will be covered. The course may also include a project component on an individual study basis. The individual study project is to be chosen in the areas identified by Code T-Transport processes and R-Refrigeration/drying (see School for details).

CEIC8303
Fouling in Process Industries and Equipment
Staff Contact: Dr Roya Sheikholeslami
Enrolment Requires School approval
UOC6 HPW3
Fouling is a universal problem in various types of process equipment and is costing the industrial nations billions of dollars annually. This course aims to approach the problem from both practical and fundamental points of view. The course will discuss applications, process and industrial fouling occurrences, mechanisms and fundamentals, predictive models, prevent and cleaning methods, design considerations, monitoring techniques, economic considerations and some case studies. The course may also include a project component on an individual study basis. The individual study project is to be chosen in the areas identified by Code T-Transport processes, L-Industrial process and S-Separations (mem., super., mass trans & diff. Oper.) (see School for details).

CEIC8310
Computing Studies in the Process Industries
Staff Contact: Associate Professor Tuan Pham
Enrolment Requires School approval
UOC6 HPW3

CEIC8311
Instrumental Analysis in the Proc Industries
Staff Contact: Associate Professor Michael Brungs
Enrolment Requires School approval
UOC6 HPW3
This course 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).

CEIC8312
Safety & Communication in the Process Industries
Staff Contact: Dr R. Crisp
Enrolment Requires School approval
UOC6 HPW3
CEIC8313
Environmental Technologies
Staff Contact: Professor Tony Fane
Enrolment Requires School approval
UC6 HPW3
This course 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, Biological Processes, Design, Control and Monitoring, Clean Production Technologies.

CEIC8320
Process Engineering Project for M.EngSc program only
Staff Contact: Dr Roya Sheikholeslami
Enrolment Requires School approval
UC12 HPW6
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.

CEIC8330
Process Engineering in the Petroleum Industry
Staff Contact: Associate Professor Adesoji Adesina
Enrolment Requires School approval
UC6 HPW3

CEIC8331
Process Engineering: Natural Gas and Light Hydrocarbons to Petrochemicals
Staff Contact: Associate Professor Adesoji Adesina
Enrolment Requires School approval
UC6 HPW3

CEIC8332
Process Engineering in the Food Industry
Staff Contact: Associate Professor Tuan Pham
Enrolment Requires School approval
UC6 HPW3
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.

CEIC8335
Advanced Computer Methods in the Process Industries
Staff Contact: Associate Professor Tuan Pham
Enrolment Requires School approval
UC6 HPW3
Solution of Process Engineering problems, trouble-shooting and Process Design utilising advanced computer applications including flowsheeting, numerical methods, statistical design, CAD and process integration.

CEIC8336
Environmental Chemistry in the Process Industries
Staff Contact: Philip Crisp
Enrolment Requires School approval
UC6 HPW3
Introduction of 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 waste contamination, toxic elements, toxic organics, absorption processes and occupational diseases. The role of the chemical industry in causing and resolving the problems will be examined.

CEIC8337
Particle Characterisation in the Process Industries
Staff Contact: Associate Professor Rose Amal
Enrolment Requires School approval
UC6 HPW3
This course will cover theoretical 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 electrophoretic 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.

CEIC8341
Membrane Technology in the Process Industries
Staff Contact: Professor Tony Fane
Enrolment Requires School approval
UC6 HPW3
Classification of membranes and membrane processes. Driving forces and mass transfer mechanisms. Characterisation for membranes. Control of concentration poliarisation 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.

CEIC8342
Energy Management in the Process Industries
Staff Contact: Associate Professor John Stubington
Enrolment Requires School approval
UC6 HPW3
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.
CEIC8350
Industrial Water & Wastewater Engineering
Staff Contact: Professor Tony Fane
Enrolment Requires School approval
UOC6 HPW3

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 water reuse. Economic aspects. Seminars. Factory visits/laboratory.

CHEN2050
Chemical Engineering Laboratory 1
Staff Contact: Dr Vicki Chen
UOC3 HPW3 S2
Prerequisite/s: CEIC1020

An introduction to laboratory work in chemical engineering including technical report writing, flow sheet preparation, information retrieving 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: Professor Maria Skyltas-Kazacos
UOC6 HPW6 S1
Prerequisite/s: CHEM1021 or CHEM1041


CHEN2062
Introduction to Process Chemistry 2
Staff Contact: Dr Phillip Crisp
UOC3 HPW3 S2
Prerequisite/s: CHEN2061

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

CHEN2140
Mass Transfer
Staff Contact: Associate Professor John Stubington
UOC3 HPW3 S2

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

CHEN3021
Systems Modelling & Analysis
Staff Contact: Associate Professor Adesoji Adesina
UOC3 HPW2 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.

CHEN3022
Process Modelling & Optimisation
Staff Contact: Associate Professor Adesoji Adesina
UOC3 HPW3 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.

CHEN3031
Advanced Transport Phenomena
Staff Contact: Associate Professor Adesoji Adesina
UOC3 HPW3 S2
Prerequisite/s: CEIC2120, CEIC2130, CHEN2140, MATH2030

Note/s: This course is an extension of material given in CEIC2120 Fluid Flow, CEIC2130 Heat Transfer and CHEN2140 Mass Transfer.


CHEN3062
Unit Ops and Pressure Vessels
Staff Contact: Professor Neil Foster
UOC4 HPWO S1


CHEN3065
Plant and Equipment Design
Staff Contact: Associate Professor Tuan Pham
UOC4 HPW4 S2
Prerequisite/s: CEIC2110, CEIC2130, MATH2030.

CHEN3067 Process Design & Economics
Staff Contact: Associate Professor Tuan Pham
UOC3 HPW3 S1
Prerequisite/s: CEIC2110, CEIC2130, MATH2030

CHEN3068 Process Design & Safety
Staff Contact: Associate Professor Tuan Pham
UOC3 HPW3 S2
Prerequisite/s: CEIC2110, CEIC2130, MATH2030.

CHEN3080 Chemical Engineering Practice 2
Staff Contact: Associate Professor John Stubington
UOC3 HPW3 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.

CHEN4081 Design Project
Staff Contact: Dr Dianne Wiley
UOC8 HPW6 S1
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. Students develop skills in relation to team work, interpersonal skills, decision making and technical capabilities.

CHEN4091 Research Project Theory
Staff Contact: Dr Phillip Crisp
UOC3 HPW3 S1 S2
The course requires that the student select a topic in Chemical Engineering, undertake a literature survey on that topic and produce a report.

CHEN4092 Research Project Practice
Staff Contact: Dr Phillip Crisp
UOC12 HPW10 S1 S2
The experimental investigation of some aspect of an elected topic area in Chemical Engineering.

FUEL0040 Fuel Engineering for Ceramic Engineers
Staff Contact: Associate Professor John Stubington
UOC3 HPW2 S1 S2
An introduction to combustion technology, combustion calculations, burner design, furnace, kiln and boiler thermal design.

INDC2040 Physical Process Chemistry
Staff Contact: Dr Johan Heuts
UOC6 HPW6 S1
Prerequisite/s: CHEM1021 or CHEM1041

INDC3051 Process Chemistry and Operation
Staff Contact: Professor Maria Skyllas-Kazacos
UOC4 HPW4 S2
Prerequisite/s: CEIC2110, INDC2040
Chemical aspects of high temperature materials; thermodynamics and kinetics of reactions in the solid state; phase equilibrium in condensed systems; gas-solid and liquid-solid reactions. Selection of materials for chemical plant. Strength and corrosive resistance of less common materials of fabrication. Chemical and electrical aspects of corrosion and their application to corrosion problems encountered in the chemical process industries. Electrochemical kinetics. Design factors for corrosion prevention. Methods of corrosion prevention.

INDC3110 Industrial & Environmental Chemistry
Staff Contact: Dr Phillip Crisp
UOC6 HPW6 S1
Prerequisite/s: CHEM2639, INDC2040
The qualitative aspects of major unit operations in the chemical process industries. Topics covered include gas absorption, liquid-liquid extraction, distillation, filtration, evaporation, centrifugation, drying and leaching operations, particle size reduction and enlargement. Students are required to attend factory inspections at local and country centres as required and to make a short oral presentation based on information gained during the factory visit. Soil chemistry. Occupational diseases. Smog and acid rain. Toxic elements and compounds. Toxic waste disposal. Industrial accidents. Atmospheric structure and chemistry. Greenhouse warming. The Ozone hole. Nuclear energy. Alternative energy sources. Water analysis. Air analysis. Occupational health.
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. Spread sheet and database utilisation. Basic programming. Industrial applications.

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.

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.

Students are required to deliver two lectures on selected topics, one related to some aspect of chemical technology, and the other on polymer science - theory. The intention is to develop skill in oral expression, as well as ability in critical evaluation and logical presentation. Opportunity is taken, where appropriate, to arrange for guest

The subject requires that the student elects a topic in Industrial Chemistry, undertake a literature survey on that topic and produce a report.

The experimental investigation of some aspect of an elected topic area in Industrial Chemistry.

The subject requires that the student elects a topic in Industrial Chemistry, undertake a literature survey on that topic and produce a report.
School of Civil and Environmental Engineering

Head of School
Professor RL Gilbert

Senior Administrative Officer
Ms KM Irvine

Executive Assistant
Dr SJ Foster

The School undertakes 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 Govett 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 courses 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 degrees of Bachelor of Engineering in Civil Engineering and Bachelor of Engineering in Environmental Engineering (BE BE).
- 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 programs 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, the Graduate Diploma in Engineering 5459 and the Graduate Certificate in Civil or Environmental Engineering (7336 or 7337). Corresponding programs in external mode delivery are 8617, 8618 and 5454. These programs are available in specialist areas including project management, construction management engineering/technology management, infrastructure 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 external Master of Engineering Science and Graduate Diploma programs, students may undertake construction management, project management, engineering/technology management, infrastructure management, environmental engineering, water & wastewater treatment 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 Environmental 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 courses in each year of each program (the Engineering Practice courses) 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 course 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. For combined degree programs only the marks obtained in the standard Civil or Environmental Engineering courses are used in the calculation. A weighted average mark in the range of 65-69 will result in a recommendation for Honours 2/2. A weighted average mark in the range of 70-74 will result in a recommendation for Honours 1/2. A weighted average mark of 75 and above will result in a recommendation for Honours 1.

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 course.

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, operate 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>Course Code</th>
<th>Course Title</th>
<th>HPW</th>
<th>UOC</th>
</tr>
</thead>
<tbody>
<tr>
<td>CHEM1011</td>
<td>Fundamentals of Chemistry A or</td>
<td>S1</td>
<td>S2</td>
</tr>
<tr>
<td>CHEM1031</td>
<td>Higher Chemistry C</td>
<td>6</td>
<td>0</td>
</tr>
<tr>
<td>CVEN1021</td>
<td>Engineering Practice 1A</td>
<td>2</td>
<td>0</td>
</tr>
<tr>
<td>CVEN1022</td>
<td>Engineering Practice 1B</td>
<td>0</td>
<td>4</td>
</tr>
<tr>
<td>CVEN1023</td>
<td>Statics</td>
<td>3</td>
<td>0</td>
</tr>
<tr>
<td>CVEN1024</td>
<td>Dynamics</td>
<td>0</td>
<td>3</td>
</tr>
<tr>
<td>CVEN1025</td>
<td>Computing</td>
<td>3</td>
<td>0</td>
</tr>
<tr>
<td>CVEN1026</td>
<td>Engineering Materials 1</td>
<td>0</td>
<td>3</td>
</tr>
<tr>
<td>MATH1131</td>
<td>Mathematics 1A or</td>
<td>HPW</td>
<td>UOC</td>
</tr>
<tr>
<td>MATH1141</td>
<td>Higher Mathematics 1A</td>
<td>S1</td>
<td>S2</td>
</tr>
<tr>
<td>MATH1231</td>
<td>Mathematics 1B or</td>
<td>6</td>
<td>0</td>
</tr>
</tbody>
</table>

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.
elective courses (listed for each discipline below) must be of credit of electives taken from different discipline areas. Students undertaken.

<table>
<thead>
<tr>
<th>Year</th>
<th>Session 1</th>
<th>Session 2</th>
<th>Total Units of Credit</th>
</tr>
</thead>
<tbody>
<tr>
<td>CVEN2021</td>
<td>Engineering Practice 2A</td>
<td>2</td>
<td>0</td>
</tr>
<tr>
<td>CVEN2022</td>
<td>Civil Engineering Practice 2B</td>
<td>0</td>
<td>3</td>
</tr>
<tr>
<td>CVEN2025</td>
<td>Engineering Computations 1</td>
<td>3</td>
<td>0</td>
</tr>
<tr>
<td>CVEN2125</td>
<td>Systems Engineering</td>
<td>2</td>
<td>0</td>
</tr>
<tr>
<td>CVEN2126</td>
<td>Engineering Construction</td>
<td>3</td>
<td>0</td>
</tr>
<tr>
<td>CVEN2023</td>
<td>Mechanics of Solids</td>
<td>3</td>
<td>0</td>
</tr>
<tr>
<td>CVEN2322</td>
<td>Structural Engineering 1</td>
<td>0</td>
<td>6</td>
</tr>
<tr>
<td>CVEN2026</td>
<td>Engineering Materials 2</td>
<td>3</td>
<td>0</td>
</tr>
<tr>
<td>CVEN2525</td>
<td>Water Engineering 1</td>
<td>0</td>
<td>3</td>
</tr>
<tr>
<td>GAMAT0442</td>
<td>Surveying for Civil Engineers</td>
<td>3</td>
<td>0</td>
</tr>
<tr>
<td>GAMAT0491</td>
<td>Survey Camp</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>MATH2019</td>
<td>Engineering Mathematics 2CE</td>
<td>(0)</td>
<td>0</td>
</tr>
<tr>
<td>General Education</td>
<td></td>
<td>2</td>
<td>2</td>
</tr>
</tbody>
</table>

Total HPW Session 1 19
Total HPW Session 2 20
Total Units of Credit 48

Year 4 - Session 1

Students achieving a weighted average mark exceeding 62 in all courses 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>Year</th>
<th>Session 1</th>
<th>Session 2</th>
<th>Total Units of Credit</th>
</tr>
</thead>
<tbody>
<tr>
<td>CVEN3021</td>
<td>Civil Engineering Practice 3A</td>
<td>4</td>
<td>0</td>
</tr>
<tr>
<td>CVEN3022</td>
<td>Civil Engineering Practice 3B</td>
<td>0</td>
<td>4</td>
</tr>
<tr>
<td>CVEN3025</td>
<td>Engineering Computations 3</td>
<td>3</td>
<td>0</td>
</tr>
<tr>
<td>CVEN3126</td>
<td>Engineering Management 1</td>
<td>3</td>
<td>0</td>
</tr>
<tr>
<td>CVEN3224</td>
<td>Geotechnical Engineering 1</td>
<td>0</td>
<td>6</td>
</tr>
<tr>
<td>CVEN3322</td>
<td>Structural Engineering 2</td>
<td>0</td>
<td>6</td>
</tr>
<tr>
<td>CVEN3348</td>
<td>Transport Planning &amp; Environment</td>
<td>3</td>
<td>0</td>
</tr>
<tr>
<td>CVEN3448</td>
<td>Transport Engineering</td>
<td>3</td>
<td>0</td>
</tr>
<tr>
<td>CVEN3525</td>
<td>Water Engineering 2</td>
<td>6</td>
<td>0</td>
</tr>
<tr>
<td>General Education</td>
<td></td>
<td>2</td>
<td>2</td>
</tr>
</tbody>
</table>

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

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 courses (listed for each discipline below) must be undertaken.

<table>
<thead>
<tr>
<th>Year</th>
<th>Session 1</th>
<th>Session 2</th>
<th>Total Units of Credit</th>
</tr>
</thead>
<tbody>
<tr>
<td>CVEN4001</td>
<td>Honours Thesis Part B</td>
<td>0</td>
<td>3</td>
</tr>
</tbody>
</table>

Construction and Management Major

<table>
<thead>
<tr>
<th>Year</th>
<th>Session 1</th>
<th>Session 2</th>
<th>Total Units of Credit</th>
</tr>
</thead>
<tbody>
<tr>
<td>CVEN4139</td>
<td>Advanced Construction &amp; Project Management</td>
<td>0</td>
<td>3</td>
</tr>
<tr>
<td>CVEN4149</td>
<td>Professional Level Project Management Tools &amp; Skills</td>
<td>0</td>
<td>3</td>
</tr>
<tr>
<td>CVEN4159</td>
<td>Advanced Construction Technology &amp; Engineering</td>
<td>0</td>
<td>3</td>
</tr>
</tbody>
</table>

Geotechnical Engineering Major

<table>
<thead>
<tr>
<th>Year</th>
<th>Session 1</th>
<th>Session 2</th>
<th>Total Units of Credit</th>
</tr>
</thead>
<tbody>
<tr>
<td>CVEN4239</td>
<td>Rock Engineering &amp; Geomechanics</td>
<td>0</td>
<td>3</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)

<table>
<thead>
<tr>
<th>Year</th>
<th>Session 1</th>
<th>Session 2</th>
<th>Total Units of Credit</th>
</tr>
</thead>
<tbody>
<tr>
<td>CHEM1011</td>
<td>Fundamentals of Chemistry A or</td>
<td></td>
<td></td>
</tr>
<tr>
<td>CHEM1031</td>
<td>Higher Chemistry C</td>
<td>6</td>
<td>0</td>
</tr>
<tr>
<td>CVEN1021</td>
<td>Engineering Practice 1A</td>
<td>2</td>
<td>0</td>
</tr>
<tr>
<td>CVEN1022</td>
<td>Engineering Practice 1B</td>
<td>0</td>
<td>4</td>
</tr>
<tr>
<td>CVEN1023</td>
<td>Statics</td>
<td>3</td>
<td>0</td>
</tr>
<tr>
<td>CVEN1024</td>
<td>Dynamics</td>
<td>0</td>
<td>3</td>
</tr>
<tr>
<td>CVEN1025</td>
<td>Computing</td>
<td>3</td>
<td>0</td>
</tr>
<tr>
<td>CVEN1026</td>
<td>Engineering Materials 1</td>
<td>0</td>
<td>3</td>
</tr>
<tr>
<td>CVEN1531</td>
<td>Introduction to Water &amp; Atmospheric Chemistry</td>
<td>0</td>
<td>4</td>
</tr>
<tr>
<td>MATH1131</td>
<td>Mathematics 1A or</td>
<td></td>
<td></td>
</tr>
<tr>
<td>MATH1141</td>
<td>Higher Mathematics 1A</td>
<td>6</td>
<td>0</td>
</tr>
<tr>
<td>MATH1231</td>
<td>Mathematics 1B or</td>
<td></td>
<td></td>
</tr>
<tr>
<td>MATH1241</td>
<td>Higher Mathematics 1B</td>
<td>0</td>
<td>6</td>
</tr>
</tbody>
</table>

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

Year 2

<table>
<thead>
<tr>
<th>Year</th>
<th>Session 1</th>
<th>Session 2</th>
<th>Total Units of Credit</th>
</tr>
</thead>
<tbody>
<tr>
<td>BIOS1101</td>
<td>Evolutionary &amp; Functional Biology</td>
<td>0</td>
<td>6</td>
</tr>
<tr>
<td>CEIC0010</td>
<td>Mass Transfer &amp; Materials Balance</td>
<td>3</td>
<td>0</td>
</tr>
<tr>
<td>CVEN2021</td>
<td>Engineering Practice 2A</td>
<td>2</td>
<td>0</td>
</tr>
<tr>
<td>CVEN2025</td>
<td>Engineering Computations 1</td>
<td>3</td>
<td>0</td>
</tr>
<tr>
<td>CVEN2125</td>
<td>Systems Engineering</td>
<td>0</td>
<td>2</td>
</tr>
<tr>
<td>CVEN2023</td>
<td>Mechanics of Solids</td>
<td>3</td>
<td>0</td>
</tr>
<tr>
<td>CVEN2525</td>
<td>Water Engineering 1</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>CVEN2722</td>
<td>Environmental Engineering Pract 2B</td>
<td>0</td>
<td>2</td>
</tr>
<tr>
<td>GEOG1711</td>
<td>Planet Earth: Environment in Crisis</td>
<td>0</td>
<td>3</td>
</tr>
<tr>
<td>GAMAT0753</td>
<td>Introduction to Spatial Info Systems</td>
<td>0</td>
<td>3</td>
</tr>
<tr>
<td>INDC4120</td>
<td>Chemistry of Industrial Environment</td>
<td>0</td>
<td>3</td>
</tr>
</tbody>
</table>
Year 3
BIOS3301 Population and Community 0 3 3
CEIC0050 Atmospheric & Process Chemistry 3 0 3
CVEN3025 Engineering Computations 2 3 0 3
CVEN3128 Engineering Management 1 3 3 3
CVEN3224 Geotechnical Engineering 1 0 6 6
CVEN3438 Transport Planning & Environment 3 0 3
CVEN3525 Water Engineering 2 6 0 6
CVEN3531 Water Chemistry 0 3 3
CVEN3720 Envt Engineering Practice 3A 4 0 6
CVEN3721 Envt Engineering Practice 3B 0 4 6
General Education 2 2 6
Total HPW Session 1 21
Total HPW Session 2 20
Total Units of Credit 48

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

CVEN4008 Industrial Training 0 0 0
CVEN4000 Honours Thesis Part A or CVEN4721 Envt Engineering Practice 4 0 4 6
CVEN4224 Geotechnical Engineering 2 3 0 4
CVEN4525 Water Engineering 3 3 0 4
CVEN4533 Transport & Fate of Pollutants 3 3 0 4
CVEN4722 Envt Policy, Law & Economics 3 0 3
CVEN4723 Waste Management 3 0 4
Total HPW Session 1 19
Total Units of Credit 24

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 courses (listed for each discipline below) must be undertaken.

CVEN4001 Honours Thesis Part B 0 3 4
Geotechnical Engineering Major
CVEN4269 Environmental Geomechanics 0 3 4
plus two of the following three courses
CVEN4239 Rock Engineering & Geomechanics 0 3 4
CVEN4249 Advanced Geotechnical Engineering 0 3 4
CVEN4259 Advanced Pavement Engineering 0 3 4
Transport Engineering Major
CVEN4439 Transport Operations & Systems Design 0 3 4
CVEN4449 Traffic Management & Control 0 3 4
CVEN4459 Transport & Environment 0 3 4
Water Engineering Major
CVEN4539 Advanced Water Quality & Treatment 0 3 4
CVEN4549 Advanced Catchment & Coastal Processes 0 3 4
CVEN4569 Advanced Environment Systems 0 3 4
Chemical Engineering Major
CEIC3070 Process Control 0 3 4
CEIC3010 Reaction Engineering 0 3 4
CHEN2063 Process Chemistry 0 3 4
Geography Major
Any two of the following three courses:
GEOG3025 Geomorphology 0 4 6

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 courses within the full Arts program and enables students to gain a broad education in Arts and Social Sciences, as well as specialisation 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 program 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 program 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 program.

Organization
The BE BA program is administered by the School of Civil and Environmental Engineering. The School will consult with the Faculty of Arts and Social Sciences in approving the BA component of the 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 courses 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 courses 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*
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 offers 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 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 are 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 program 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 program 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 program.

Organization

The BE BA program is administered by the School of Civil and Environmental Engineering. The School will consult with the Faculty of Arts and Social Sciences in approving the BA component of the program. The School of Civil and Environmental Engineering must approve the final program and timetable.

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 courses 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 courses 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 3600 Level units of credit specified, 6 Level 1 units of credit in an approved course. Students must also complete a minor sequence of credit in an approved course. 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 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.

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 must complete the full requirements of Program 3620 BE in Civil Engineering except that they are exempt from the General Education 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 might require completion of courses 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

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 offers 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 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 are 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 program 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 program 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 program.

8. The total units of credit in the program is 5 x 48 = 240.
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 School of Civil and Environmental Engineering administer the program.

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 program.

Students must satisfy admission requirements for both the BE in Civil Engineering and BSc programs or may transfer from the BE in Civil 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.

Course credits can accrue simultaneously for both component degrees where there is an overlap of courses 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 courses 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 courses with at least 18 units of credit of level 3 courses) 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 courses therein. Also, students must satisfy the normal prerequisites for entry to Civil Engineering and to individual courses 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 program 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 program 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 Education requirement is exempted; and
   c) a final year engineering major (12 units of credit) is exempted.
10. Group A and Group B courses listed in Rule 12 below will count towards satisfying requirements of both rules 2 and 9 above. The courses 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 courses listed in Rule 12 below in Group B on the basis of courses/requirements in parentheses.
12. Exemptions will be granted for the courses in Group C below with respect to Rule 9 on the basis of the requirements within parentheses.
   a) CVEN3025 (at least 3 units of credit of level III applied mathematics).
   b) CVEN3224, CVEN3322, CVEN3438, CVEN3448, CVEN3525
   c) a final year engineering major (12 units of credit).
   d) the General Education requirement is exempted.

13. Students wishing to major in Physics must consult with the School of Physics in regard to choice of courses.
14. A typical structure of a combined Engineering /Science program 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 courses in the Civil Engineering program.

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

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

Year 4
Science courses to total at least 24 units of credit and CVEN3224, CVEN3322, CVEN3438, CVEN3448, CVEN3526

Year 5
Science courses 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 program with a greater weighting on courses 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 might require completion of additional courses.

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</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 1</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>CHEM1011</td>
<td>Fundamentals of Chemistry A or Higher Chemistry C</td>
<td>6</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td>COMP1011</td>
<td>Computing 1A</td>
<td>0</td>
<td>6</td>
<td></td>
</tr>
<tr>
<td>CVEN1021</td>
<td>Engineering Practice 1A</td>
<td>2</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td>CVEN1023</td>
<td>Statics</td>
<td>3</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td>CVEN1024</td>
<td>Dynamics</td>
<td>0</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>CVEN1025</td>
<td>Computing</td>
<td>0</td>
<td>4</td>
<td></td>
</tr>
<tr>
<td>CVEN1026</td>
<td>Engineering Materials 1</td>
<td>0</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>MATH1131</td>
<td>Mathematics 1A or Higher Math</td>
<td>6</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td>MATH1141</td>
<td>Mathematics 1A or Higher Math</td>
<td>0</td>
<td>6</td>
<td></td>
</tr>
<tr>
<td>PHYS1171</td>
<td>Physics 1CE</td>
<td>0</td>
<td>4</td>
<td></td>
</tr>
<tr>
<td>Total HPW Session 1</td>
<td></td>
<td>20</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total HPW Session 2</td>
<td></td>
<td>22</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total Units of Credit</td>
<td></td>
<td>48</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Year 2</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>COMP1021</td>
<td>Computing 1B</td>
<td>6</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td>COMP2011</td>
<td>Data Organisation</td>
<td>0</td>
<td>6</td>
<td></td>
</tr>
<tr>
<td>CVEN2021</td>
<td>Engineering Practice 2A</td>
<td>2</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td>CVEN2022</td>
<td>Civil Engineering Practice 2B</td>
<td>0</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>CVEN2025</td>
<td>Engineering Computations 1</td>
<td>0</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>CVEN2026</td>
<td>Mechanics of Solids</td>
<td>3</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td>CVEN2322</td>
<td>Structural Engineering 1</td>
<td>0</td>
<td>6</td>
<td></td>
</tr>
<tr>
<td>CVEN2026</td>
<td>Engineering Materials 2</td>
<td>3</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td>CVEN2525</td>
<td>Water Engineering 1</td>
<td>0</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>MATH1081</td>
<td>Discrete Mathematics</td>
<td>6</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td>MATH2019</td>
<td>Engineering Mathematics 2CE</td>
<td>0</td>
<td>5</td>
<td></td>
</tr>
<tr>
<td>Total HPW Session 1</td>
<td></td>
<td>23</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total HPW Session 2</td>
<td></td>
<td>22</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total Units of Credit</td>
<td></td>
<td>48</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Year 3</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>COMP2021</td>
<td>Digital System Structures</td>
<td>5</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td>COMP2041</td>
<td>Software Construction:</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>CVEN2125</td>
<td>Systems Engineering</td>
<td>0</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>CVEN2126</td>
<td>Engineering Construction</td>
<td>3</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td>CVEN3025</td>
<td>Engineering Computations 2</td>
<td>3</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td>CVEN3126</td>
<td>Engineering Management 1</td>
<td>0</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>CVEN3322</td>
<td>Structural Engineering 2</td>
<td>0</td>
<td>6</td>
<td></td>
</tr>
<tr>
<td>GMAT0442</td>
<td>Surveying for Civil Engineers</td>
<td>3</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td>GMAT0491</td>
<td>Survey Camp</td>
<td>(0)</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td>One Level 3 Computing Elective</td>
<td></td>
<td>5</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td>One Level 3 Computing Elective</td>
<td></td>
<td>5</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td>Total HPW Session 1</td>
<td></td>
<td>19</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total HPW Session 2</td>
<td></td>
<td>21</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total Units of Credit</td>
<td></td>
<td>48</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Year 4</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>CVEN3021</td>
<td>Civil Engineering Practice 3A</td>
<td>4</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td>CVEN3022</td>
<td>Civil Engineering Practice 3B</td>
<td>0</td>
<td>4</td>
<td></td>
</tr>
<tr>
<td>CVEN3224</td>
<td>Geotechnical Engineering 1</td>
<td>0</td>
<td>6</td>
<td></td>
</tr>
<tr>
<td>CVEN3438</td>
<td>Transport Planning &amp; Environment</td>
<td>3</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td>CVEN3448</td>
<td>Transport Engineering</td>
<td>3</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td>CVEN3525</td>
<td>Water Engineering 2</td>
<td>6</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td>One Level 3 Computing Elective</td>
<td></td>
<td>5</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td>Two Level 3 Computing Electives</td>
<td></td>
<td>10</td>
<td>12</td>
<td></td>
</tr>
<tr>
<td>Total HPW Session 1</td>
<td></td>
<td>21</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total HPW Session 2</td>
<td></td>
<td>20</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total Units of Credit</td>
<td></td>
<td>48</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Year 5 – Session 1

Students achieving a weighted average mark exceeding 62 in all civil engineering courses 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>Course Title</th>
<th>HPW</th>
<th>UOC</th>
</tr>
</thead>
<tbody>
<tr>
<td>CVEN4008</td>
<td>Industrial Training</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>CVEN4000</td>
<td>Honours Thesis Part A or B</td>
<td>0</td>
<td>3</td>
</tr>
<tr>
<td>CVEN4021</td>
<td>Civil Engineering Practice 4</td>
<td>4</td>
<td>0</td>
</tr>
<tr>
<td>CVEN4126</td>
<td>Engineering Management 2</td>
<td>3</td>
<td>0</td>
</tr>
<tr>
<td>CVEN4224</td>
<td>Geotechnical Engineering 2</td>
<td>3</td>
<td>0</td>
</tr>
<tr>
<td>CVEN4322</td>
<td>Structural Engineering 3</td>
<td>6</td>
<td>0</td>
</tr>
<tr>
<td>CVEN4525</td>
<td>Water Engineering 3</td>
<td>3</td>
<td>0</td>
</tr>
<tr>
<td>Total HPW Session 1</td>
<td></td>
<td>19</td>
<td></td>
</tr>
<tr>
<td>Total Units of Credit</td>
<td></td>
<td>24</td>
<td></td>
</tr>
</tbody>
</table>

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 courses (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>0</td>
<td>3</td>
</tr>
<tr>
<td>CVEN4139</td>
<td>Advanced Construction &amp; Project Management</td>
<td>0</td>
<td>3</td>
</tr>
<tr>
<td>CVEN4149</td>
<td>Professional Level Project</td>
<td>0</td>
<td>3</td>
</tr>
<tr>
<td>CVEN4159</td>
<td>Advanced Construction Technology &amp; Engineering</td>
<td>0</td>
<td>3</td>
</tr>
<tr>
<td>Computing Major</td>
<td>One Level 4 Computing Elective</td>
<td>0</td>
<td>5</td>
</tr>
<tr>
<td>Computing Major</td>
<td>One Level 4 Computing Elective</td>
<td>0</td>
<td>5</td>
</tr>
<tr>
<td>Geotechnical Engineering Major</td>
<td>Rock Engineering &amp; Geomechanics</td>
<td>0</td>
<td>3</td>
</tr>
<tr>
<td>CVEN4249</td>
<td>Advanced Geotechnical Engineering</td>
<td>0</td>
<td>3</td>
</tr>
<tr>
<td>CVEN4259</td>
<td>Advanced Pavement Engineering</td>
<td>0</td>
<td>3</td>
</tr>
<tr>
<td>Structural Engineering Major</td>
<td>Design of Bridges</td>
<td>0</td>
<td>3</td>
</tr>
<tr>
<td>CVEN4359</td>
<td>Structural Analysis &amp; Finite Elements</td>
<td>0</td>
<td>3</td>
</tr>
<tr>
<td>Transport Engineering Major</td>
<td>Transport Operations &amp; Systems Design</td>
<td>0</td>
<td>3</td>
</tr>
<tr>
<td>CVEN4449</td>
<td>Traffic Management &amp; Control</td>
<td>0</td>
<td>3</td>
</tr>
<tr>
<td>CVEN4459</td>
<td>Transport &amp; Environment</td>
<td>0</td>
<td>3</td>
</tr>
<tr>
<td>Water Engineering Major</td>
<td>Advanced Water Quality &amp; Treatment</td>
<td>0</td>
<td>3</td>
</tr>
<tr>
<td>CVEN4559</td>
<td>Advanced Catchment &amp; Coastal Processes</td>
<td>0</td>
<td>3</td>
</tr>
<tr>
<td>Total HPW Session 2</td>
<td></td>
<td>18 or 19</td>
<td></td>
</tr>
<tr>
<td>Total Units of Credit</td>
<td></td>
<td>24</td>
<td></td>
</tr>
</tbody>
</table>
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 School of Civil and Environmental Engineering administer the program.

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 in Science and Mathematics in approving the BSc component of the program.

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.

Course credits can accrue simultaneously for both component degrees where there is an overlap of courses 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 courses 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 courses therein. Also, students must satisfy the normal prerequisites for entry to Environmental Engineering and to individual courses therein.
5. Students desiring to enrol in the BSc degree program 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 program which can be completed by an additional year of study.
6. The degrees of Bachelor of Engineering and Bachelor of Science are not awarded until the completion of the full five-year program.
7. Students contemplating enrolling in this program 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) the General Education requirement is 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 courses below will count towards satisfying requirements of both rules 2 and 9 above. The courses 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 courses listed in Rule 12 below Group B on the basis of courses/requirements in parentheses.
12. Exemptions will be granted for the courses 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, 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 courses.

14. A typical structure of a combined Engineering/Science program 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 courses in the Environmental Engineering course

- **Year 2**
  - The year 2 courses in the Environmental Engineering program, except that 12 units of credit of Science courses are substituted for CVEN2021, CVEN2722 and General Education.

- **Year 3**
  - Science courses to total at least 36 units of credit and CVEN2021, CVEN2722, CVEN3025, CVEN3126

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

- **Year 5**
  - Science courses 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 program with a greater weighting on courses 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 might require completion of additional courses.

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

Combined Program BE(Environmental) 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</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></td>
<td>CVEN3224</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>CVEN3721</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>CVEN3720</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>CVEN3721</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>CVEN3724</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Year 1</td>
<td>CHEM1011</td>
<td>Fundamentals of Chemistry A or C</td>
<td>6 0 6</td>
<td></td>
</tr>
<tr>
<td></td>
<td>CHEM1031</td>
<td>Higher Chemistry C</td>
<td>6 0 6</td>
<td></td>
</tr>
<tr>
<td></td>
<td>COMP1011</td>
<td>Computing 1A</td>
<td>0 6 6</td>
<td></td>
</tr>
<tr>
<td></td>
<td>CVEN1021</td>
<td>Engineering Practice 1A</td>
<td>2 0 4</td>
<td></td>
</tr>
<tr>
<td></td>
<td>CVEN1023</td>
<td>Statics</td>
<td>3 0 4</td>
<td></td>
</tr>
<tr>
<td></td>
<td>CVEN1024</td>
<td>Dynamics</td>
<td>0 3 4</td>
<td></td>
</tr>
<tr>
<td></td>
<td>CVEN1025</td>
<td>Computing</td>
<td>3 0 4</td>
<td></td>
</tr>
<tr>
<td></td>
<td>CVEN1026</td>
<td>Engineering Materials 1</td>
<td>0 3 4</td>
<td></td>
</tr>
<tr>
<td></td>
<td>CVEN1531</td>
<td>Introduction to Water &amp; Atmospheric Chemistry</td>
<td>0 4 4</td>
<td></td>
</tr>
<tr>
<td></td>
<td>MATH1131</td>
<td>Mathematics 1A or 1B</td>
<td>6 0 6</td>
<td></td>
</tr>
<tr>
<td></td>
<td>MATH1141</td>
<td>Higher Mathematics 1A</td>
<td>6 0 6</td>
<td></td>
</tr>
<tr>
<td></td>
<td>MATH1231</td>
<td>Mathematics 1B or 2B</td>
<td>6 0 6</td>
<td></td>
</tr>
<tr>
<td></td>
<td>MATH1241</td>
<td>Higher Mathematics 1B</td>
<td>6 0 6</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Total HPW Session 1</td>
<td>20</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Total HPW Session 2</td>
<td>22</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Total Units of Credit</td>
<td>48</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Year 2</th>
<th>Course Code</th>
<th>Course Title</th>
<th>HPW</th>
<th>UOC</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>BIOS1101</td>
<td>Evolutionary &amp; Functional Biology</td>
<td>0 6 6</td>
<td></td>
</tr>
<tr>
<td></td>
<td>CEIC3010</td>
<td>Mass Transfer &amp; Materials Balance</td>
<td>3 0 3</td>
<td></td>
</tr>
<tr>
<td></td>
<td>COMP1021</td>
<td>Computing 1B</td>
<td>6 0 6</td>
<td></td>
</tr>
<tr>
<td></td>
<td>COMP2011</td>
<td>Data Organisation</td>
<td>0 6 6</td>
<td></td>
</tr>
<tr>
<td></td>
<td>CVEN2021</td>
<td>Engineering Practice 2A</td>
<td>2 0 3</td>
<td></td>
</tr>
<tr>
<td></td>
<td>CVEN2025</td>
<td>Engineering Computations 1</td>
<td>3 0 3</td>
<td></td>
</tr>
<tr>
<td></td>
<td>CVEN2023</td>
<td>Mechanics of Solids</td>
<td>3 0 3</td>
<td></td>
</tr>
<tr>
<td></td>
<td>CVEN2525</td>
<td>Water Engineering 1</td>
<td>0 3 3</td>
<td></td>
</tr>
<tr>
<td></td>
<td>CVEN2722</td>
<td>Envt Engineering Practice 2B</td>
<td>0 2 3</td>
<td></td>
</tr>
<tr>
<td></td>
<td>MATH1081</td>
<td>Discrete Mathematics</td>
<td>6 0 6</td>
<td></td>
</tr>
<tr>
<td></td>
<td>MATH2019</td>
<td>Engineering Mathematics 2CE</td>
<td>0 5 6</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Total HPW Session 1</td>
<td>23</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Total HPW Session 2</td>
<td>22</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Total Units of Credit</td>
<td>48</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Year 3</th>
<th>Course Code</th>
<th>Course Title</th>
<th>HPW</th>
<th>UOC</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>BIOS3301</td>
<td>Population and Community</td>
<td>0 3 3</td>
<td></td>
</tr>
<tr>
<td></td>
<td>CVEN2021</td>
<td>Digital System Structures</td>
<td>5 0 6</td>
<td></td>
</tr>
<tr>
<td></td>
<td>COMP2041</td>
<td>Software Construction: Techniques and Tools</td>
<td>0 5 6</td>
<td></td>
</tr>
<tr>
<td></td>
<td>CVEN2125</td>
<td>Systems Engineering</td>
<td>0 2 3</td>
<td></td>
</tr>
<tr>
<td></td>
<td>CVEN3025</td>
<td>Engineering Computations 2</td>
<td>3 0 3</td>
<td></td>
</tr>
<tr>
<td></td>
<td>CVEN3126</td>
<td>Engineering Management 1</td>
<td>0 3 3</td>
<td></td>
</tr>
<tr>
<td></td>
<td>CVEN3531</td>
<td>Water Chemistry</td>
<td>0 3 3</td>
<td></td>
</tr>
<tr>
<td></td>
<td>GEOG1711</td>
<td>Planet Earth: Environment in Crisis</td>
<td>3 0 3</td>
<td></td>
</tr>
<tr>
<td></td>
<td>GMAT0753</td>
<td>Introduction to Spatial Information Systems</td>
<td>0 3 3</td>
<td></td>
</tr>
<tr>
<td></td>
<td>INDC4120</td>
<td>Chemistry of the Industrial Environment</td>
<td>0 3 3</td>
<td></td>
</tr>
<tr>
<td></td>
<td>One Level 3 Computing Elective</td>
<td>5 0 6</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>One Level 3 Computing Elective</td>
<td>0 5 6</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Total HPW Session 1</td>
<td>21</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Total HPW Session 2</td>
<td>21</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Total Units of Credit</td>
<td>48</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Year 4</th>
<th>Course Code</th>
<th>Course Title</th>
<th>HPW</th>
<th>UOC</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>CEIC3050</td>
<td>Atmospheric &amp; Process Chemistry</td>
<td>0 3 3</td>
<td></td>
</tr>
<tr>
<td></td>
<td>CVEN3720</td>
<td>Envt Engineering Practice 3A</td>
<td>4 0 6</td>
<td></td>
</tr>
<tr>
<td></td>
<td>CVEN3721</td>
<td>Envt Engineering Practice 3B</td>
<td>0 4 6</td>
<td></td>
</tr>
<tr>
<td></td>
<td>CVEN3224</td>
<td>Geotechnical Engineering</td>
<td>0 6 6</td>
<td></td>
</tr>
<tr>
<td></td>
<td>CVEN3438</td>
<td>Transport Planning &amp; Environment</td>
<td>0 3 3</td>
<td></td>
</tr>
<tr>
<td></td>
<td>CVEN3525</td>
<td>Water Engineering 2</td>
<td>6 0 6</td>
<td></td>
</tr>
<tr>
<td></td>
<td>One Level 3 Computing Elective</td>
<td>5 0 6</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Two Level 3 Computing Electives</td>
<td>0 10 12</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Total HPW Session 1</td>
<td>21</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Total HPW Session 2</td>
<td>20</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Total Units of Credit</td>
<td>48</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Year 5 - Session 1

Students achieving a weighted average mark exceeding 62 in all environmental engineering courses 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>HPW</th>
<th>UOC</th>
</tr>
</thead>
<tbody>
<tr>
<td>CVEN4008</td>
<td>Industrial Training</td>
<td>0 0 0</td>
<td></td>
</tr>
<tr>
<td>CVEN4000</td>
<td>Honours Thesis Part A or B</td>
<td>0 0 0</td>
<td></td>
</tr>
<tr>
<td>CVEN4721</td>
<td>Envt Engineering Practice 4</td>
<td>4 0 6</td>
<td></td>
</tr>
<tr>
<td>CVEN4224</td>
<td>Geotechnical Engineering 2</td>
<td>3 0 4</td>
<td></td>
</tr>
<tr>
<td>CVEN4525</td>
<td>Water Engineering 3</td>
<td>3 0 4</td>
<td></td>
</tr>
<tr>
<td>CVEN4533</td>
<td>Transport &amp; Fate of Pollutants</td>
<td>3 0 3</td>
<td></td>
</tr>
<tr>
<td>CVEN4722</td>
<td>Envt Policy, Law &amp; Economics</td>
<td>3 0 3</td>
<td></td>
</tr>
<tr>
<td>CVEN4723</td>
<td>Waste Management</td>
<td>3 0 4</td>
<td></td>
</tr>
<tr>
<td>Total HPW Session 1</td>
<td>19</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total Units of Credit</td>
<td>24</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

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 courses (listed for each discipline below) must be undertaken.

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
</tr>
</thead>
<tbody>
<tr>
<td>CVEN4001</td>
<td>Honours Thesis Part B</td>
</tr>
<tr>
<td>Computing Major</td>
<td></td>
</tr>
<tr>
<td>One Level 4 Computing Elective</td>
<td>0 5 6</td>
</tr>
<tr>
<td>One Level 4 Computing Elective</td>
<td>0 5 6</td>
</tr>
<tr>
<td>Geotechnical Engineering Major</td>
<td></td>
</tr>
<tr>
<td>CVEN4269</td>
<td>Environmental Geomechanics</td>
</tr>
<tr>
<td>plus two of the following three courses:</td>
<td></td>
</tr>
<tr>
<td>CVEN4239</td>
<td>Rock Engineering &amp; Geomechanics</td>
</tr>
<tr>
<td>CVEN4249</td>
<td>Advanced Geotechnical Engineering</td>
</tr>
<tr>
<td>CVEN4259</td>
<td>Advanced Pavement Engineering</td>
</tr>
<tr>
<td>Transport Engineering Major</td>
<td></td>
</tr>
<tr>
<td>CVEN4439</td>
<td>Transport Operations &amp; Systems Design</td>
</tr>
<tr>
<td>CVEN4449</td>
<td>Traffic Management &amp; Control</td>
</tr>
<tr>
<td>CVEN4459</td>
<td>Transport &amp; Environment</td>
</tr>
<tr>
<td>Water Engineering Major</td>
<td></td>
</tr>
<tr>
<td>CVEN4539</td>
<td>Advanced Water Quality &amp; Treatment</td>
</tr>
<tr>
<td>CVEN4549</td>
<td>Advanced Catchment &amp; Coastal Processes</td>
</tr>
<tr>
<td>CVEN4569</td>
<td>Advanced Environmental Systems</td>
</tr>
<tr>
<td>Chemical Engineering Major</td>
<td></td>
</tr>
<tr>
<td>CEIC3070</td>
<td>Process Control</td>
</tr>
<tr>
<td>CEIC3010</td>
<td>Reaction Engineering</td>
</tr>
<tr>
<td>CHEN2063</td>
<td>Process Chemistry</td>
</tr>
<tr>
<td>Geography Major</td>
<td></td>
</tr>
<tr>
<td>Any two of the following three courses:</td>
<td></td>
</tr>
<tr>
<td>GEOG3025</td>
<td>Geomorphology</td>
</tr>
<tr>
<td>GEOG3761</td>
<td>Environmental Change</td>
</tr>
<tr>
<td>GEOG3921</td>
<td>Coastal Resource Management</td>
</tr>
<tr>
<td>Total HPW Session 2</td>
<td>17 to 20</td>
</tr>
<tr>
<td>Total Units of Credit</td>
<td>24</td>
</tr>
</tbody>
</table>
3631
BE in Civil Engineering BE in Environmental Engineering – Full-time Program

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 School of Civil and Environmental Engineering administers the program.

Rules

1. Students must satisfy the normal program and course prerequisites for Environmental Engineering and Civil Engineering.

2. Program Outline

Year 1
Standard Year 1 of Program 3620

Year 2
CHEM1021 Fundamentals of Chemistry B 3
CVEN2025 Engineering Computations 1 3
CVEN2126 Engineering Construction 3
CVEN2223 Mechanics of Solids 3
CVEN2525 Water Engineering 1 3
CVEN2322 Structural Engineering 1 6
CVEN2026 Engineering Materials 2 3
GMAT0442 Surveying for Civil Engineers 3
GMAT0491 Surveying Camp 3
GEOG1711 Planet Earth: Environment in Crisis 3
MATH2019 Engineering Mathematics 2CE 6
General Education 6

Total Credit Points 48

Year 3
BIOS1101 Evolutionary and Functional Biology 6
CEIC0010 Mass Transfer & Materials Balance 3
CVEN2021 Engineering Practice 2A 3
CVEN2022 Civil Engineering Practice 2B or 3
CVEN2722 Environmental Engineering Practice 2B 3
CVEN2125 Systems Engineering 3
CVEN3126 Engineering Management 1 3
CVEN3322 Structural Engineering 2 6
CVEN3438 Transport Planning & Environment 3
CVEN3448 Transport Engineering 3
CVEN3525 Water Engineering 6
GMAT0753 Introduction to Spatial Information Systems 3
INDC4120 Chemistry of the Industrial Environment 3
General Education 3

Total credit points 48

Year 4
BIOS3301 Population & Community Ecology for Environmental Engineers 3
CVEN3021 Civil Engineering Practice 3A or 3
CVEN3720 Environmental Engineering Practice 3A 6
CVEN3022 Civil Engineering Practice 3B or 3
CVEN3721 Environmental Engineering Practice 3B 6
CVEN3025 Engineering Computations 2 3
CVEN3224 Geotechnical Engineering 1 6
CVEN3531 Water Chemistry 3
CVEN4322 Structural Engineering 3 6
CVEN4722 Environmental Policy, Law & Economics 3
CEIC0050 Atmospheric & Process Chemistry 3
6 Units of Credit Geography Elective 6
General Education 3

Total credit points 48

Year 5 – Session 1
CVEN4008 Industrial Training UOC 0
CVEN4000 Honours Thesis Part A or 3
CVEN4021 Civil Engineering Practice 4 6
CVEN4721 Environmental Engineering Practice 4 6
CVEN4126 Engineering Management 2 or 6
CVEN4723 Waste Management 4
CVEN4224 Geotechnical Engineering 2 4
CVEN4525 Water Engineering 3 4
CVEN4533 Transport & Fate of Pollutants 3
3 Unit of Credit Open Elective 3

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.

CVEN4001 Honours Thesis Part B 4

Construction and Management Major

CVEN4139 Advanced Construction and Project Management 4
CVEN4149 Professional Level Project Management Tools & Skills 4
CVEN4159 Advanced Construction Technology & Engineering 4

Geotechnical Major

Any 3 of the following 4 courses:
CVEN4393 Rock Engineering & Geomechanics 4
CVEN4449 Advanced Geotechnical Engineering 4
CVEN4459 Advanced Pavement Engineering 4
CVEN4469 Environmental Geomechanics 4

Structures Major

CVEN4439 Design of Bridges 4
CVEN4549 Special Topics in Concrete, Steel & Composite Structures 4
CVEN4359 Structural Analysis & Finite Elements 4

Transport Major

CVEN4439 Transport Operations & Systems Design 4
CVEN4449 Traffic Management & Control 4
CVEN4459 Transport & Environment 4

Water Major

Any 3 of the following 4 courses:
CVEN4539 Advanced Water Quality & Treatment 4
CVEN4549 Advanced Catchment & Coastal Processes 4
CVEN4559 Advanced Water Engineering 4
CVEN4569 Advanced Environmental Systems 4

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 u.c.'s 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 program with greater weighting on courses 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 program.

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 with the permission of the Head of the School of Civil and Environmental Engineering.

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

The Faculty of Law administers this program 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 courses in these faculties. Students must study engineering courses 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 courses 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>CVEN1021</td>
<td>Engineering Practice 1A</td>
<td>4</td>
</tr>
<tr>
<td>CVEN1025</td>
<td>Computing</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>CVEN1026</td>
<td>Engineering Materials 1</td>
<td>4</td>
</tr>
<tr>
<td>MATH1131</td>
<td>Mathematics 1A or</td>
<td></td>
</tr>
<tr>
<td>MATH1141</td>
<td>Higher Mathematics 1A</td>
<td>6</td>
</tr>
<tr>
<td>MATH1231</td>
<td>Mathematics 1B or</td>
<td>6</td>
</tr>
<tr>
<td>MATH1241</td>
<td>Higher Mathematics 1B</td>
<td>6</td>
</tr>
<tr>
<td>PHYS1279</td>
<td>Physics 1CE</td>
<td>6</td>
</tr>
<tr>
<td>LAWS1051</td>
<td>Legal System</td>
<td>3</td>
</tr>
<tr>
<td>LAWS1061</td>
<td>Torts</td>
<td>6</td>
</tr>
<tr>
<td>LAWS7410</td>
<td>Legal Research and Writing</td>
<td>3</td>
</tr>
<tr>
<td><strong>Total credit points</strong></td>
<td><strong>48</strong></td>
<td></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>CHEM1011</td>
<td>Fundamentals of Chemistry A or</td>
<td></td>
</tr>
<tr>
<td>CHEM1031</td>
<td>Higher Chemistry C</td>
<td>6</td>
</tr>
<tr>
<td>CVEN2025</td>
<td>Engineering Computations 1</td>
<td>3</td>
</tr>
<tr>
<td>CVEN2125</td>
<td>Systems Engineering</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>CVEN2322</td>
<td>Structural Engineering 1</td>
<td>6</td>
</tr>
<tr>
<td>CVEN2026</td>
<td>Engineering Materials 2</td>
<td>3</td>
</tr>
<tr>
<td><strong>Total credit points</strong></td>
<td><strong>48</strong></td>
<td></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>CVEN2525</td>
<td>Water Engineering 1</td>
<td>3</td>
</tr>
<tr>
<td>MATH2019</td>
<td>Engineering Mathematics 2 CE</td>
<td>6</td>
</tr>
<tr>
<td>LAWS1071</td>
<td>Contracts 1</td>
<td>3</td>
</tr>
<tr>
<td>LAWS1072</td>
<td>Contracts 2</td>
<td>6</td>
</tr>
<tr>
<td>LAWS2140</td>
<td>Public Law</td>
<td>3</td>
</tr>
<tr>
<td><strong>Total credit points</strong></td>
<td><strong>48</strong></td>
<td></td>
</tr>
</tbody>
</table>

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></td>
</tr>
<tr>
<td>CVEN4021</td>
<td>Civil Engineering Practice 4</td>
<td>6</td>
</tr>
<tr>
<td>CVEN4126</td>
<td>Engineering Management 2</td>
<td>4</td>
</tr>
<tr>
<td>CVEN4224</td>
<td>Geotechnical Engineering 2</td>
<td>4</td>
</tr>
<tr>
<td>CVEN4322</td>
<td>Structural Engineering 3</td>
<td>6</td>
</tr>
<tr>
<td>CVEN4525</td>
<td>Water Engineering 3</td>
<td>4</td>
</tr>
<tr>
<td><strong>Total credit points</strong></td>
<td><strong>24</strong></td>
<td></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.

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>UOC</th>
</tr>
</thead>
<tbody>
<tr>
<td>LAWS2160</td>
<td>Administrative Law</td>
<td>6</td>
</tr>
<tr>
<td>LAWS6210</td>
<td>Law, Lawyers and Society</td>
<td>6</td>
</tr>
<tr>
<td>CVEN4001</td>
<td>Honours Thesis Part B</td>
<td>4</td>
</tr>
<tr>
<td><strong>Total credit points</strong></td>
<td><strong>48</strong></td>
<td></td>
</tr>
</tbody>
</table>

Year 5

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>UOC</th>
</tr>
</thead>
<tbody>
<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 Structures</td>
<td>4</td>
</tr>
<tr>
<td>CVEN4359</td>
<td>Structural Analysis &amp; Finite Elements</td>
<td>4</td>
</tr>
<tr>
<td><strong>Total credit points</strong></td>
<td><strong>24</strong></td>
<td></td>
</tr>
</tbody>
</table>

Year 6

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>UOC</th>
</tr>
</thead>
<tbody>
<tr>
<td>CVEN4393</td>
<td>Advanced Structural Engineering</td>
<td>4</td>
</tr>
<tr>
<td>CVEN4394</td>
<td>Advanced Geotechnical Engineering</td>
<td>4</td>
</tr>
<tr>
<td>CVEN4259</td>
<td>Advanced Pavement Engineering</td>
<td>4</td>
</tr>
<tr>
<td><strong>Total credit points</strong></td>
<td><strong>48</strong></td>
<td></td>
</tr>
</tbody>
</table>

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 grade of Honours are made in recognition of superior
performance throughout the program with greater weighting on courses in the later years.
6. The total units of credit in the program is $6 \times 48 = 288$.
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.

The Faculty of Law administers this program 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 courses in those faculties. Students must study engineering courses in a sequence approved by the Faculty of Engineering. There are no general Faculty prerequisites to courses offered by he Faculty of Law but students must study law courses 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 Name</th>
<th>UOC</th>
</tr>
</thead>
<tbody>
<tr>
<td>CHEM1011</td>
<td>Fundamentals of Chemistry A or 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 &amp; Atmospheric Chemistry</td>
<td>4</td>
</tr>
<tr>
<td>MATH1311</td>
<td>Mathematics 1A or Higher Mathematics 1A</td>
<td>6</td>
</tr>
<tr>
<td>LAWS1051</td>
<td>Legal Systems</td>
<td>3</td>
</tr>
<tr>
<td>LAWS1061</td>
<td>Torts</td>
<td>6</td>
</tr>
<tr>
<td>LAWS7410</td>
<td>Legal Research and Writing</td>
<td>3</td>
</tr>
</tbody>
</table>

Total credit points: 48

**Year 2**

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Name</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>CVEN2025</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>INDC4120</td>
<td>Chemistry of the Industrial Environment</td>
<td>3</td>
</tr>
<tr>
<td>MATH1231</td>
<td>Mathematics 1B or Higher Mathematics 1B</td>
<td>6</td>
</tr>
<tr>
<td>LAWS1071</td>
<td>Contracts 1</td>
<td>3</td>
</tr>
<tr>
<td>LAWS1072</td>
<td>Contracts 2</td>
<td>6</td>
</tr>
<tr>
<td>LAWS2140</td>
<td>Public Law</td>
<td>3</td>
</tr>
<tr>
<td>LAWS6210</td>
<td>Law, Lawyers and Society</td>
<td>6</td>
</tr>
</tbody>
</table>

Total credit points: 48

**Year 3**

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Name</th>
<th>UOC</th>
</tr>
</thead>
<tbody>
<tr>
<td>BIOS3301</td>
<td>Population and Community Ecology for Environmental 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>Environmental 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>6</td>
</tr>
<tr>
<td>CVEN3438</td>
<td>Transport 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>Engineering Mathematics 2 CE</td>
<td>6</td>
</tr>
<tr>
<td>LAWS1001</td>
<td>Criminal Law 1</td>
<td>6</td>
</tr>
</tbody>
</table>

Total credit points: 48

**Year 4 – Session 1**

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Name</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>Environmental Engineering Practice 4</td>
<td>6</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>Transport &amp; Fate of Pollutants</td>
<td>3</td>
</tr>
<tr>
<td>CVEN4722</td>
<td>Environmental Policy, Law &amp; Econ</td>
<td>3</td>
</tr>
<tr>
<td>CVEN4723</td>
<td>Waste Management</td>
<td>4</td>
</tr>
</tbody>
</table>

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.

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Name</th>
<th>UOC</th>
</tr>
</thead>
<tbody>
<tr>
<td>LAWS1011</td>
<td>Criminal Law 2</td>
<td>6</td>
</tr>
<tr>
<td>LAWS2160</td>
<td>Administrative Law</td>
<td>6</td>
</tr>
<tr>
<td>CVEN4001</td>
<td>Honours Thesis Part B</td>
<td>4</td>
</tr>
</tbody>
</table>

**Geotechnical Major**

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Name</th>
<th>UOC</th>
</tr>
</thead>
<tbody>
<tr>
<td>CVEN4269</td>
<td>Environmental Geomechanics</td>
<td>4</td>
</tr>
<tr>
<td>CVEN4239</td>
<td>Rock Engineering &amp; Geomechanics</td>
<td>4</td>
</tr>
<tr>
<td>CVEN4249</td>
<td>Advanced Geotechnical Engineering</td>
<td>4</td>
</tr>
<tr>
<td>CVEN4259</td>
<td>Advanced Pavement Engineering</td>
<td>4</td>
</tr>
</tbody>
</table>

**Transport Major**

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Name</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 Management &amp; Control</td>
<td>4</td>
</tr>
<tr>
<td>CVEN4459</td>
<td>Transport &amp; Environment</td>
<td>4</td>
</tr>
</tbody>
</table>

**Water Major**

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Name</th>
<th>UOC</th>
</tr>
</thead>
<tbody>
<tr>
<td>CVEN4539</td>
<td>Advanced Water Quality &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>Advanced Water Engineering</td>
<td>4</td>
</tr>
</tbody>
</table>

**Chemical Engineering Major**

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Name</th>
<th>UOC</th>
</tr>
</thead>
<tbody>
<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 Engineering Electives for Environmental Engineers</td>
<td>4</td>
</tr>
</tbody>
</table>

**Year 5**

48 units of credits from Law [see Faculty of Law Handbook]

**Year 6**

48 units of credits from Law [see Faculty of Law Handbook]

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 greater weighting on courses in the later years.
6. The total units of credit in the program is $6 \times 48 = 288$.
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 programs 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) courses, one in S1 (instead of Engineering Practice) and two in S2 (instead of 12 units of credit of engineering electives). These three commerce courses 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 courses.

To complete the remaining 8 MCom courses, students must apply to register as Master of Commerce students and 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 courses in Year 4. However, course fees apply to the 8 remaining MCom courses.

3622

BE MEngSc in Civil Engineering – Full-time Program

Students may undertake a 4 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 program 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 program 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 into 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. In the ninth semester, 24 units of credit of graduate coursework are undertaken. The 12 units of credit of graduate coursework completed in the eighth semester is counted towards both degrees and the 12 unit of 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 4 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 courses in the sequence approved by the Faculty of Engineering and are not permitted to enrol in any graduate course 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.
4. Normal HECS/fees apply to the first 8 semesters of the program (including the 12 units of credit of postgraduate courses completed in Year 4) consistent with other undergraduate programs within the Faculty. Fees for the remaining 30 units of credit of the MEngSc program will be 75% of the current fee for the standard 48 credit unit MEngSc.
5. The total units of credit required for the BE in Civil Engineering is 4 x 48 = 192 and for the MEngSc is 48.

3627

BE MEngSc in Environmental Engineering – Full-time program

Students may undertake a 4 year full-time combined program leading to the awards of Bachelor of Engineering in Environmental Engineering and Master of Engineering Science in any of the existing sub-disciplines of Environmental Engineering, Project Management; Technology Management; Geotechnical Engineering; Transport Engineering; Coastal Engineering and Management; Groundwater Studies; Hydrology and Water Resources; Waste Management; Water Quality Management; and Water and Wastewater Treatment.

This program 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 program 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 3625 to complete the BE in Environmental Engineering. Students enrolled in the BE in Environmental Engineering (3625) who have achieved an average in excess of 65% in the first three years of their studies may be permitted to transfer into this combined degree program.

Program of Study

Students undertake the first three years (6 semesters) of the BE in Environmental Engineering program. Provided a 65% or better average is achieved in these first three years, students undertake the 4th year of the Environmental 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 unit of credit graduate project/thesis. In the ninth semester, 24 units of credit of graduate coursework are undertaken. 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.
Opportunities are provided for graduate research leading to the award of the two degrees Bachelor of Engineering in Environmental Engineering and Master of Engineering Science (BE MEngSc).

2. Normal HECS/fees apply to the first 8 semesters of the program (including the 12 units of credit of postgraduate courses completed in Year 4) consistent with other undergraduate programs within the Faculty. Fees for the remaining 36 units of credit of the MEngSc program will be 75% of the current fee for the standard 48 unit of credit MEngSc.

Postgraduate Study

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. There are formal graduate programs leading to the award of the degree of Master of Engineering Science 8612, Master of Environmental Engineering Science 8615, the Graduate Diploma in Engineering 5459 and the Graduate Certificate in Civil or Environmental Engineering 7336 or 7337. 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 programs, and specialise in engineering construction and management or aspects of water engineering. Fees are payable for postgraduate 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. Courses are presented in a range of delivery modes including 3 hours per week over a 14 week session (6 uc), 3 hours per week over a 7 week period (3 uc), and as 3 day short courses (3 uc). Subject to approval, candidates may undertake some courses from other schools in the faculty, in other faculties or at other universities.

Students may enrol in a particular plan or specialisation. Usually a student completes the core requirements in the specialisation, and then a choice of elective courses and/or a project. The Postgraduate Coursework Coordinator must approve elective courses.

Graduate Diploma candidates are required to complete a program of study totalling 36 units of credit of coursework and may choose from a range of courses in the discipline of their choice, perhaps including all the core courses of one of the specialisations. All courses 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 courses.

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

3. The total units of credit required for the BE in Environmental Engineering is 4 x 48 = 192 and for the MEngSc is 48.

4. Students must study all courses in the sequence approved by the Faculty of Engineering and are not permitted to enrol in any graduate courses until the first seven semesters of the program are successfully completed.

5. A minimum average of 65% in the first 3 years of the BE program is required.

8612
Master of Engineering Science
MEngSc

Internal Mode Delivery

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

Management
CVEN9701 Engineering Economics and Financial 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. Courses are selected from the following list.

CVEN9775 Numerical Methods in Geotechnical Engineering
CVEN9776 Engineering for Underground Structures
CVEN9779  Soil Dynamics and Earthquake Engineering
CVEN9783  Pavement Materials
CVEN9784  Pavement Analysis and Design
CVEN9785  Pavement Evaluation and Management
CVEN9786  Industrial, Airport and Heavy Duty Pavements
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
CVEN9798  Fundamentals of Geomechanics
CVEN9799  Geotechnics of Waste Disposal and Site Remediation
CVEN7807  Groundwater Hydrology
CVEN7808  Investigation of Groundwater Resources
CVEN7809  Geophysical Techniques in Groundwater Studies

8612.3000  Structural Engineering

Courses are selected from the following list.

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

Courses are selected from the following list.

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
CVEN9783  Pavement Materials
CVEN9784  Pavement Analysis and Design
CVEN9785  Pavement Evaluation and Management
CVEN9786  Industrial, Airport and Heavy Duty Pavements

8612.5000  Water Engineering

In addition to the specialisations listed below, a more general MEngSc program in Water Engineering can be undertaken by choosing 48 units of credit from any of the core areas shown below or the list of additional elective courses.

Specialization in Water Engineering is possible in the following six areas by completing the core courses:

- Coastal Engineering and Management
- Groundwater Studies
- Hydrology and Water Resources
- Waste Management
- Water Quality Management
- Water and Wastewater Treatment

Details of each speciality area's core requirements are given below. It should be noted that not all courses are offered each year and the School Office should be consulted for details of which courses are offered in any particular year.

Specialization Area Core Course Requirements

8612.5100  Waste Management
The courses in this 30 units of credit core are all offered over a 14 week period. The remaining 18 units of credit can be made up from the electives listed or as approved by the Postgraduate Coursework Coordinator. The core courses are:

CVEN9851  Unit Operations in Public Health Engineering
CVEN9872  Solid Waste Management
CVEN9881  Hazardous Waste Management
CVEN9884  Environmental Engineering Science 1
CVEN9885  Environmental Engineering Science 2

8612.5200  Water and Wastewater Treatment
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 18 units of credit can be made up from electives listed or as approved by the Postgraduate Coursework Coordinator. The core courses are:

CVEN9851  Unit Operations in Public Health Engineering
CVEN9884  Environmental Engineering Science 1
CVEN9885  Water and Wastewater Analysis
CVEN9856  Water Treatment
CVEN9857  Wastewater Treatment

Additional Elective Courses

CVEN7817  Water in Mining Engineering
CVEN7829  Decision Support Systems
CVEN7822  Water Resources Modelling 2
GEOL9055  Hydrogeochemical Modelling
SESC9261  Introduction to Environmental Risk Assessment

8612.5300  Groundwater Studies
All courses in this 24 units of credit core are 3 units of credit offered in 3-day short course mode. GEOL courses are offered in co-operation with the School of Geology. The program is organised by the UNSW Groundwater Centre. The remaining 24 units of credit may be from electives listed or as approved by the Postgraduate Coursework Coordinator. The core courses are:

CVEN7807  Groundwater Hydrology
CVEN7808  Investigation of Groundwater Resources
CVEN7809  Geophysical Techniques in Groundwater Studies
CVEN7819  Hydrological Processes
CVEN7823  Applied Groundwater Modelling
GEOL9111  Groundwater Environments
GEOL9053  Hydrogeochemistry
GEOL9054  Analysis and Interpretation of Hydrochemical Data

8612.5400  Coastal Engineering and Management
All courses in this 24 units of credit core are 3 units of credit offered in 3-day short course mode. The remaining 24 units of credit may be from electives listed or as approved by the Postgraduate Coursework Coordinator. The core courses are:

CVEN7819  Hydrological Processes
CVEN7802  Coastal Dynamics
CVEN7803  Coastal & Beach Processes
CVEN7804  Coastal Structures
CVEN7805  Coastal Zone Management
CVEN7807  Groundwater Hydrology
CVEN7812  Natural and Artificial Wetlands
CVEN7813  Estuarine Processes

8612.5500  Hydrology and Water Resources
All courses in this 24 units of credit core are 3 units of credit offered in 3-day short course mode. The remaining 24 units of credit may be from electives listed or as approved by the Postgraduate Coursework Coordinator. The core courses are:
8612.5600 Water Quality Management
All courses in this 36 units of credit core are offered in 3-day short course mode. The remaining 12 units of credit may be from electives listed or as approved by the Postgraduate Coursework Coordinator.
The core courses are:
CVEN7819 Hydrological Processes
CVEN7820 Rainfall and Runoff Processes
CVEN7800 Urban Hydrology and Stormwater
CVEN7807 Groundwater Hydrology
CVEN7815 Introduction to Catchment Models
CVEN7816 Catchment Surface Models
CVEN7814 Flood Estimation
CVEN7824 Risk Analysis in Water Engineering

Additional Water Engineering Electives
GEOL9055 Hydrogeological Modelling
CVEN7810 Electrical Methods in Groundwater Investigation
CVEN7817 Water in Mining Engineering
CVEN7818 Channel and River Models
CVEN7822 Water Resources Modelling 2
CVEN7830 Physical Aspects of Contaminated Groundwater
GEOL9112 Investigation and Management of Salinity
CVEN7801 Design of Stormwater Structures
CVEN7811 Sediment Transport in Alluvial River Systems
CVEN7825 Aquatic Chemistry for Engineering
CVEN7831 Chemical and Biological Aspects of Contaminated Groundwater
CVEN9930 Masters Project

8617 Master of Engineering Science

MEngSc (External Mode Delivery)
- External MEngSc courses are offered on a fee-paying basis. Specialisation is offered in the following areas:
8617.1600 Project Management
8617.1700 Construction Management
8617.1800 Engineering/Technology Management
8617.1900 Infrastructure Management

Management
CVEN8701 Engineering Economics and Financial Management
CVEN8702 Project Planning and Control
CVEN8703 Quality and Quality Systems
CVEN8706 Human Resources Management
CVEN8707 Contracts Management
CVEN8708 Asset Management
CVEN8710 Management of Risk
CVEN8711 Management and Professional Services
CVEN8714 Resource Management
CVEN8717 Marketing in Technology and Engineering
CVEN8718 Strategic Management in Engineering
CVEN8720 Problem Solving and Decision Making
CVEN8726 Legal Studies and Professional Practice
CVEN8730 International Project Management
CVEN8731 Project Management Framework

Construction
CVEN8723 Design of Construction Operations
CVEN8724 Construction Engineering and Technology
CVEN8727 Construction Estimating and Tendering

8617.4000 Transport Engineering
CVEN8414 Transport Systems Part 1
CVEN8415 Transport Systems Part 2
CVEN8421 Fundamentals of Traffic Engineering
CVEN8422 Traffic Management and Control

Choose electives from management courses listed above.

8617.5000 Water Engineering

Specialisation is offered in the following areas.
- Waste Management
- Water and Wastewater Treatment

Each specialised area has a requirement of five compulsory core courses with elective courses to be chosen either from core courses in alternative specialisation areas listed below or from additional (non-core) courses listed below. Courses are 6 units of credit unless noted otherwise.

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

8617.5100 Waste Management
CVEN8851 Unit Operations in Water and Waste Management
CVEN8872 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 Water Management
CVEN8855  Water and Wastewater Analysis and Quality Requirements
CVEN8856  Water Treatment
CVEN8857  Wastewater Treatment
CVEN8884  Environmental Engineering Science 1

Additional External Courses
CVEN8799  Geotechnics of Waste Disposal & Site Remediation
CVEN8888  Environmental Management
CVEN8889  Environmental Economics and Law
CVEN8930  Masters Project

8618
Master of Environmental Engineering Science

MEnvEngSc  (External Mode Delivery)
This program is offered on a fee-paying basis.

Core courses
CVEN8884  Environmental Engineering Science 1
CVEN8885  Environmental Engineering Science 2
CVEN8888  Environmental Management
CVEN8889  Environmental Economics and Law

Elective courses
CVEN8799  Geotechnics of Waste Disposal & Site Remediation
CVEN8851  Unit Operations in Water and Waste Management
CVEN8855  Water and Wastewater Analysis and Quality Requirements
CVEN8856  Water Treatment
CVEN8857  Wastewater Treatment
CVEN8872  Solid Waste Management
CVEN8881  Hazardous Waste Management
CVEN8930  Masters Project

Graduate Diplomas in Civil and Environmental Engineering

Graduate Diploma students undertake 36 units of credit coursework. Candidates may choose from a range of courses in the special area of their choice.

All courses offered in the Masters programs can also be taken in the Graduate Diploma programs subject to the approval of the Postgraduate Coursework Coordinator. There are also opportunities to select courses from other professional areas in which candidates may be interested. In some cases 12 units of credit may be derived from approved undergraduate courses and the programs may contain courses from other schools of the Faculty, other faculties of the University and other universities to the approval of the Coordinator.

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

External GradDip programs are offered on a fee paying basis

5459
Graduate Diploma

GradDip  (Internal Mode Delivery)
Civil Engineering

Courses offered are the same as those for 8612 (see above).

5454
Graduate Diploma

GradDip  (External Mode Delivery)

Courses offered are the same as those for 8617 (see above) and are in the following areas:

Graduate Certificates in Civil and Environmental Engineering

Graduate Certificate in Civil Engineering 7336
Graduate Certificate in Environmental Engineering 7337

The School of Civil and Environmental Engineering offers a Graduate Certificate qualification which will be awarded on the successful completion of postgraduate courses totalling 24 units of credit. There is a wide range of courses available (see lists of courses for the Master of Engineering Science programs 8612 and 8617) in a range of delivery modes including internal, external and short course modes. Most courses offered in the Masters programs can also be taken in the Graduate Certificate program subject to the approval of the Postgraduate Coursework Coordinator.

The Graduate Certificate program will suit practising engineers, and other graduates, wishing to pursue a specialised range of courses to enhance their career opportunities in a particular area. It will also provide an opportunity to those who have relevant professional experience but limited formal qualifications to study in a specialist area at the graduate level. Enquiries and applications should be directed to the School.

Subject to satisfactory performance, 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 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 Guide, appearing earlier in this book.

CVEN0616
Structures for Chemical Engineering
Staff Contact: School Office
UOC3 HPW2
Note/s: This is a servicing course for other Schools.

CVEN0636
Properties of Materials
Staff Contact: School Office
UOC3 HPW3 S2
Note/s: This is a servicing course for other Schools.

CVEN0646
Water and Wastewater Engineering
Staff Contact: School Office
UOC3 HPW3 S1
Note/s: This is a servicing course for other Schools.
Basic concepts of hydraulics: Fluid properties, hydrostatics, motion of fluids, conduit 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: School Office
UOC3 HPW3 S2
Note/s: This is a servicing course for other Schools.
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 space improvement.

CVEN1021
Engineering Practice 1A
Staff Contact: School Office
UOC4 HPW2 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: School Office
UOC6 HPW4 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: School Office
UOC4 HPW3 S1 S2
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 (determinant, 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: School Office
UOC4 HPW3 S2
Assumed Knowledge: CVEN1023
An introductory subject dealing with mechanics of bodies and 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: School Office
UOC4 HPW3 S1 S2
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: School Office
UOC4 HPW3 S1 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: School Office
UOC4 HPW4 S2
Corequisite/s: CVEN1312, PHYS1979, MATH1311 or MATH1141
Assumed Knowledge: CHEM1011

CVEN2021
Engineering Practice 2A
Staff Contact: School Office
UOC4 HPW2 S1
Prerequisite/s: CVEN1021, CVEN1022
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: School Office
UOC4 HPW2 S2
Prerequisite/s: CVEN2021
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: School Office
UOC3 HPW3 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: School Office
UOC3 HPW3 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: School Office
UOC3 HPW3 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: School Office
UOC3 HPW2 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: School Office
UOC3 HPW3 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 scaffolding, 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, power dams and civils, tunnelling, pipelines and roads, railway and bridge construction.

CVEN2322
Structural Engineering 1
Staff Contact: School Office
UOC6 HPW6 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: School Office
UOC3 HPW3 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: School Office
UOC4 HPW2 S2
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; the broad framework of the physical environment in which we live; engineering degree program and seeks to further develop student and communication; the media; current environmental issues; accounting for the environment.

CVEN3021
Civil Engineering Practice 3A
Staff Contact: School Office
UOC6 HPW4 S1
Prerequisite/s: CVEN2021, CVEN2022
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: School Office
UOC6 HPW4 S2
Prerequisite/s: CVEN2021, CVEN2022
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: School Office
UOC3 HPW3 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.

CVEN3125
Engineering Management 1
Staff Contact: School Office
UOC3 HPW3 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: School Office
UOC6 HPW6 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: School Office
UOC6 HPW6 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; slenderness effects in frames; elastic stability analysis; Euler buckling.

CVEN3438
Transport Planning and Environment
Staff Contact: School Office
UOC3 HPW3 S1
Assumed Knowledge: CVEN2025
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: School Office
UOC3 HPW3 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: School Office
UOC6 HPW6 S1
This course 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.
CVEN3531
Water Chemistry
Staff Contact: School Office
UOC6 HPW3 S2
Prerequisites: CHEM1011, CVEN1531
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.

CVEN3720
Environmental Engineering Practice 3A
Staff Contact: School Office
UOC6 HPW4 S1
Prerequisite/s: CVEN2021, CVEN2022
A project based 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.

CVEN3721
Environmental Engineering Practice 3B
Staff Contact: School Office
UOC6 HPW4 S2
Prerequisite/s: CVEN3720
Assumed Knowledge: CVEN3720
This course 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.

CVEN4000
Honours Thesis Part A
Staff Contact: School Office
UOC6 HPW4 S1 S2
Prerequisite/s: 132 units of credit completed and WA of 62 units of credit.
Note/s: Only students having a weighted average as set by the School (currently > 60%) in all courses 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 an approved 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.

CVEN4001
Honours Thesis Part B
Staff Contact: School Office
UOC4 HPW3 S1 S2
Prerequisite/s: CVEN4000
Part B of the honours thesis. Subject description as for CVEN4000.

CVEN4008
Industrial Training
Staff Contact: School Office
UOC1 HPW0 X1 S1 S2
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.

CVEN4021
Civil Engineering Practice 4
Staff Contact: School Office
UOC6 HPW4 S1
Prerequisite/s: CVEN3021, CVEN3022
Assumed Knowledge: CVEN3021, CVEN3022
This final year integrating subject involves formulating designs for and solution to real world civil engineering problems. The problems will be drawn from industry and will be multi-disciplinary involving application of material learnt throughout the undergraduate program. The subject will involve either group or individual project work and will involve the preparation of working drawings and project reports similar to those required in industry.

CVEN4126
Engineering Management 2
Staff Contact: Prof D Carmichael UOC4 HPW3 WKS14 S1
Assumed Knowledge: CVEN3126
Management of project and engineering resources. Topics chosen from: management of assets and facilities; contracts management and administration; legal matters and professional practice; financial management; engineering economics; management of international projects; marketing; managing professional services.

CVEN4139
Advanced Construction and Project Management
Staff Contact: School Office
UOC4 HPW3 S2
Prerequisite/s: CVEN3126, CVEN4126
Advanced construction technology topics and topics in the planning, design, organisation, coordination, staffing, administration, control and management of construction and allied projects.

CVEN4149
Professional Level Project Management Tools and Skills
Staff Contact: School Office
UOC4 HPW3 S2
Prerequisite/s: CVEN3126, CVEN4126
Professional level construction and project management skills and techniques.

CVEN4159
Advanced Construction Technology and Engineering
Staff Contact: School Office
UOC4 HPW3 S2
Prerequisite/s: CVEN3126, CVEN4126
State-of-the-art work associated with selected advanced topics in construction technology and engineering.

CVEN4224
Geotechnical Engineering 2
Staff Contact: School Office
UOC4 HPW3 S1
Assumed Knowledge: CVEN3224
Theoretical presumptive bearing capacity of shallow foundations. Allowable settlement and foundations on sand, clay and rock. Lateral earth pressures and retaining wall design. Single axially and laterally loaded piles and pile groups.

CVEN4229
Rock Engineering and Geomechanics
Staff Contact: School Office
UOC4 HPW3 S2
Prerequisite/s: CVEN3224, CVEN4224
Description of rock mass and discontinuities; rock strength and failure criteria. Core logging; field data collection, mapping and fracture surveys; data presentation; hemispherical projections; introductory rock slope stability; foundations on rock; excavation of rock; in-situ stress; stresses about underground openings; classification systems and tunnel support requirements; introduction to and applications of critical state soil mechanics; numerical methods in geomechanics.
CVEN4249
Advanced Geotechnical Engineering
Staff Contact: School Office
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: School Office
UOC4 HPW3 S2
Prerequisite/s: CVEN3224, CVEN4224
Site investigation for pavements, sampling and in-situ testing of sub-grades, prediction of moisture equilibria; 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 mechanic analysis and design; mechanic 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.

CVEN4269
Environmental Geomechanics
Staff Contact: School Office
UOC4 HPW3 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.

CVEN4339
Design of Bridges
Staff Contact: School Office
UOC4 HPW3 S2
Prerequisite/s: CVEN3222, 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: School Office
UOC4 HPW3 S2
Prerequisite/s: CVEN2322, 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. CompositeSteel-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: School Office
UOC4 HPW3 S2
Prerequisite/s: CVEN2322, 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: School Office
UOC4 HPW3 S2
Prerequisite/s: CVEN3438
This course 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 railyards. Case studies related to ferry services, bus operations and freight transport are also covered.

CVEN4449
Traffic Management and Control
Staff Contact: School Office
UOC4 HPW3 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: School Office
UOC4 HPW3 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: School Office
UOC4 HPW3 S1
Assumed Knowledge: CVEN3525
Topics include water quality parameters; unit operations in treatment of water and wastewater; water and wastewater treatment; potable water distribution systems; sewage collection systems; and stormwater systems.
CVEN4533
Transport and Fate of Pollutants
Staff Contact: School Office
UOC3 HPW3 S1
Assumed Knowledge: CVEN3525
Topics include pollutant sources; spreading of substances in air, water and groundwater environments; transport processes in rivers, estuaries, lakes and coastal waters; quantification of a groundwater resource, its sustainability and possible contamination.

CVEN4539
Advanced Water Quality and Treatment
Staff Contact: School Office
UOC4 HPW3 S2
Prerequisite/s: CVEN4525
Topics will be selected from the area of water quality and treatment. Topics may include water and wastewater treatment; water quality in rivers, lakes, reservoirs, estuaries, and coastal waters; catchment processes and management; water quality modelling.

CVEN4549
Advanced Catchment and Coastal Processes
Staff Contact: School Office
UOC4 HPW3 S2
Prerequisite/s: CVEN4525
Topics will be selected from the area of catchment and coastal processes. Topics may include catchment processes and management; rainfall and flood estimation with reservoir yield analysis; groundwater systems; stormwater systems; fluvial processes and river engineering; coastal processes, coastal engineering and coastal zone management.

CVEN4559
Advanced Water Engineering
Staff Contact: School Office
UOC4 HPW3 S2
Prerequisite/s: CVEN4525
Topics will be selected from the area of hydraulic and hydrologic systems. Topics may include hydraulic structures; groundwater investigations; hydrological data, analysis and risk assessment; stormwater control structures; computational hydraulics.

CVEN4569
Advanced Environmental Systems
Staff Contact: School Office
UOC4 HPW3 S2
Prerequisite/s: CVEN4525
Topics will be selected from the area of environmental systems and management. Topics may include environmental material accounting techniques; waste management; environmental risk assessment; groundwater system contamination; site remediation; microbiology; water quality in rivers, lakes, reservoirs, estuaries, and coastal waters; water quality modelling.

CVEN4721
Environmental Engineering Practice 4
Staff Contact: School Office
UOC6 HPW4 S1
Prerequisite/s: CVEN3720, CVEN2721
Assumed Knowledge: CVEN3720, CVEN3721
This final year integrating subject involves formulating designs for and solution to real world environmental engineering problems. It continues to integrate the various parts of the environmental engineering degree program and seeks to further develop the students, skill in critical thinking, communication and research. The subject will involve either group or individual project work and will involve the preparation of project reports similar to those required in industry.

CVEN4722
Environmental Policy, Law and Economics
Staff Contact: School Office
UOC3 HPW3 S1
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: School Office
UOC4 HPW3 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: School Office
UOC3 HPW21 S2
Corequisite/s: CVEN7819
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 quality and quantity, 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: School Office
UOC3 HPW21
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: School Office
UOC3 HPW21 S2
Excluded: CVEN9835

CVEN7803
Coastal and Beach Processes
Staff Contact: School Office
UOC3 HPW21 S2
Corequisite/s: CVEN7802
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.

CVEN7805
Coastal Zone Management
Staff Contact: School Office
UOC3 HPW21
Excluded: CVEN9836
CVEN7806 Catchment and Water Quality Management
Staff Contact: School Office
UOC3 HPW21 S1
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: School Office
UOC3 HPW21 S1 S2
Corequisite/s: CVEN7819
Excluded: CVEN9860


CVEN7808 Investigation of Groundwater Resources
Staff Contact: School Office
UOC3 HPW21 S1 S2
Corequisite/s: CVEN7807
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: School Office
UOC3 HPW21 S2
Excluded: CVEN9861


CVEN7811 Sediment Transport in Alluvial River Systems
Staff Contact: School Office
UOC3 HPW21
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: School Office
UOC3 HPW21 S1
Corequisite/s: CVEN7819
Excluded: CVEN9863


CVEN7813 Estuarine Processes
Staff Contact: School Office
UOC3 HPW21
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: School Office
UOC3 HPW21 S1
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: School Office
UOC3 HPW21 S2
Corequisite/s: CVEN7820
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 a 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: School Office
UOC3 HPW21
Corequisite/s: CVEN7814, CVEN7815
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.

CVEN7818 Channel and River Models
Staff Contact: School Office
UOC3 HPW21 S1 S2
Corequisite/s: CVEN7815
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-dispersion models in both a coupled and uncoupled situation.
Hydrological Processes
Staff Contact: School Office
UOC3 HPW21 S1 S2
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.

Rainfall and Runoff Processes
Staff Contact: School Office
UOC3 HPW21
Corequisite/s: CVEN7819
Excluded: CVEN9876
Precipitation processes; interception and infiltration; storm runoff processes; loss models; hydrograph analysis.

Water Resources Modelling 1
Staff Contact: School Office
UOC3 HPW21
Prerequisite/s: CVEN7819
Corequisite/s: CVEN7824
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.

Applied Groundwater Modelling
Staff Contact: School Office
UOC3 HPW21
Prerequisite/s: CVEN7807
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.

Risk Analysis in Water Engineering
Staff Contact: School Office
UOC3 HPW21
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.

Aquatic Chemistry for Engineering
Staff Contact: School Office
UOC3 HPW21 S2
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 colloidal chemistry. Tools developed enabling solution of realistic water chemistry problems including introduction to use of chemical speciation computer codes.

Microbiology for Engineering
Staff Contact: School Office
UOC3 HPW21 S1
Corequisite/s: CVEN7825
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.
External Mode Subjects

CVEN8414
Transport Systems Part 1
Staff Contact: Dr V Vandebona
UOC6

CVEN8415
Transport Systems Part 2
Staff Contact: Dr V Vandebona
UOC6

CVEN8421
Fundamentals of Traffic Engineering
Staff Contact: Dr P Hidas
UOC6

CVEN8422
Traffic Management and Control
Staff Contact: Dr P Hidas
UOC6

CVEN8701
Engineering Economics and Financial Management
Staff Contact: School Office
UOC6 HPW0 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 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: School Office
UOC6 HPW0 S2
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: School Office
UOC6 HPW0 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.

CVEN8706
Human Resources Management
Staff Contact: School Office
UOC6 HPW0 S1 S2
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: School Office
UOC6 HPW0 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.

CVEN8710
Management of Risk
Staff Contact: School Office
UOC6 HPW0 S2
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.

CVEN8714
Resource Management
Staff Contact: School Office
UOC6 HPW0 S1 S2
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: School Office
UOC6 HPW0 S2
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: School Office  
UC6  HPW0  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 type.

CVEN8720 Problem Solving and Decision Making  
Staff Contact: School Office  
UC6  HPW0  S2  

CVEN8723 Design of Construction Operations  
Staff Contact: School Office  
UC6  HPW0  S1  
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.

CVEN8730 International Project Management  
Staff Contact: School Office  
UC6  HPW0  S1  S2  

CVEN8731 Project Management Framework  
Staff Contact: School Office  
UC6  HPW0  S1  S2  
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.

CVEN8798 Fundamentals of Geomechanics  
Staff Contact: Dr G E Swarbrick  
UC3  

CVEN8799 Geotechnics Waste Disposal and Site Remediation  
Staff Contact: School Office  
UC6  HPW0  S1  
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.

CVEN8827 Composite Steel-Concrete Structures  
Staff Contact: School Office  
UC6  HPW0  

CVEN8851 Unit Operations in Water and Waste Management  
Staff Contact: School Office  
UC6  HPW0  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.

CVEN8855 Water and Wastewater Analysis and Quality Requirements  
Staff Contact: School Office  
UC6  HPW0  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.

CVEN8856 Water Treatment  
Staff Contact: School Office  
UC6  HPW0  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, ion exchange reverse osmosis. Taste and odour control. Disposal of water treatment residuals.

CVEN8857 Wastewater Treatment  
Staff Contact: School Office  
UC6  HPW0  S2  
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.

CVEN8872 Solid Waste Management  
Staff Contact: School Office  
UC6  HPW0  S2  
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.
CVEN8881
Hazardous Waste Management
Staff Contact: School Office
UOC6 HPW0 S2
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, petro-chemical, food processing, etc.).

CVEN8884
Environmental Engineering Science 1
Staff Contact: School Office
UOC6 HPW0 S1
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: School Office
UOC6 HPW0 S2

CVEN8888
Environmental Management
Staff Contact: School Office
UOC6 HPW0 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 and waste audits, Life Cycle Assessment and other materials accounting techniques.

CVEN8889
Environmental Economics and Law
Staff Contact: School Office
UOC6 HPW0
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.

CVEN8895
Fundamental Knowledge in Environmental Management: Engineering
Staff Contact: School Office
UOC6 HPW0
Note: This is a servicing course for MEnvStud students.

Systems approach to defining environmental problems and developing engineering solutions; simplified models of real world processes; introduction to a range of technologies for environmental protection and resource conservation; applications of science principles to engineering; engineering interfaces with science and sociology.

CVEN8901
Special Topic In Civil and Environmental Engineering
Staff Contact: School Office
UOC6 HPW0 S1 S2
This syllabus changes to allow presentation of a special topic of current interest particularly by visitors with recognised expertise in the topic.

CVEN8930
Masters Project
Staff Contact: School Office
UOC12 HPW0 S1 S2
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.

Internal Mode Subjects

CVEN9405
Urban Transport Planning Practice
Staff Contact: School Office
UOC6 HPW3

CVEN9414
Transport Systems Part 1
Staff Contact: School Office
UOC6 HPW3 S1

CVEN9415
Transport Systems Part 2
Staff Contact: School Office
UOC6 HPW3 S2

CVEN9421
Fundamentals of Traffic Engineering
Staff Contact: School Office
UOC6 HPW3 S1

CVEN9422
Traffic Management and Control
Staff Contact: School Office
UOC6 HPW3 S2
Unsignalised intersections; operating characteristics, capacity and delay. Signalised intersections; capacity and timing analysis. Signal

**CVEN9701**
Engineering Economics and Financial Management
*Staff Contact: School Office*
UOC6 HPW42 X2
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.

**CVEN9702**
Project Planning and Control
*Staff Contact: School Office*
UOC6 HPW3 S1
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: School Office*
UOC6 HPW3 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: School Office*
UOC6 HPW3
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.

**CVEN9708**
Asset Management
*Staff Contact: School Office*
UOC6 HPW3

**CVEN9710**
Management of Risk
*Staff Contact: School Office*
UOC6 HPW3 S2
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.

**CVEN9723**
Design of Construction Operations
*Staff Contact: School Office*
UOC6 HPW3 S1
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.

**CVEN9730**
International Project Management
*Staff Contact: School Office*
UOC6 HPW42 X2

**CVEN9731**
Project Management Framework
*Staff Contact: School Office*
UOC6 HPW3 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: School Office*
UOC3 HPW3

**CVEN9773**
Introduction to Rock Engineering
*Staff Contact: School Office*
UOC3 HPW1.5 S2
An introductory course for those students with no previous knowledge of rock engineering.

**CVEN9776**
Rock Engineering for Underground Structures
*Staff Contact: School Office*
UOC3 HPW3 S2
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.
CVEN9783
Pavement Materials
Staff Contact: School Office
UOC6 HPW3 S1

CVEN9784
Pavement Analysis and Design
Staff Contact: School Office
UOC6 HPW3 S2

CVEN9785
Pavement Evaluation and Management
Staff Contact: School Office
UOC3 HPW3 S1

CVEN9788
Geotechnical Site Investigations
Staff Contact: School Office
UOC6 HPW/42 S1 S2
Geotechnical mapping and logging. Introduction to terrain evaluation, aerial photographic interpretation, remote sensing and engineering geophysics. Drilling, trenching, sampling and in-situ permeability testing of soil and rock. In-situ testing of soil, including SPT, CPT, piezocene, vane shear, dilatometer, pressuremeter, plate load. Laboratory testing of soil including triaxial, direct shear, ring shear, consolidation. Geotechnical model and design parameters. Field instrumentation for pore pressure and displacement. Environmental investigations - sampling of groundwater and contaminated soil, sample storage, testing.

CVEN9790
Soil and Rock Slope Instability and Stabilisation
Staff Contact: School Office
UOC6 HPW3 S2
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; stabilisation methods including geometry change, control of piezometric pressures, anchoring, retaining walls, reinforced soil; design of slopes in soft ground; design of slopes for earthquake; open cut mine slopes and probabilistic design; landslide risk assessment and zoning.

CVEN9792
Foundation Engineering
Staff Contact: School Office
UOC6 HPW3 S1
Principles of foundation design. Design of conventional and special footings such as combined, cantilever etc, load capacity and settlement of single piles and pile groups subjected vertical and lateral loads, raft foundations, pile-raft systems, foundations on difficult soils, lateral earth pressure and sheet pile walls.

CVEN9793
Geomechanics
Staff Contact: School Office
UOC6 HPW3 S1
The fundamentals of the effective stress concept, clay mineralogy, seepage analysis and Laplace Equation, basic and advanced theories of consolidation, nonlinearity and Biots theorem, critical state soil mechanics, fundamentals of continuum mechanics, theory of elasticity, constitutive relationships and failure criteria for real soils, soil plasticity and cam-clay model, theorem of collapse, fundamentals of unsaturated soils mechanics.

CVEN9794
Geotechnical Engineering of Dams
Staff Contact: School Office
UOC6 HPW3 S2

CVEN9795
Design of Dams for Earthquake
Staff Contact: School Office
UOC3 HPW3

CVEN9798
Fundamentals of Geomechanics
Staff Contact: School Office
UOC3 HPW3 S1

CVEN9799
Geotechnics of Waste Disposal and Site Remediation
Staff Contact: School Office
UOC6 HPW3
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.
CVEN9802
Structural Stability
Staff Contact: School Office
UOC6 HPW3 S2

Euler strut; uniform and non-uniform cross sections. Eccentric loading; stressing beyond the elastic limit. Struts continuous over several supports. Stability of frames.

CVEN9806
Prestressed Concrete Design
Staff Contact: School Office
UOC6 HPW3 S2


CVEN9809
Reinforced Concrete Design
Staff Contact: School Office
UOC6 HPW3 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.

CVEN9818
Bridge Engineering
Staff Contact: School Office
UOC6 HPW3 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.

CVEN9820
Computational Structural Mechanics
Staff Contact: School Office
UOC6 HPW3 S2


CVEN9822
Steel Structures
Staff Contact: School Office
UOC6 HPW3 S1


CVEN9824
Advanced Materials Technology
Staff Contact: School Office
UOC6 HPW3 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.

CVEN9827
Composite Steel-Concrete Structures
Staff Contact: School Office
UOC6 HPW0


CVEN9851
Unit Operations in Water and Waste Management
Staff Contact: School Office
UOC6 HPW3 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.

CVEN9855
Water and Wastewater Analysis and Quality Requirements
Staff Contact: School Office
UOC6 HPW3 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.

CVEN9856
Water Treatment
Staff Contact: School Office
UOC6 HPW3 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, ion exchange and reverse osmosis. Taste and odour control. Disposal of water treatment residuals.

CVEN9857
Wastewater Treatment
Staff Contact: School Office
UOC6 HPW3 S2

Principles and applications of aerobic and anaerobic biological processes on 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.

CVEN9872
Solid Waste Management
Staff Contact: School Office
UOC6 HPW3 S2

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.
CVEN9881
Hazardous Waste Management
Staff Contact: School Office
UOC6 HPW3 S2
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, petro-chemical, food processing, etc.).

CVEN9884
Environmental Engineering Science 1
Staff Contact: School Office
UOC6 HPW3 S1
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: School Office
UOC6 HPW3 S2
Excluded: CVEN7827, CVEN7828

CVEN9888
Environmental Management
Staff Contact: School Office
UOC6 HPW3 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: School Office
UOC6 HPW3
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.

CVEN9901
Fundamental Knowledge in Environmental Management: Engineering
Staff Contact: School Office
UOC6 HPW3 S1
Note: This is a servicing course for MEnvStud students.
Systems approach to defining environmental problems and developing engineering solutions; simplified models of real world processes; introduction to a range of technologies for environmental protection and resource conservation; applications of science principles to engineering; engineering interfaces with science and sociology.

CVEN9902
Special Topic in Civil and Environmental Engineering
Staff Contact: School Office
UOC6 HPW3 S1 S2
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 HPW0 S1 S2
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.
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 program.

The Staff of the School are grouped into research groups of Artificial Intelligence, Computer Systems 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 3648, 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 BE MCom is managed in conjunction with the Faculty of Commerce and Economics. The Bachelor of Engineering Bioinformatics, which will commence in 2001, is offered in collaboration with the faculty of Life Sciences. 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

<table>
<thead>
<tr>
<th>Bachelor of Engineering</th>
<th>Duration</th>
</tr>
</thead>
<tbody>
<tr>
<td>3645 BE in Computer Engineering</td>
<td>4 years</td>
</tr>
<tr>
<td>3648 BE in Software Engineering</td>
<td>4 years</td>
</tr>
<tr>
<td>3722 BE BA in Computer Engineering</td>
<td>5 years</td>
</tr>
<tr>
<td>3726 BE BSc in Computer Engineering</td>
<td>5 years</td>
</tr>
<tr>
<td>3728 BE MBiomedE in Computer Engineering</td>
<td>5 years</td>
</tr>
<tr>
<td>BE MCom in Computer Engineering</td>
<td>5 years</td>
</tr>
<tr>
<td>3651 BE BSc in Software Engineering</td>
<td>5 years</td>
</tr>
<tr>
<td>3652 BE BA in Software Engineering</td>
<td>5 years</td>
</tr>
<tr>
<td>Combined BE/BSc in Computer Science</td>
<td>Duration</td>
</tr>
<tr>
<td>3725 BE BSc in Electrical Engineering</td>
<td>5 years</td>
</tr>
<tr>
<td>3730 BE BSc in Civil Engineering</td>
<td>5 years</td>
</tr>
<tr>
<td>3611 BE BSc in Aerospace Engineering</td>
<td>5 years</td>
</tr>
<tr>
<td>3661 BE BSc in Manufacturing Management</td>
<td>5 years</td>
</tr>
<tr>
<td>3681 BE BSc in Mechanical Engineering</td>
<td>5 years</td>
</tr>
<tr>
<td>3701 BE BSc in Naval Architecture</td>
<td>5 years</td>
</tr>
<tr>
<td>3746 BE BSc in Geomatic Engineering</td>
<td>5 years</td>
</tr>
</tbody>
</table>

Majors in Computer Science

<table>
<thead>
<tr>
<th>Program and Degree</th>
<th>Duration</th>
</tr>
</thead>
<tbody>
<tr>
<td>3978 BSc3</td>
<td>3 years (pass)</td>
</tr>
<tr>
<td>3978 BSc</td>
<td>4 years (Hons)</td>
</tr>
<tr>
<td>3400 BA</td>
<td>3 years (Pass)</td>
</tr>
<tr>
<td>3420 BSoc Sc</td>
<td>4 years (Hons)</td>
</tr>
<tr>
<td>3930 BSc BA</td>
<td>4 years (Pass)</td>
</tr>
<tr>
<td>4770 BSc LLB</td>
<td>5 years</td>
</tr>
</tbody>
</table>

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 Student Office.
Undergraduate Study

Program Outlines

COMP B1 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>Year 1</th>
<th>HPW</th>
<th>UOC</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>S1</td>
<td>S2</td>
</tr>
<tr>
<td>COMP1011</td>
<td>Computing 1A or</td>
<td>6</td>
</tr>
<tr>
<td>COMP1711</td>
<td>Higher Computing 1A</td>
<td>6</td>
</tr>
<tr>
<td>COMP1021</td>
<td>Computing 1B or</td>
<td>6</td>
</tr>
<tr>
<td>COMP1721</td>
<td>Higher Computing 1B</td>
<td>6</td>
</tr>
<tr>
<td>ELEC1011</td>
<td>Electrical Engineering 1</td>
<td>6</td>
</tr>
<tr>
<td>MATH1141</td>
<td>Higher Mathematics 1A or</td>
<td>6</td>
</tr>
<tr>
<td>MATH1131</td>
<td>Mathematics 1A</td>
<td>6</td>
</tr>
<tr>
<td>MATH1241</td>
<td>Higher Mathematics 1B or</td>
<td>6</td>
</tr>
<tr>
<td>MATH1231</td>
<td>Mathematics 1B</td>
<td>6</td>
</tr>
<tr>
<td>MATH1081</td>
<td>Discrete Mathematics</td>
<td>6</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>6</td>
</tr>
<tr>
<td>Total HPW Session 1</td>
<td>24</td>
<td></td>
</tr>
<tr>
<td>Total HPW Session 2</td>
<td>24</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></td>
<td>S1</td>
<td>S2</td>
</tr>
<tr>
<td>ACCT9003</td>
<td>Accounting Fundamentals</td>
<td>2</td>
</tr>
<tr>
<td>COMP2111</td>
<td>Data Organisation or</td>
<td>5</td>
</tr>
<tr>
<td>COMP2711</td>
<td>Higher Data Organisation</td>
<td>5</td>
</tr>
<tr>
<td>COMP2021</td>
<td>Digital Systems Structures</td>
<td>5</td>
</tr>
<tr>
<td>COMP3111</td>
<td>Software Engineering</td>
<td>5</td>
</tr>
<tr>
<td>COMP3221</td>
<td>Microprocessors &amp; Embedded Systems</td>
<td>5</td>
</tr>
<tr>
<td>ELEC2021</td>
<td>Circuits and Systems A</td>
<td>3</td>
</tr>
<tr>
<td>ELEC2032</td>
<td>Circuits and Systems B</td>
<td>3</td>
</tr>
<tr>
<td>MATH2610</td>
<td>Higher Real Analysis* or</td>
<td>2.5</td>
</tr>
<tr>
<td>MATH2510</td>
<td>Real Analysis</td>
<td>2.5</td>
</tr>
<tr>
<td>MATH2620</td>
<td>Higher Complex Analysis* or</td>
<td>2.5</td>
</tr>
<tr>
<td>MATH2520</td>
<td>Complex Analysis</td>
<td>2.5</td>
</tr>
<tr>
<td>MATH2859</td>
<td>Probability, Statistics &amp; Information</td>
<td>3</td>
</tr>
<tr>
<td></td>
<td>General Education</td>
<td>4</td>
</tr>
<tr>
<td>Total HPW Session 1</td>
<td>20.5</td>
<td></td>
</tr>
<tr>
<td>Total HPW Session 2</td>
<td>19.5</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></td>
<td>S1</td>
<td>S2</td>
</tr>
<tr>
<td>COMP3710</td>
<td>Software Project Management</td>
<td>2.5</td>
</tr>
<tr>
<td>COMP3211</td>
<td>Computer Architecture</td>
<td>5</td>
</tr>
<tr>
<td>COMP3231</td>
<td>Operating Systems</td>
<td>5</td>
</tr>
<tr>
<td>ELEC3006</td>
<td>Electronics A</td>
<td>5</td>
</tr>
<tr>
<td>MATH2509</td>
<td>Linear Algebra or</td>
<td>3</td>
</tr>
<tr>
<td>COMP3120</td>
<td>Introduction to Algorithms</td>
<td>5</td>
</tr>
<tr>
<td>TELE3013</td>
<td>Telecommunications Systems 1</td>
<td>5</td>
</tr>
<tr>
<td>2 Electives</td>
<td>5</td>
<td>5</td>
</tr>
<tr>
<td>General Education</td>
<td>4</td>
<td>6</td>
</tr>
<tr>
<td>Total HPW Session 1</td>
<td>19</td>
<td></td>
</tr>
<tr>
<td>Total HPW Session 2</td>
<td>20.5</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></td>
<td>S1</td>
<td>S2</td>
</tr>
<tr>
<td>COMP3720</td>
<td>Total Quality Management</td>
<td>2.5</td>
</tr>
<tr>
<td>COMP4910</td>
<td>Thesis Part A</td>
<td>3</td>
</tr>
<tr>
<td>COMP4911</td>
<td>Thesis Part B</td>
<td>12</td>
</tr>
<tr>
<td>COMP4920</td>
<td>Professional Issues and Ethics*</td>
<td>2.5</td>
</tr>
<tr>
<td>4 Electives</td>
<td>15</td>
<td>24</td>
</tr>
<tr>
<td>Total HPW Session 1</td>
<td>20.5</td>
<td></td>
</tr>
<tr>
<td>Total HPW Session 2</td>
<td>22.5</td>
<td></td>
</tr>
<tr>
<td>Total Units of Credit</td>
<td>48</td>
<td></td>
</tr>
</tbody>
</table>

* Notes
1. A mark of at least 70CR is required in MATH1231 or MATH1241 in order to do higher level MATH courses in Year 2.
2. All students in the BE Computer Engineering program must complete at least 60 days of approved Industrial Training before the end of Year 4, as part of the requirements for COMP4920 Professional Issues and Ethics.

Elective Courses
1. The program selected by each student must be approved by the Head of School or nominee. Not all electives are offered in each session. Students are advised each year of the timetable of available electives. It may be possible to substitute other electives run by the participating Schools, apart from those listed below, but this is not permitted if it unduly restricts the range of courses studied overall.
2. Electives for Stages 3 and 4 total 36 units of credit (6 courses of 6 units of credit, or equivalent) and are selected from Groups N, S, CE3, CE4, and D (see below), with these restrictions:
3. At least 6 units of credit must be taken from Group N (more than 6 is not recommended);
4. At least 12 units of credit must be taken from Group CE4;
5. At most 12 units of credit may be counted from Group S;
6. 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).
## Group N Networks Electives
- **TEL3018** Data Networks 1 UOC 6
- **COMP3331** Computer Networks and Applications or Physical Communications UOC 6
- **COMP9331** Computer Networks and Applications or Physical Communications UOC 6

## Group S Science Electives
- **MATH2301** Mathematical Computing A UOC 6
- **MATH2400** Finite Mathematics UOC 3
- **MATH3141** Mathematical Methods EE UOC 6
- **MATH3411** Information, Codes and Ciphers UOC 6
- **PHYS2010** Mechanics UOC 3
- **PHYS2020** Computational Physics UOC 3
- **PHYS2040** Quantum Physics UOC 3
- **PHYS2310** Nuclear Science and Technology UOC 3

## Group CE3 Level-3 Computer Engineering Electives
- **COMP2411** Logic and Logic Programming UOC 6
- **COMP3131** Parsing and Translation or Compiling Techniques and Programming Languages UOC 6
- **COMP3311** Database Systems or Computer Networks UOC 6
- **COMP3411** Artificial Intelligence or Artificial Intelligence UOC 6
- **COMP3421** Computer Graphics or Computer Graphics UOC 6
- **COMP9701** Computer Graphics Using a GUI Toolkit or Computer Graphics UOC 6
- **COMP9751** Human-Computer Interaction or Human-Computer Interaction UOC 6
- **ELEC3004** Signal Processing 1 UOC 6
- **ELEC3014** Systems & Control 1 UOC 6
- **ELEC3016** Electronics B UOC 6

## Group CE4 Level-4 Computer Engineering Electives
- **COMP4001** Object-Oriented System Development UOC 6
- **COMP4111** Distributed Object Systems UOC 6
- **COMP4411** Experimental Robotics UOC 6
- **COMP9116** Software Development Using the B-Method and B-Toolkit UOC 6
- **COMP9242** Advanced Operating Systems UOC 12
- **COMP9243** Distributed Systems UOC 6
- **COMP9231** Integrated Digital Systems or Digital Systems Structures UOC 6
- **ELEC4522** Integrated Digital Systems UOC 6
- **COMP9311** Next Generation Database Systems UOC 6
- **COMP9315** Database System Implementation UOC 6
- **COMP9333** Advanced Computer Networks UOC 6
- **COMP9417** Machine Learning UOC 6
- **COMP9517** Image Processing and Applications UOC 6
- **COMP9519** Multimedia Systems UOC 6
- **COMP9790** Principles of GNSS Positioning UOC 6
- **COMP9791** Modern Navigation & GNSS Positioning Techniques UOC 6
- **ELEC4042** Signal Processing 2 UOC 6
- **ELEC4412** Systems & Control 2 UOC 6
- **ELEC4413** Systems & Control 3 UOC 6
- **ELEC4483** Biomedical Instrumentation, Measurement and Design UOC 6
- **ELEC4503** Electronics C UOC 6
- **ELEC4522** Microelectronics Design & Technology UOC 6
- **ELEC4540** Applied Photovoltaics UOC 6
- **TELE4313** Optical Communications UOC 6
- **TELE4323** Digital Modulation and Coding UOC 6
- **TELE4343** Source Coding and Compression UOC 6
- **TELE4352** Data Networks 2 UOC 6
- **TELE4353** Mobile and Satellite Communication Systems UOC 6
- **TELE4353** Telecommunication Systems UOC 6

## Group D Discontinued Courses
- **COMP2031** Concurrent Computing UOC 6
- **MATH9150** Transform Methods UOC 3
- **PHYS2859** Introductory Semiconductor Physics UOC 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

## SENGAI 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 Student Office, to which enquiries should be directed.

<table>
<thead>
<tr>
<th>HPW</th>
<th>UOC</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>S1</strong></td>
<td><strong>S2</strong></td>
</tr>
<tr>
<td>Stage 1</td>
<td></td>
</tr>
<tr>
<td>SENG1010 Software Engineering Workshop 1A</td>
<td>2.5</td>
</tr>
<tr>
<td>SENG1020 Software Engineering Workshop 1B</td>
<td>2.5</td>
</tr>
<tr>
<td>COMP1011 Computing 1A or Computing 1B</td>
<td>6</td>
</tr>
<tr>
<td>COMP1721 Mathematics 1A</td>
<td>6</td>
</tr>
<tr>
<td>or MATH1141 Higher Math 1A</td>
<td></td>
</tr>
<tr>
<td>MATH1081 Discrete Mathematics</td>
<td>6</td>
</tr>
<tr>
<td>INFS1603 Business Data Management</td>
<td>6</td>
</tr>
<tr>
<td>COMP1021 Computing 1B or Computing 1A</td>
<td></td>
</tr>
<tr>
<td>COMP1721</td>
<td>6</td>
</tr>
<tr>
<td>INFS1611 Requirements Engineering</td>
<td>1.5</td>
</tr>
<tr>
<td>MATH2400 Finite Mathematics</td>
<td>2</td>
</tr>
<tr>
<td>Option - free elective</td>
<td>6</td>
</tr>
<tr>
<td>Total HPW Session 1</td>
<td>24</td>
</tr>
</tbody>
</table>

| Total HPW Session 2 | 20.5 |
| Total Units of Credit | 48 |

<table>
<thead>
<tr>
<th>HPW</th>
<th>UOC</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>S1</strong></td>
<td><strong>S2</strong></td>
</tr>
<tr>
<td>Stage 2</td>
<td></td>
</tr>
<tr>
<td>SENG2010 Software Engineering Workshop 2A 2.5</td>
<td></td>
</tr>
<tr>
<td>SENG2020 Software Engineering Workshop 2B</td>
<td>2.5</td>
</tr>
<tr>
<td>COMP2110 Software System Specification</td>
<td>2.5</td>
</tr>
<tr>
<td>COMP2011 Data Organization or Software System Specification</td>
<td></td>
</tr>
<tr>
<td>COMP2711</td>
<td>5</td>
</tr>
<tr>
<td>COMP2021 Digital Systems Structures</td>
<td>5</td>
</tr>
<tr>
<td>COMP2411 Logic &amp; Logic Programming</td>
<td>5</td>
</tr>
<tr>
<td>INFS2603 Systems Analysis and Design</td>
<td>5</td>
</tr>
<tr>
<td>MATH2859 Statistics for Computing</td>
<td>6</td>
</tr>
<tr>
<td>Option - General Education</td>
<td>6</td>
</tr>
<tr>
<td>Option - Free elective</td>
<td>6</td>
</tr>
<tr>
<td>Total HPW Session 1</td>
<td>20.5</td>
</tr>
<tr>
<td>Total HPW Session 2</td>
<td>21.5</td>
</tr>
<tr>
<td>Total Units of Credit</td>
<td>48</td>
</tr>
</tbody>
</table>
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.

http://www.cse.unsw.edu.au/seng

---

Software Engineering Combined Programs

3651
BE BSc in Software Engineering

The BE (Software Engineering) / BSc combined program requires the completion of 240 UOC, including 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 uc of Science. Combined Programs are exempt from the General Education requirement.

The major Science discipline may not be Computer Science.
The BE(Software Engineering)/BA combined program requires the completion of 240 uoc, including 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. http://www.cse.unsw.edu.au/seng

All Arts programs should be approved by the Faculty of Arts and Social Science.

<table>
<thead>
<tr>
<th>Stage</th>
<th>SENG1010</th>
<th>SENG1020</th>
<th>MATH1131</th>
<th>MATH1081</th>
<th>COMP1011</th>
<th>COMP1021</th>
<th>INFS1611</th>
<th>INFS1603</th>
<th>UOC</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Software Engineering Workshop 1A</td>
<td>Software Engineering Workshop 1B</td>
<td>Mathematics 1A</td>
<td>Discrete Mathematics</td>
<td>Computing 1A or COMP1711</td>
<td>Computing 1B or COMP1721</td>
<td>Requirements Engineering</td>
<td>Business Data Management</td>
<td>S1 24</td>
</tr>
<tr>
<td></td>
<td>- 3</td>
<td>- 3</td>
<td>6</td>
<td>6</td>
<td>6</td>
<td>6</td>
<td>- 3</td>
<td>6</td>
<td>S2 24</td>
</tr>
</tbody>
</table>

Total Units of Credit 24 24

<table>
<thead>
<tr>
<th>Stage</th>
<th>SENG2010</th>
<th>SENG2020</th>
<th>COMP2110</th>
<th>COMP2021</th>
<th>COMP2411</th>
<th>INFS2603</th>
<th>MATH2859</th>
<th>Arts electives</th>
<th>UOC</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>3</td>
<td>3</td>
<td>6</td>
<td>6</td>
<td>6</td>
<td>6</td>
<td>- 3</td>
<td>6</td>
<td>S2 24</td>
</tr>
</tbody>
</table>

Total Units of Credit 24 24

<table>
<thead>
<tr>
<th>Stage</th>
<th>SENG3010</th>
<th>SENG3020</th>
<th>COMP3141</th>
<th>INFS2607</th>
<th>SE Electives</th>
<th>Arts electives</th>
<th>UOC</th>
</tr>
</thead>
<tbody>
<tr>
<td>3</td>
<td>Software Engineering Workshop 3A</td>
<td>Software Engineering Workshop 3B</td>
<td>Software System Design &amp; Implementation</td>
<td>Business Data Networks</td>
<td>9 9</td>
<td>6 6</td>
<td>S1 24</td>
</tr>
<tr>
<td></td>
<td>3</td>
<td>3</td>
<td>6</td>
<td>- 6</td>
<td>9 9</td>
<td>6 6</td>
<td>S2 24</td>
</tr>
</tbody>
</table>

Total Units of Credit 24 24

<table>
<thead>
<tr>
<th>Stage</th>
<th>SE Electives</th>
<th>Arts electives</th>
<th>UOC</th>
</tr>
</thead>
<tbody>
<tr>
<td>4</td>
<td>- 6</td>
<td>24 18</td>
<td></td>
</tr>
</tbody>
</table>

Total Units of Credit 24 24

<table>
<thead>
<tr>
<th>Stage</th>
<th>SENG4921</th>
<th>SENG4910</th>
<th>SENG4911</th>
<th>SE Electives</th>
<th>UOC</th>
</tr>
</thead>
<tbody>
<tr>
<td>5</td>
<td>Professional Issues and Ethics</td>
<td>Thesis part A</td>
<td>Thesis part B</td>
<td>12 12</td>
<td>24 24</td>
</tr>
<tr>
<td></td>
<td>6</td>
<td>6</td>
<td>- 12</td>
<td>12 12</td>
<td></td>
</tr>
</tbody>
</table>

Total Units of Credit 24 24

Notes
1. The chosen courses must form a major sequence of 42 UOC.
2. To satisfy prerequisites it may be necessary to use a different arrangement of courses than shown above.
3. To accommodate particular sequences of Arts electives it may be necessary to change the distribution of SE electives between stages 3, 4 and 5.
4. The BE requirement of 60 days of approved industrial training has been incorporated into SENG4921.

Computer Engineering Combined Programs

Students in Computer Engineering who maintain an average 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, transfer into, or continue in a combined program shall have complied with all the requirements for prerequisite study, sequencing and academic attainment (a credit average, i.e. 65%) of both the Course Authorities concerned.

Students who commence a combined 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 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 both the Course Authorities concerned.

COMPBL 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 programs 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 the 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 the major is chosen from other Faculties, then a major sequence plus at least 12 units of credit from the Schools of the Faculty of Arts and Social Sciences is required.
   
   iii) Mathematics or Computer Science majors are not usually permitted, as the BE BSc combined program is more appropriate.

2. Students in the BE BA program are exempt from all General Education requirements. However, if the 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.

COMPBI 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 & Engineering. All Science majors within program 3970 are available (see Science Handbook for details).

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 Sc program is administered by the School of Computer Science & Engineering.

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 minimum of 60 units of credit in Science courses, including a major sequence in an approved area.

2. Students in the BE BSc program are exempt from all General Education requirements. However, if the 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 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.

Computer Engineering Joint Programs

Students in Computer Engineering who maintain a high average performance may qualify for the award of an additional Masters degree after five years of full-time study in which some common elective material has been merged. (The Masters degrees referred to here are the Master of Biomedical Engineering and the Master of Commerce). Students wishing to enrol in, transfer into, or continue in a joint program shall have complied with all the requirements for prerequisite study, sequencing and academic attainment (a credit average, ie 65%) of both the Course Authorities concerned.

COMPMI 3645
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.

Bachelor of Engineering/Master of Commerce (proposed)
BE MCom

The BE(Computer Engineering)/MCom program requires completion of 240 units of credit, of which 66 UOC are taken within the Faculty of Commerce and Economics. The program requires 48 UOC in each year of the program, and includes 12 UOC of General Education.

Entry to the joint program is possible at the end of Year 3 of the BE(Computer Engineering) program, and requires a weighted average of 65CR over these three years, a recommendation from the Head of the School of Computer Science and Engineering, and approval of the Faculties of Engineering and Commerce.
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 Science, or who wish to take a shorter postgraduate qualification, which may be possible to substitute other electives run by the participating Schools, apart from those listed below, but this is not permitted if it unduly restricts the range of courses studied overall.

Elective Courses

1. The program selected by each student must be approved by the Head of School or nominee. Not all electives are offered in each session. Students are advised each year of the timetable of available electives. It may be possible to substitute other electives run by the participating Schools, apart from those listed below, but this is not permitted if it unduly restricts the range of courses studied overall.

2. Computer Engineering Electives for Years 3 and 4 total 18 units of credit (3 courses of 6 units of credit, or equivalent) and are selected from Groups CE3 and CE4 (as described for the 3645 program). At least one elective must be from Group CE4.

3. Commerce Electives for Years 4 and 5 total 54 units of credit (9 courses of 6 units of credit, or equivalent) and are selected from the list of 'core' and 'non-core' Master of Commerce courses. The Year-4 Commerce elective must be a 'core' course.

Graduate Programs in Information Science

The Information Science Program offers three major streams for graduate diploma or masters students:

- General
- Database Systems

Master of Information Science

MinInfSc

MinInfSc students complete a program totalling 72 units of credit (UOC), typically 12 courses. This may be done by enrolling in one of the three major streams.

The typical duration for the MinInfSc 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.

COMPFS 8508 (General)

Master of Information Science

The following core courses must be completed by all who are undertaking this program:

- COMP9021 Principles of Programming
- COMP9311 Database Systems
- COMP9302 Data Structures and Algorithms
- COMP9511 Human Computer Interaction
- COMP9314 Next Generation Databases
- COMP9315 Database System Implementation
- COMP9414 Artificial Intelligence

Four courses from the following group:
- COMP9416 Knowledge Based Systems
- INFS9927 Knowledge Based Information Systems
### COMPFS 5453 (General)

**Graduate Diploma in Information Science**

Graduate Diploma candidates are required to complete a program totalling 48 units of credit (UOC), typically 8 courses. This may be done by enrolling in one of the three major streams.

The typical duration of this program is two sessions full-time or four sessions part-time. This is based on an enrolment in the max full-time load, i.e. 4 courses per session.

The following core courses must be completed by all who are undertaking this program:

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Name</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>COMP9021</td>
<td>Principles of Programming</td>
<td></td>
</tr>
<tr>
<td>COMP9311</td>
<td>Human Computer Interaction</td>
<td></td>
</tr>
<tr>
<td>INFS5983</td>
<td>Database Systems</td>
<td></td>
</tr>
<tr>
<td>INFS9102</td>
<td>Decision Support Systems</td>
<td></td>
</tr>
<tr>
<td>INFS9416</td>
<td>Knowledge Based Systems</td>
<td></td>
</tr>
<tr>
<td>INFS9592</td>
<td>Next Generation Databases</td>
<td></td>
</tr>
<tr>
<td>INFS9593</td>
<td>Business Data Communication</td>
<td></td>
</tr>
</tbody>
</table>

Electives may be chosen from the following list:

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Name</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>COMP9415</td>
<td>Computer Graphics</td>
<td></td>
</tr>
<tr>
<td>COMP9417</td>
<td>Machine Learning</td>
<td></td>
</tr>
<tr>
<td>IMGT5110</td>
<td>Information Retrieval Systems</td>
<td></td>
</tr>
<tr>
<td>GEOG9012</td>
<td>Remote Sensing Applications</td>
<td></td>
</tr>
<tr>
<td>INF5992</td>
<td>Advanced Data Communications</td>
<td></td>
</tr>
<tr>
<td>INF5993</td>
<td>Object-Oriented Information Systems</td>
<td></td>
</tr>
<tr>
<td>INF5992</td>
<td>Information Systems Management</td>
<td></td>
</tr>
<tr>
<td>INF5992</td>
<td>Data Management</td>
<td></td>
</tr>
</tbody>
</table>

One course from each of the following groups:

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Name</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>COMP9314</td>
<td>Next Generation Databases</td>
<td></td>
</tr>
<tr>
<td>COMP9315</td>
<td>Database System Implementation</td>
<td></td>
</tr>
<tr>
<td>COMP9414</td>
<td>Artificial Intelligence</td>
<td></td>
</tr>
<tr>
<td>COMP9416</td>
<td>Knowledge Based Systems</td>
<td></td>
</tr>
<tr>
<td>INFS9592</td>
<td>Knowledge Based Information Systems</td>
<td></td>
</tr>
<tr>
<td>INFS9593</td>
<td>Decision Support Systems</td>
<td></td>
</tr>
<tr>
<td>GEOG9012</td>
<td>Remote Sensing Applications</td>
<td></td>
</tr>
<tr>
<td>GMAT9604</td>
<td>Land Information Systems</td>
<td></td>
</tr>
<tr>
<td>IMGT5110</td>
<td>Information Retrieval Systems</td>
<td></td>
</tr>
</tbody>
</table>
COMPES 8685
Master of Engineering Science
in Computer Science and Engineering
MEngSc
MEngSc students complete a program totalling 48 units of credit (UOC). The program can be completed in two modes:
Course Work Option
8 x 6 UOC
or
Course Work and Project Option
5 x 6 UOC and
A project taken during the final session worth 18 UOC.

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 hardware, software and 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 are continually evaluated for their relevance and currency.

Graduate Programs in Computer Science

MCompSc students complete a program totalling 96 units of credit (UOC). The program can be completed in two modes:
Course work Option
16 x 6 UOC
or
Project Option
12 x 6 UOC, and a project taken during the final session worth 24 UOC.

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:

Core Requirement: (four courses)
COMP9021 Principles of Programming
COMP9511 Human Computer Interaction
COMP9311 Database Systems
COMP9314 Next Generation Databases
COMP9331 Computer Networks and Applications

Secondary Core: (two courses)
INFS5983 Business Data Communications
COMP9024 Data Structures and Algorithms

Intelligent systems Requirement: (one course)
COMP9414 Artificial Intelligence
COMP9416 Knowledge Based Systems
INFS5927 Knowledge Based Information systems
COMP9417 Machine Learning

This program provides specialised education in all aspects of computer network 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
COMP9331 Computer Networks and Applications

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)
INFS5983 Business Data Communications
COMP9024 Data Structures and Algorithms

Intelligent systems Requirement: (one course)
COMP9414 Artificial Intelligence
COMP9416 Knowledge Based Systems
INFS5927 Knowledge Based Information systems
COMP9417 Machine Learning

Graduate Programs 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.
Mode: Course work and Project
Group A 24 UOC
Group B 36 UOC
Group C & D 12 UOC
Other 24 UOC 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 Enrolment Coordinator. Approved courses are counted as Group D substitutions.

5452
Graduate Diploma in Computer Science

GradDip
GradDipCS students are required to complete a program totaling 72 units of credit (UOC). The program can be completed by taking 12 x 6 UOC.

Postgraduate courses in the School of Computer Science and Engineering are divided into three 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 UOC
Group B 36 UOC
Group C & D 12 UOC

A student may be allowed to take one postgraduate course from another school with prior approval from the Postgraduate Enrolment Coordinator. 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
COMP4111 Distributed Object Systems & Technology
COMP4141 Theory of Computation
COMP9116 Software System Development
COMP9211 Computer Architecture
COMP9231 Integrated Digital Systems
COMP9242 Advanced Operating Systems (12 UOC)
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
COMP9444 Neural Networks
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 Tony Papagelis
UOC6 HPW6 WKS14 S1 or S2
Introductory concepts and basic skills training for competence with personal computers. Foundational concepts of hardware and software. History of computers, 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 graphic 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: A/Prof John Potter
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 or COMP1711
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 Andrew Taylor
UOC6 HPW6 WKS14 S1, S2
Prerequisite/s: COMP1011 or COMP1711
Note/s: Excluded COMP1721 or COMP2811
The objective of this subject is for students to develop proficiency in programming in a high level imperative language and to develop a background of relevant knowledge and skills on which to base further study of computing. Topics covered include: fundamental data structures and algorithms, program testing and debugging and the structure of computer systems. Practical experience of these topics is supplied by laboratory programming exercises and assignments.

COMP1091
Computing 1C
Staff Contact: Dr Kai Engelhardt
UOC6 HPW6 WKS14 S1
Prerequisite/s: UAI score of at least 90, or HSC computing, or COMP1001
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.

COMP1711
Higher Computing 1A
Staff Contact: Mr Richard Buckland
UOC6 HPW6 WKS14 S1
Excluded: COMP1811 or COMP1011
Assumed Knowledge: There is no specific assumed knowledge. This course should be taken by those with HSC Maths, 2 and 3 units (145-150) or 3 and 4 unit Maths (186-200) or UAI >97.
As for COMP1011 but in greater depth.

COMP1721
Higher Computing 1B
Staff Contact: Dr Andrew Taylor
UOC6 HPW6 WKS14 S2
Prerequisite/s: a mark of a least 75 in COMP1011 or COMP1711
Note/s: Excluded COMP1721 OR COMP2811
As for COMP1021 but in greater depth.

COMP2011
Data Organisation
Staff Contact: School Office
UOC6 HPW6 WKS14 S1, S2
Prerequisite/s: COMP1021 or COMP1721
Excluded: COMP2711
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 Jingling Xue
UOC6 HPW5 WKS14 S1 S2
Prerequisite/s: COMP1021 or COMP1721
Note/s: Excluded ELEC1041, 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.

COMP2041
Software Construction: Techniques and Tools
Staff Contact: School Office
UOC6 HPW5 WKS14 S2
Prerequisite/s: COMP1021 or COMP1721 or COMP2811

COMP2110
Software System Specification
Staff Contact: A/Prof Ken Robinson
UOC6 HPW2.5 WKS14 S2
Prerequisite/s: COMP1021 or COMP1721
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 SENG2210.

COMP2411
Logic and Logic Programming
Staff Contact: A/Prof R Van der Meyden
UCO6 HPW5 WK514 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 Albert Nymeyer
UCO6 HPW5 WK514 S1, S2
Prerequisite/s: COMP2011 or COMP2711
Note/s: Excluded COMP9008
Informal specification: Data flow diagram methodology, analysis, design, testing, management and documentation of software. The B-method and formal specification, including set theory, logic and functional abstraction. A major group project involving extensive use of the B toolkit is undertaken.

COMP3120
Introduction to Algorithms
Staff Contact: Mr Richard Buckland
UCO3 HPW2.5 WK514 S2
Prerequisite/s: COMP2011 or COMP2711
Note/s: Excluded COMP3121, COMP9101

COMP3121
Algorithms and Programming Techniques
Staff Contact: Mr Richard Buckland
UCO6 HPW5 WK514 S2
Prerequisite/s: COMP2011 or COMP2711
Note/s: Excluded COMP9101, COMP9120

COMP3131
Parsing and Translation
Staff Contact: Dr Jingling Xue
UCO6 HPW5 WK514 S2
Prerequisite/s: COMP2011 or COMP2711
Note/s: Excluded COMP9102

COMP3141
Software System Design & Implementation
Staff Contact: Dr John Place
UCO6 HPW5 WK514 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 Hosssam Eldindy
UCO6 HPW5 WK514 S2
Prerequisite/s: COMP2021 or ELEC2012
Note/s: Excluded COMP9211
- Combinatorial and sequential circuit design; synchronisation, communication and arbitration; register transfer specification (Modul). 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 William Matheson
UCO6 HPW5 WK514 S2
Prerequisite/s: COMP2021 or ELEC2012
Note/s: Excluded ELEC2041, COMP9921
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, I/O interfacing, polling and interrupt and DMA I/O programming. Examples are mostly taken from the MC68K 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 drivers for additional subsystems are designed, implemented, and tested.

COMP3231
Operating Systems
Staff Contact: Dr Jayasooriah
UCO6 HPW5 WK514 S2
Prerequisite/s: COMP2011 or COMP2711, COMP2021
Note/s: Excluded COMP9201

COMP3311
Database Systems
Staff Contact: A/Prof Bouallem Benattallah
UCO6 HPW5 WK514 S2
Prerequisite/s: COMP2011 or COMP2711
Note/s: Excluded COMP9311, INF3608
COM3331
Computer Networks and Applications
Staff Contact: Dr Sanjay Jha
UOC6 HPW5 WK514 S2
Prerequisite/s: COMP3211 or COMP3711
Note/s: Excluded COMP3331, ELEC4352
Networking technology and protocol overview. Local Area Networks: architectures; media; generalised Medium Access Control methods. IEEE802 LAN standards. Datalink 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 Semester 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: Prof Achim Hoffmann
UOC6 HPW5 WK514 S1
Prerequisite/s: COMP2011 or COMP2711
Note/s: Excluded COMP9414

COMP3421
Computer Graphics
Staff Contact: Dr Tim Lambert
UOC6 HPW5 WK514 S1
Prerequisite/s: COMP2011 or COMP2711
Note/s: Excluded COMP9415, COMP9701

COMP3511
Human Computer Interaction
Staff Contact: Dr Daniel Woo
UOC6 HPW5 WK514 S2
Prerequisite/s: COMP2011 or COMP2711
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: Mr Edward Cowcher
UOC3 HPW2.5 WK514 S2
Prerequisite/s: MATH2859, COMP2011 or COMP2711
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: Mr Edward Cowcher
UOC3 HPW3 WK514 S1
Prerequisite/s: COMP3710 and 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 quality, 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 John Potter
UOC6 HPW4 WK514 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.

COMP4012
Cryptographic Approaches to Distributed Systems
Security
Staff Contact: A/Prof Ron van der Meyden
UOC6 HPW5 WK514 S2
Enrolment: requires School Approval
The course will introduce cryptography, cryptographic protocols and their applications in securing distributed systems, with a focus towards emerging issues in the internet and electronic commerce. The emphasis will be on applications of cryptographic mechanisms rather than the mathematics underlying ciphers. The course will be taught in a seminar format, with students expected to give presentations based on readings of primary and secondary sources.

COMP4111
Distributed Object Systems and Technology
Staff Contact: Dr Ian Gorton
UOC6 HPW4 WK514 S2
Prerequisite/s: Passed at least one COMP3xxx
Assumed Knowledge: Programming skills in C++/ Java
This course provides a comprehensive introduction to the underlying technologies and architectures used in real-life distributed object systems. The topics covered include object request (CORBA), directory services, security services, distributed transaction processing, common application architectures, performance implications and reliability and fault tolerance.

COMP4411
Experimental Robotics
Staff Contact: Dr Arcot Sowmya,
UOC6 HPW5 WK514 S1
Prerequisite/s: 12 units of credit from COMP3### or 12 units of credit from COMP9###
Artificial Intelligence Concepts in Robotics. The approach is experimental, with hands-on experience with a small mobile robot kit. Topics covered will include a selection from: history and philosophy of robotics, hardware components and subsystems, sensors, measurements and perception, robotic architectures, multiple robot systems, localisation problem and solutions, robot learning, navigation and obstacle avoidance, robot planning, robot vision and vision processing.

COMP4415
Logical Foundations of Artificial Intelligence
Staff Contact: Prof Norman Foo
UOC6 HPW4 WK514 S1
Prerequisite/s: COMP3411 and 6UOC COMP3###.
Note/s: Excluded COMP4412 (1996)
This course is a rigorous introduction to the logics that have been shown to be useful for knowledge representation and a wide range of reasoning in formal computer science. The first part covers the syntax and semantics of first-order logic. The syntactic component embodies a computable calculus for inference, while the semantic component shows how one may define the notion of “truth”. A sound calculation is one in which no inference is untrue, while a complete calculus is one which is capable of inferring all truth. We prove soundness and completeness for a popular version of first-order logic. Then we use a consequence of this, called compactness, to show that some garden-variety notions in computer science like transitive closure are not first-order expressible. The second part of the course is an introduction to nonmonotonic reasoning. This is the formalization of the idea of “defaults”, which are used informatively to jump to reasonable conclusions in the absence of information, e.g., if I told you Tweety is a bird and nothing else, you would probably assume it can fly. But if I told you later that Tweety is an emu, you would have to retract your earlier conclusion.

There is no actual prerequisite beyond “mathematical maturity”, which is really the willingness to learn how to do some proofs if you don’t already know it.

In years when most of the class has already a good background in first-order logic, the material will shift to Modal Logic. See the instructor if you wish to find out details.

COMP4910
Thesis Part A
Staff Contact: School Office
UC3 HPW3 WKS S1 or S2

Thesis part A and B are done in the last two semesters of the BE degree program. For full-time students, a nominal three hours per week in the first semester and fifteen hours per week in the second semester 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 semester.

COMP4911
Thesis Part B
Staff Contact: School Office
UC15 HPW15 WKS S1 or S2

Thesis part A and B are done in the last two semesters of the BE degree program. For full-time students, a nominal three hours per week in the first semester and fifteen hours per week in the second semester 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 semester.

COMP4920
Professional Issues and Ethics
Staff Contact: School Office
UC3 HPW2.5 WKS14 S2

Note/s: Excluded COMP4903

This course 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 processes, in addition to ethics. The course will be delivered using lectures, class discussions, written assignments, reading lists, the Internet, presentations, and invited speakers.

COMP9008
Software Engineering
Staff Contact: School Office
UC6 HPW4 WKS14 S1

Assumed Knowledge: COMP9024
Note/s: Excluded COMP3111

Informal specification: Data flow diagram methodology, analysis, design, testing, management and documentation of software. The B-method and formal specification, including set theory, logic and functional abstraction. A major group project involving extensive use of the B toolkit is undertaken.

COMP9020
Foundations of Computer Science
Staff Contact: A/Prof Arthur Ramer
UC6 HPW3 WKS14 S1, S2


COMP9021
Principles of Programming
Staff Contact: School Office
UC6 HPW3 WKS14 S1, S2

Note/s: Excluded COMP1021 or COMP1721

This is a first programming course. 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 algorithms. A brief introduction to Unix is also included. Lab: programming exercises and assignments.

COMP9022
Digital System Structures
Staff Contact: Dr Jayasooria
UC6 HPW3 WKS14 S1

Note/s: Excluded COMP2021


COMP9024
Data Structures & Algorithms
Staff Contact: Dr Nandan Paramesh
UC6 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 Richard Buckland
UC6 HPW3 WKS14 S2

Prerequisite/s: COMP9024

Note/s: Excluded COMP3121, COMP3120

The B-Method is a rigorous mathematically based method for the verification and inheritance operations. There is no dependence on a particular programming language, 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 course 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.


COMP9211 Computer Architecture Staff Contact: A/Prof Hossam Elgindy UOC6 HPW4 WK514 S1 Prerequisite/s: COMP9022 Note/s: Excluded COMP3211 Combinatorial and sequential circuit design and realisation. Arithmetic and logic unit design strategies. Instruction set design: role of performance metrics, RISC vs CISC. Processor design: datapath design, microprogramming, and an introduction to the use of pipelining in enhancing performance. Memory Hierarchy: cache and virtual memory systems. Processor, memory and I/O interface. Testing and design for testability.

COMP9221 Microprocessors and Embedded Systems Staff Contact: Dr Daniel Woo UOC6 HPW4 WK514 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, I/O interfacing, polling and interrupt and DMA I/O programming. Examples are mostly taken from the MC68K 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 drivers for additional subsystems are designed, implemented, and tested.

COMP9231 Integrated Digital Systems Staff Contact: A/Prof Gemot Heiser UOC6 HPW4 WK514 S2 Prerequisite/s: COMP3231 or COMP2021 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.

COMP9243 Distributed Systems Staff Contact: A/Prof Ken Robinson UOC6 HPW3 WK514 S2 Prerequisite/s: COMP3231 or COMP2021, COMP3331 or COMP3931 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 Xumein Lin UOC6 HPW3 WK514 S1 S2 Prerequisite/s: COMP9021 Excluded: COMP3311 A first course 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; introduction to issues in database management, system implementation; survey of trends in database systems. This course may be offered in distance mode from 2001, depending on resources.

COMP9314 Next Generation Database Systems Staff Contact: Dr Raymond Wong UOC6 HPW3 WK514 S1 S2 Prerequisite/s: COMP9024,COMP3311 or COMP3931 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 John Shepheard UOC6 HPW3 WK514 S1 Prerequisite/s: COMP9024 or COMP2011,COMP3911 or COMP3311 Detailed examination of techniques used in the implementation of database management systems. Topics are drawn from: query optimisation, transaction management, advanced file access methods, database performance tuning. Lab: programming project to implement components of an RDBMS.
COMP9331
Computer Networks and Applications  
Staff Contact: Dr Sanjay Jha  
UOC6 HPW3 WK514 S2  
Prerequisite/s: COMP9331  
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 Mahbub Hassan  
UOC6 HPW3 WK514 S2  
Prerequisite/s: COMP3331 and COMP9331  

This course will focus on the routing and switching architectures, algorithms and protocols for packet switching networks, both connectionless and connection orientated networks (such as IP and ATM networks.) Aclnaive Internet addressing: CIDR, VPH, NAT. In depth discussion of interior and exterior routing protocols, such as BGP, OSPF, IP over ATM solutions: such as LANE, Classical IP over ATM, IP switching and MPLS. Mobile IP, Internet Multicasting. Overview of emerging switching and routing technologies, such as optical routing and QoS routing. There is substantial network programming component in the assessable material, for which C programming is assumed.

COMP9333  
Advanced Computer Networks  
Staff Contact: Dr Sanjay Jha  
UOC6 HPW3 WK514 S1  
Prerequisite/s: COMP9332  
Note/s: Quota applies (50)  

This course teaches the fundamentals and practical solutions to quality of service (QoS) based networks, with an emphasis on the next generation internet architecture and protocols. Topics include: scheduling policies (fair queueing, priority queueing etc.), congestion avoidance/control schemes (RED, RIO etc) admission control, multimedia protocols (RTP, RTCP etc). This course will also cover recent QoS related developments by IETF/IEEE such as: IntServ, Diffserv, RSVP, LAN, QoS. There will be hands on practical labs on network performance measurement and some network programming. The assessment of the course includes a substantial hands on project on building a network system in Linux/FreeBSD environment. C programming knowledge is assumed for labs and the project.

COMP9414  
Artificial Intelligence  
Staff Contact: Dr W Wilson  
UOC6 HPW4 WK514 S1  
Prerequisite/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 programming language (Prolog or Lisp). Students may be required to submit simple Artificial Intelligence programs, or essays on an aspect of AI, for assessment, in areas such as robotics, computer vision, natural language processing, and machine learning.

COMP9415  
Computer Graphics  
Staff Contact: Dr Tim Lambert  
UOC6 HPW3 WK514 S1  
Prerequisite/s: COMP9024  
Note/s: Excluded COMP3421 COM9701  


COMP9416  
Knowledge-Based Systems  
Staff Contact: Prof Claude Sammut  
UOC6 HPW3 WK514 S2  
Assumed knowledge: COMP9414 or COMP3411  

This course 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 course 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 Achim Hoffman  
UOC6 HPW3 WK514 S2  
Prerequisite/s: COMP9414 or COMP9411  
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.

COMP9444  
Neural Networks  
Staff Contact: Dr William Wilson  
UOC6 HPW3 WK514 S2  
Prerequisite/s: COMP3411 or COMP9414  
Excluded: COMP4444  
Assumed knowledge: COMP9024  


COMP9511  
Human-Computer Interaction  
Staff Contact: Dr Daniel Woo  
UOC6 HPW3 WK514 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: School Office
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
Pattern Recognition and Vision
Staff Contact: School Office
UOC 6 HPW 3
Prerequisite/s: COMP9517
Note/s: Excluded COMP4012
Principles of pattern recognition and computer vision; review of early processing. Pattern Recognition: classification techniques; structural and syntactic pattern recognition; document image analysis and character recognition; statistical pattern recognition. Computer Vision: 2D and 3D representation; model-based vision and image understanding; motion analysis and active vision; applications in medical imaging, robot vision, satellite imaging, multimedia.

COMP9519
Multimedia Authoring and Cooperative Agents
Staff Contact: Dr Nandan Parameswaran
UOC6 HPW4 WK514 S2
Prerequisite/s: 18UOC COMP3### or COMP9021
Provides an introduction to multimedia computing and distributed multimedia systems. The course 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 (24 Units of Credit)
Staff Contact: School Office
UOC24 HPW 0 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 semester to the School Office. A receipt will be issued.

COMP9945
Project Report (18 Units of Credit)
Staff Contact: School Office
UOC18 HPW WKS S1 or S2
Note/s: MengSc and MinInfSc 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 semester to the School Office. A receipt will be issued.

COMP9790
Principles of GNSS Positioning
Staff Contact: School Office
Enrolment Requires School approval
UOC6 HPW5
Note/s: This course is equivalent to GMAT4900 and is only available to students in stage 4.
This course will introduce the student to reference coordinate systems and time systems, satellite orbital motion, signal propagation and satellite tracking observables. The principles of positioning using the current two Global Navigation Satellite Systems (GNSS) will be studied: the U.S. developed Global Positioning System (GPS) and Russia’s Global Navigation Satellite System (GLONASS). The mathematical models for pseudo-range and carrier phase-based modes of positioning, for both single receiver (absolute) positioning and relative positioning implementations, will be developed. These principles will be illustrated using the Matlab GNSS toolkit, which allows the student to develop algorithms for real and simulated data processing. Local, regional and wide area differential positioning will also be considered. Land, marine and airborne positioning applications will be discussed.

COMP9791
Modern Navigation & Positioning Technologies
Staff Contact: School Office
Enrolment Requires School approval
UOC6 HPW5
Note/s: This course is equivalent to GMAT4910.
This course presents an overview of the various satellite-based and non-satellite navigation technologies and some of their applications. Various user receiver configurations, system augmentations an implementation issues will be analysed. These include: differential GPS (DGPS) schemes and services, real-time systems and their communication links, pseudo-range and carrier phase-based technologies, pseudolites, and combined GPS/GLONASS positioning. In addition, the role of other sensors (such as gyros, accelerometers and inertial navigation systems (INS)) and ancillary data (such as digital maps) can play in navigation will be discussed. Data fusion techniques for integrating GPS (or GLONASS) with INS, such as Kalman Filtering, will be presented. Particular emphasis will be placed on the role such positioning technologies will play in Intelligent Transport Systems (ITS) and future L-Commerce applications. Students will gain hands-on experience with a variety of navigation technology.

SENG1010
Software Engineering Workshop 1A
Staff Contact: School Office
UOC6 HPW2.5 WK514 S2
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 or COMP1711, INF51603
The Software Engineering Workshop is a series of courses that span the first three years of the Software Engineering course. The course 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 courses 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 course in the series will involve group project work, presentations, report writing, and documentation. This is the first course 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 course will not persist for the entire series of courses. Groups will be reformed arbitrarily at various stages.

SENG1020
Software Engineering Workshop 1B
Staff Contact: School Office
UOC6 HPW2.5 WK514 S2
Prerequisite/s: SENG1010.
Corequisite/s: INF51611, COMP1021 or COMP1721
Note/s: See main entry SENG1010
This is the second course 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 course will form the practical component of INF51611.
This is the third course in the series and will cover specification. During this course 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 INFS2603 and COMP2110. As part of the specification document, the groups should identify a set of acceptance tests appropriate to the functional specification. This course forms the practical components of COMP2110.

In this course, the fourth course 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.

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.

In the sixth and final course in the series, the groups will undertake the integration, testing, evaluation, and maintenance of a system, whose components have been produced in SENG2010.

This course represents the thesis proposal component. The proposal is assessed by a seminar given at the end of semester.

The thesis is done in the last two semesters of the BE degree program. For full-time students, seven hours per week in the first semester and fourteen hours per week in the second semester are devoted to directed laboratory and research work on an approved course 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 semester.
School of Electrical Engineering and Telecommunications

Head of School
Professor BG Celler

Director of Academic Studies
Dr E Ambikairajah

Administrative Officers
Mrs S Ratric
Ms MV Spano

The School comprises several discipline areas, indicating shared research interests and teaching commitments: Telecommunications; Energy Systems; Electronics; Systems and Control. 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 being updated to meet the everchanging challenges of present and future needs.

The School offers undergraduate and graduate training in all branches of the professions of electrical engineering and telecommunications. The Degree programs are accredited by The Institution of Engineers, Australia as meeting the requirements for admission to graduate membership. The School is also associated with the Australian Photonics Co-operative Research Centre which conducts research into Optical Fibre communication devices and technology.

A very vibrant Co-op program is offered for Electrical Engineering and Telecommunications students. Co-operative scholarships are funded by Australia's premier industries.
Summary of Undergraduate Courses

Normal full-time

<table>
<thead>
<tr>
<th>Single Degree Programs</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>COMPAA13645 BE in Computer Engineering</td>
<td>4 years</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Combined Degree Programs</th>
<th>Duration</th>
</tr>
</thead>
<tbody>
<tr>
<td>ELECB13720 BE BA in Electrical Engineering</td>
<td>5 years</td>
</tr>
<tr>
<td>TELEB13646 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>TELEB13641 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>

Options within Electrical Engineering include: Telecommunications, Computer Systems, Control Systems, Energy Systems, Electronics, Photovoltaics, Signal Processing. The BE in Computer Engineering is jointly administered by the Schools of Computer Science and Engineering, and Electrical Engineering and Telecommunications.

The undergraduate curricula are being progressively revised to provide flexible training to suit the future needs of students. Individual student needs can be further met by substitution provisions within the programs.

Combined Degree 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.

Guidelines for Substitution of Courses

To suit the special abilities or needs of individual students a limited number of course substitutions is permitted within each program. Any such substitution must have prior approval of the Head of School.

1. The substituted course is of at least the same length and level as the prescribed course.
2. Core courses are normally substituted with courses covering similar material.
3. Students may substitute for two of the Professional Electives, courses of suitable level and difficulty from areas relevant to the profession of Electrical Engineering. One of these substitutions may be a Year 3 elective from within the School. Substitution of one postgraduate course within the School is permitted, provided that the student has passed Year 3 Electrical Engineering and Telecommunications courses at an adequate level and a similar course is not offered at the undergraduate level.
4. Substitution is not permitted if it unduly restricts the range of courses studied to only one area of electrical engineering or computer systems.
6. Substitution is normally not permitted in Year 1 or Year 2.

Guide to Industrial Training Requirement

Each student is personally responsible for ensuring the completion of the full 60 days compulsory industrial training prescribed as part of the requirements for the award of the degree. Industrial Training should be concurrent with enrolment and is best accumulated in the summer recesses at the end of Years 2 and 3, but must be completed by the end of Year 4.

Students should in general work with professional engineers and take an active part in their work in the design of simple equipment, solving of engineering problems, or any other work which is relevant to the profession of Engineering.

At the end of each period of employment every student must submit a report, typically 2000-3000 words, summarising the work done, the training received and including a description of the organisation of the Company.

Industrial Training will be assessed as a compulsory part of the course ELEC4011 Ethics and Electrical Engineering Practice. Students must complete the industrial training requirement in order to receive a completed assessment for this course.

Postgraduate Programs: The formal coursework postgraduate programs offered are: Graduate Diploma in Electrical Engineering 5458, Graduate Diploma in Telecommunications 5448, Master of Engineering Science in Electrical Engineering 8501, Master of Engineering Science in Telecommunications 8503. Opportunities are provided for graduate research programs leading to the award of the degrees of Master of Engineering 2660 and Doctor of Philosophy 1640.
Undergraduate Study

Computing Requirements

Information regarding recommended computing equipment for the courses offered by the School is available from the School Office or the School’s computer resources web page.

Program Outlines

ELECA13640
Electrical Engineering - Full-time Program

Bachelor of Engineering in Electrical Engineering
BE (Electrical Engineering)

Year 1

<table>
<thead>
<tr>
<th>Session 1</th>
<th>UOC</th>
<th>HPW</th>
</tr>
</thead>
<tbody>
<tr>
<td>ELEC1010 (Introduction to Electrical Engineering)</td>
<td>3</td>
<td>2</td>
</tr>
<tr>
<td>ELEC1011 (Electrical Engineering 1)</td>
<td>6</td>
<td>6</td>
</tr>
<tr>
<td>MATH1090 (Discrete Mathematics)</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>MATH1141 (Higher Mathematics 1A)</td>
<td>6</td>
<td>6</td>
</tr>
<tr>
<td>PHYS1131 (Higher Physics 1A)</td>
<td>6</td>
<td>6</td>
</tr>
</tbody>
</table>

TOTAL: 24 23

Year 1

<table>
<thead>
<tr>
<th>Session 2</th>
<th>UOC</th>
<th>HPW</th>
</tr>
</thead>
<tbody>
<tr>
<td>COMP1011 (Computing 1A)</td>
<td>6</td>
<td>6</td>
</tr>
<tr>
<td>ELEC1041 (Digital Circuits)</td>
<td>6</td>
<td>4</td>
</tr>
<tr>
<td>MATH1241 (Higher Mathematics 1B)</td>
<td>6</td>
<td>6</td>
</tr>
<tr>
<td>PHYS1231 (Higher Physics 1B)</td>
<td>6</td>
<td>6</td>
</tr>
</tbody>
</table>

TOTAL: 24 22

Note: MATH1141 and MATH1241 may be taken at the ordinary level (MATH1131 and MATH1231).

Year 2

<table>
<thead>
<tr>
<th>Session 1</th>
<th>UOC</th>
<th>HPW</th>
</tr>
</thead>
<tbody>
<tr>
<td>COMP1021 (Computing 1B)</td>
<td>6</td>
<td>6</td>
</tr>
<tr>
<td>ELEC2031 (Circuits and Systems)</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>ELEC2041 (Microprocessors and Interfacing)</td>
<td>6</td>
<td>4</td>
</tr>
<tr>
<td>MATH2011 (Several Variable Calculus)</td>
<td>6</td>
<td>4</td>
</tr>
<tr>
<td>PHYS2039 (Electromagnetism)</td>
<td>3</td>
<td>3</td>
</tr>
</tbody>
</table>

TOTAL: 24 20

Year 2

<table>
<thead>
<tr>
<th>Session 2</th>
<th>UOC</th>
<th>HPW</th>
</tr>
</thead>
<tbody>
<tr>
<td>ELEC2032 (Electronics and Systems)</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>ELEC2015 (Electromagnetic Applications)</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>ELEC2042 (Real Time Instrumentation)</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>MATH2620 (Higher Complex Analysis)</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>MATH2859 (Probability, Statistics &amp; Information)</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>MATH2509 (Linear Algebra for Engineers)</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>General Education</td>
<td>6</td>
<td>4</td>
</tr>
</tbody>
</table>

TOTAL: 24 22

Note: MATH2620 may be taken at the ordinary level (MATH2520). COMP1011 and COMP1021 may be taken at the higher level (COMP1711 and COMP1721).

Year 3

<table>
<thead>
<tr>
<th>Session 1</th>
<th>UOC</th>
<th>HPW</th>
</tr>
</thead>
<tbody>
<tr>
<td>ELEC3004 (Signal Processing &amp; Transform Methods)</td>
<td>6</td>
<td>5</td>
</tr>
<tr>
<td>ELEC3005 (Electrical Energy 1)</td>
<td>6</td>
<td>5</td>
</tr>
<tr>
<td>ELEC3006 (Electronics A)</td>
<td>6</td>
<td>5</td>
</tr>
<tr>
<td>General Education</td>
<td>6</td>
<td>4</td>
</tr>
</tbody>
</table>

TOTAL: 24 19

Year 4

<table>
<thead>
<tr>
<th>Session 1</th>
<th>UOC</th>
<th>HPW</th>
</tr>
</thead>
<tbody>
<tr>
<td>ELEC3017 (Electrical Engineering Design)</td>
<td>6</td>
<td>5</td>
</tr>
<tr>
<td>ELEC3014 (Systems &amp; Control 1)</td>
<td>6</td>
<td>5</td>
</tr>
<tr>
<td>2 Electives from</td>
<td></td>
<td></td>
</tr>
<tr>
<td>TELE3013 (Telecommunication Systems 1)</td>
<td>6</td>
<td>5</td>
</tr>
<tr>
<td>ELEC3015 (Electrical Energy 2)</td>
<td>6</td>
<td>5</td>
</tr>
<tr>
<td>ELEC3016 (Electronics B)</td>
<td>6</td>
<td>5</td>
</tr>
<tr>
<td>ELEC3041 (Real Time Engineering)</td>
<td>6</td>
<td>5</td>
</tr>
<tr>
<td>TELE3018 (Data Networks 1)</td>
<td>6</td>
<td>5</td>
</tr>
<tr>
<td>MATH3141 (Electrical Engineering Design)</td>
<td>6</td>
<td>6</td>
</tr>
<tr>
<td>COMP2011 (Data Organisation)</td>
<td>6</td>
<td>5</td>
</tr>
<tr>
<td>ELEC3402 (Introductory Physiology for Engineers)</td>
<td>6</td>
<td>5</td>
</tr>
</tbody>
</table>

TOTAL: 24 20

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 and ELEC4915).

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. COMP2011 may be taken at the higher level (COMP2711).

TELEA13643
Telecommunications Engineering Full Time Program

Bachelor of Engineering in Telecommunications
BE (Telecommunications)

Year 1

<table>
<thead>
<tr>
<th>Session 1</th>
<th>UOC</th>
<th>HPW</th>
</tr>
</thead>
<tbody>
<tr>
<td>ELEC1011 (Electrical Engineering 1)</td>
<td>6</td>
<td>6</td>
</tr>
<tr>
<td>MATH1090 (Discrete Mathematics)</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>MATH1141 (Higher Mathematics 1A)</td>
<td>6</td>
<td>6</td>
</tr>
<tr>
<td>TELE1010 (Introduction to Telecommunications)</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>PHYS1131 (Physics 1A)</td>
<td>6</td>
<td>6</td>
</tr>
</tbody>
</table>

TOTAL: 24 24

Year 1

<table>
<thead>
<tr>
<th>Session 2</th>
<th>UOC</th>
<th>HPW</th>
</tr>
</thead>
<tbody>
<tr>
<td>COMP1011 (Computing 1A)</td>
<td>6</td>
<td>6</td>
</tr>
<tr>
<td>ELEC1041 (Digital Circuits)</td>
<td>6</td>
<td>4</td>
</tr>
<tr>
<td>MATH1241 (Higher Mathematics 1B)</td>
<td>6</td>
<td>6</td>
</tr>
<tr>
<td>PHYS1231 (Physics 1B)</td>
<td>6</td>
<td>6</td>
</tr>
</tbody>
</table>

TOTAL: 24 22

Note: MATH1141 and MATH1241 may be taken at the ordinary level (MATH1131 and MATH1231).
### Year 2
#### Session 1
- **COMP1021** Computing 1B 6 6
- **ELEC2031** Circuits and Systems 3 3
- **ELEC2041** Microprocessors and Interfacing 6 4
- **MATH2011** Several Variable Calculus 6 4
- **MATH2859** Probability, Statistics & Information 3 3

**TOTAL** 24 20

#### Year 2
#### Session 2
- **ELEC2032** Electronics and Systems 3 3
- **ELEC2042** Real Time Instrumentation 3 3
- **TELE3018** Data Networks 1 6 4
- **MATH2620** Higher Complex Analysis 3 3
- **MATH2509** Linear Algebra for Engineers 3 3
- **COMPI** General Education 6 4

**TOTAL** 24 20

**Note:** MATH2620 may be taken at the ordinary level (MATH2520). COMP1011 and COMP1021 may be taken at the higher level (COMP1711 and 1721).

### Year 3
#### Session 1
- **ELEC3004** Signal Processing & Transform Methods 6 5
- **ELEC3006** Electronics A 6 5
- **TELE3452** Data Networks 2 6 4
- **PHYS2939** Electromagnetism 3 3
- **ELEC3016** Electronic B 6 5
- **ELEC3041** Real Time Engineering 6 5
- **MATH3141** EE Mathematical Methods 6 4
- **COMP2011** Data Organisation 6 5

**TOTAL** 24 20

#### Year 3
#### Session 2
- **TELE3013** Telecommunication Systems 1 6 5
- **ELEC3017** Electrical Engineering Design 6 5
- **TELE3015** High Frequency Electromagnetics 3 3
- **General Education** 3 2
- **1 Elective from**
  - **ELEC3014** Systems & Control 1 6 5
  - **ELEC3016** Electronics B 6 5
  - **ELEC3041** Real Time Engineering 6 5
  - **MATH3141** EE Mathematical Methods 6 4
  - **COMP2011** Data Organisation 6 5

**TOTAL** 24 19

### Year 4
#### Session 1
- **ELEC4010** Introduction to Management for Electrical Engineers 3 4
- **TELE4363** Telecommunication Systems 2 6 4
- **TELE4354** Network Management 6 4
- **TELE4910** Thesis Part A 3 4
- **1 Professional Electives** 6 4

**TOTAL** 24 20

#### Year 4
#### Session 2
- **ELEC4011** Ethics and Electrical Engineering Practice 3 2
- **TELE4911** Thesis Part B 9 10
- **2 Professional Electives** 12 8

**TOTAL** 24 20

**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 (TELE4914 and TELE4915).

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.

COMP2011 may be taken at the higher level (COMP2711).

---

### Professional Electives

#### ELECTRONICS

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Title</th>
<th>UOC</th>
<th>HPW</th>
</tr>
</thead>
<tbody>
<tr>
<td>ELEC4503</td>
<td>Electronics C</td>
<td>6</td>
<td>4</td>
</tr>
<tr>
<td>ELEC4522</td>
<td>Microelectronics Design and Technology</td>
<td>6</td>
<td>4</td>
</tr>
<tr>
<td>ELEC4532</td>
<td>Integrated Digital Systems</td>
<td>6</td>
<td>4</td>
</tr>
</tbody>
</table>

#### CONTROL

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Title</th>
<th>UOC</th>
<th>HPW</th>
</tr>
</thead>
<tbody>
<tr>
<td>ELEC4412</td>
<td>Systems and Control 2</td>
<td>6</td>
<td>4</td>
</tr>
<tr>
<td>ELEC4413</td>
<td>Systems and Control 3</td>
<td>6</td>
<td>4</td>
</tr>
</tbody>
</table>

#### ENERGY SYSTEMS

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Title</th>
<th>UOC</th>
<th>HPW</th>
</tr>
</thead>
<tbody>
<tr>
<td>ELEC4205</td>
<td>Electrical Energy Systems*</td>
<td>6</td>
<td>4</td>
</tr>
<tr>
<td>ELEC4216</td>
<td>Electrical Drive Systems*</td>
<td>6</td>
<td>4</td>
</tr>
<tr>
<td>ELEC4240</td>
<td>Power Electronics*</td>
<td>6</td>
<td>4</td>
</tr>
<tr>
<td>SOLA3640</td>
<td>Applied Photovoltaics*</td>
<td>6</td>
<td>4</td>
</tr>
</tbody>
</table>

#### SIGNAL PROCESSING

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Title</th>
<th>UOC</th>
<th>HPW</th>
</tr>
</thead>
<tbody>
<tr>
<td>ELEC4042</td>
<td>Signal Processing 2</td>
<td>6</td>
<td>4</td>
</tr>
<tr>
<td>ELEC4483</td>
<td>Biomedical Instrumentation, Measurement and Design</td>
<td>6</td>
<td>4</td>
</tr>
</tbody>
</table>

#### TELECOMMUNICATIONS

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Title</th>
<th>UOC</th>
<th>HPW</th>
</tr>
</thead>
<tbody>
<tr>
<td>TELE4313</td>
<td>Optical Communications</td>
<td>6</td>
<td>4</td>
</tr>
<tr>
<td>TELE4323</td>
<td>Digital Modulation and Coding</td>
<td>6</td>
<td>4</td>
</tr>
<tr>
<td>TELE4363</td>
<td>Telecommunications Systems 2**</td>
<td>6</td>
<td>4</td>
</tr>
<tr>
<td>TELE3333</td>
<td>Wireless Data Communication Systems</td>
<td>6</td>
<td>4</td>
</tr>
<tr>
<td>TELE4343</td>
<td>Source Coding and Compression</td>
<td>6</td>
<td>4</td>
</tr>
<tr>
<td>TELE4352</td>
<td>Data Networks 2**</td>
<td>6</td>
<td>4</td>
</tr>
<tr>
<td>TELE4353</td>
<td>Mobile and Satellite Communication Systems</td>
<td>6</td>
<td>4</td>
</tr>
<tr>
<td>TELE4354</td>
<td>Network Management**</td>
<td>6</td>
<td>4</td>
</tr>
</tbody>
</table>

#### COMPUTER SYSTEMS

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Title</th>
<th>UOC</th>
<th>HPW</th>
</tr>
</thead>
<tbody>
<tr>
<td>COMP3111</td>
<td>Software Engineering</td>
<td>6</td>
<td>4</td>
</tr>
<tr>
<td>COMP3211</td>
<td>Computer Organisation and Design</td>
<td>6</td>
<td>4</td>
</tr>
<tr>
<td>COMP3231</td>
<td>Operating Systems</td>
<td>6</td>
<td>4</td>
</tr>
<tr>
<td>COMP3311</td>
<td>Database Systems</td>
<td>6</td>
<td>4</td>
</tr>
<tr>
<td>COMP3411</td>
<td>Artificial Intelligence</td>
<td>6</td>
<td>4</td>
</tr>
<tr>
<td>MATH3411</td>
<td>Information, Codes and Ciphers</td>
<td>6</td>
<td>4</td>
</tr>
</tbody>
</table>
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). 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. To transfer to the BE MCom program at the end of Year 3 of the BE, a candidate requires a weighted average of at least 65%, a recommendation from the Head of School of Electrical Engineering and Telecommunications, and the approval of the Faculty of Engineering and Commerce. Commerce courses are taken in place of engineering electives in Year 4. Students already in a BE Program who maintain a credit average 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 who wish 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 credit average performance, i.e. 65% average) of both the Program Authorities concerned.

Notes: The Elective/Core subject will be PHYS2999 for Science with a Physics major, COMP2011 or COMP2711 for Computer Science, and a free elective for either Science with a Mathematics major or Arts.

Year 1
As for Program ELECA13640

Year 2
Session 1

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>UOC</th>
<th>HPW</th>
</tr>
</thead>
<tbody>
<tr>
<td>COMP1021</td>
<td>Computing I</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 Interface</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>MATH2011</td>
<td>Several Variable Calculus</td>
<td>4</td>
<td>4</td>
</tr>
<tr>
<td>PHYS2939</td>
<td>Electromagnetism</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>TOTAL</td>
<td></td>
<td>24</td>
<td>20</td>
</tr>
</tbody>
</table>

Year 2
Session 2

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>UOC</th>
<th>HPW</th>
</tr>
</thead>
<tbody>
<tr>
<td>Science/Arts Elective/Core</td>
<td>6</td>
<td>5</td>
<td></td>
</tr>
<tr>
<td>Science/Arts Elective</td>
<td>6</td>
<td>5</td>
<td></td>
</tr>
<tr>
<td>ELEC2032</td>
<td>Electronics 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>3</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>22</td>
</tr>
</tbody>
</table>
Year 4
Session 1
<table>
<thead>
<tr>
<th>Course</th>
<th>UOC</th>
<th>HPW</th>
</tr>
</thead>
<tbody>
<tr>
<td>ELEC3004 Signal Processing &amp; Transform Methods</td>
<td>6</td>
<td></td>
</tr>
<tr>
<td>ELEC3006 Electronics A</td>
<td>6</td>
<td></td>
</tr>
<tr>
<td>TELE4352 Data Networks 2</td>
<td>6</td>
<td></td>
</tr>
<tr>
<td>MATH2509 Linear Algebra for Engineers</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>PHYS2939 Electromagnetism 3</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>TOTAL</td>
<td>24</td>
<td>20</td>
</tr>
</tbody>
</table>

Year 4
Session 2
<table>
<thead>
<tr>
<th>Course</th>
<th>UOC</th>
<th>HPW</th>
</tr>
</thead>
<tbody>
<tr>
<td>ELEC3017 Electrical Engineering Design</td>
<td>6</td>
<td></td>
</tr>
<tr>
<td>TELE3013 Telecommunication Systems 1</td>
<td>6</td>
<td></td>
</tr>
<tr>
<td>TELE3015 Electromagnetic Applications</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>Arts/Science Elective</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>TOTAL</td>
<td>24</td>
<td>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 courses are taken.

Year 5
As for Year 4 of Program ELECA13640.

BE (Telecommunications) Combined Degree Programs in Science and Arts

Year 1
As for Program TELEA13643

Year 2
Session 1
<table>
<thead>
<tr>
<th>Course</th>
<th>UOC</th>
<th>HPW</th>
</tr>
</thead>
<tbody>
<tr>
<td>COMP1021 Computing 1B</td>
<td>6</td>
<td></td>
</tr>
<tr>
<td>ELEC2031 Circuits and Systems</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>ELEC2041 Microprocessors and Interfacing</td>
<td>6</td>
<td></td>
</tr>
<tr>
<td>MATH2011 Several Variable Calculus</td>
<td>6</td>
<td></td>
</tr>
<tr>
<td>MATH2859 Probability, Statistics &amp; Information</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>TOTAL</td>
<td>24</td>
<td>20</td>
</tr>
</tbody>
</table>

Year 2
Session 2
<table>
<thead>
<tr>
<th>Course</th>
<th>UOC</th>
<th>HPW</th>
</tr>
</thead>
<tbody>
<tr>
<td>Arts/Science Core/Elective</td>
<td>6</td>
<td></td>
</tr>
<tr>
<td>Arts/Science Elective</td>
<td>6</td>
<td></td>
</tr>
<tr>
<td>ELEC2032 Electronics and Systems</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>TELE3018 Data Networks 1</td>
<td>6</td>
<td></td>
</tr>
<tr>
<td>MATH2620 Higher Complex Analysis</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>TOTAL</td>
<td>24</td>
<td>20</td>
</tr>
</tbody>
</table>

Notes:
The Elective/Core subject will be PHYS2999 for Science with a Physics major, COMP2011 or COMP2711 for Computer Science, and is a free elective for either Science with a Mathematics major or Arts.
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.
COMP1011 and COMP1021 may be taken at the higher level (COMP1711 and COMP1721).

Year 3
Session 1
<table>
<thead>
<tr>
<th>Course</th>
<th>UOC</th>
<th>HPW</th>
</tr>
</thead>
<tbody>
<tr>
<td>ELEC3004 Signal Processing &amp; Transform Methods</td>
<td>6</td>
<td></td>
</tr>
<tr>
<td>ELEC3006 Electronics A</td>
<td>6</td>
<td></td>
</tr>
<tr>
<td>TELE4352 Data Networks 2</td>
<td>6</td>
<td></td>
</tr>
<tr>
<td>MATH2509 Linear Algebra for Engineers</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>PHYS2939 Electromagnetism 3</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>TOTAL</td>
<td>24</td>
<td>20</td>
</tr>
</tbody>
</table>

Year 3
Session 2
<table>
<thead>
<tr>
<th>Course</th>
<th>UOC</th>
<th>HPW</th>
</tr>
</thead>
<tbody>
<tr>
<td>ELEC2042 Real Time Instrumentation</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>TOTAL</td>
<td>3</td>
<td></td>
</tr>
</tbody>
</table>

Notes:
*The three courses above (Year 4) are inserted in place of the ELEC/TELE Professional Electives in the standard Year 4 program for the BE in Electrical Engineering/BE in Telecommunications. If an application for transfer to the combined degree program is refused, then a Year 3 elective should be taken in Year 4 to compensate for the elective displaced in Year 3.

Bachelor of Engineering Master of Biomedical Engineering
BE MBiomedE
Program ELECB13727 is a concurrent BE in Electrical Engineering and Master of Biomedical Engineering. TELEB13724 is a concurrent BE in Telecommunications and Master of Biomedical Engineering. Further details for both programs can be found in the Graduate School of Biomedical Engineering section of this handbook.
Postgraduate Study

The formal postgraduate coursework programs offered by the School of Electrical Engineering and Telecommunications are:

**ELEC(A-F)58501**
Master of Engineering Science in Electrical Engineering

**TELEAS8503**
Master of Engineering Science in Telecommunications

**ELEC(A-F)55458**
Graduate Diploma in Electrical Engineering

**TELEAS5448**
Graduate Diploma in Telecommunications

Postgraduate Coordinator A/Prof C.Y. Kwok

Coursework Programs

**ELEC(A-F)58501**
Master of Engineering Science in Electrical Engineering

**Systems and Control**
Program Coordinator: Dr. D.J. Clements

**Photovoltaics**
Program Coordinator: Dr. C. Honsberg

Course unit descriptions for Photovoltaic courses and programs can be found in the Centre for Photovoltaic Engineering section of the University handbook.

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

**Electrical Energy**
ELEC9213 Electrical Energy Systems
ELEC9240 Power Electronics

**Electronics**
ELEC9340 Electronic Communication Systems
ELEC9503 Microelectronics Design

**Photonics**
ELEC9350 Theory of Optical Fibres and Optical Signal Processing
ELEC9355 Optical Communication Systems

**Signal Processing**
ELEC9342 Digital Signal Processing and Applications
ELEC9370 Digital Image Processing Systems

**Systems & Control**
ELEC9421 Robust and Linear Control Systems
ELEC9422 Analysis and Design of Nonlinear Controllers

**Photovoltaics**
SOLA9001 Photovoltaics
SOLA9002 Solar Cells and Systems

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.

If so desired students are permitted to select not more than 12 UOC from the Special Electives from the MBT program.

**Electrical Energy**
- ELEC9201 Power System Planning & Economics
- ELEC9214 Power Systems Equipment
- ELEC9223 Power Engineering Seminars
- ELEC9226 Electrical Services in Buildings
- ELEC9231 Electric Drive Systems
- ELEC9232 Motion Control Systems
- ELEC9233 Electrical Safety

**Electronics**
- ELEC9353 Microwave Circuits, Theory, Techniques
- ELEC9501 Advanced Semiconductor Devices
- ELEC9502 VLSI Technology
- ELEC9505 Micro-systems Technology - Design and Fabrication
- COMP9231 Integrated Digital Systems

**Signal Processing**
- ELEC9344 Speech and Audio Processing
- ELEC9345 Neural Networks and Applications

**Systems and Control**
- ELEC9403 Real Time Computing and Control
- ELEC9404 Topics in Digital Control
- ELEC9405 Human Movement Control Systems
- ELEC9412 Biomedical Instrumentation and Informatics

**Photovoltaics**
- SOLA9003 High Efficiency Solar Cells
- SOLA9004 Solar Energy
- SOLA9005 Advanced Semiconductor Devices
- SOLA9006 Solar Cell Technology & Manufacturing
- SOLA9007 Grid Connected Photovoltaics

**Telecommunications**
- TELE9337 Advanced Networking
- TELE9343 Principles of Digital Communications
- COMP9008 Software Engineering
- COMP9242 Advanced Operating Systems
- TELE9344 Cellular Mobile Communication Systems

**Special Electives**
- GBAT9101 Project Management
- GBAT9105 Risk Management
- GBAT9113 Strategic Management of Business and Technology
- IRRO8690 Strategic People Management

---

**Telecommunications**
- TELE9301 Switching System Design
- TELE9302 Computer Networks
- TELE9303 Network Management

---

**Postgraduate Electives**
As for Program 8501.

**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).

- ELEC9304 Signal Processing 1
- ELEC9306 Electronics 2
- ELEC93016 Electronics 3
- ELEC9341 Real Time Engineering
- ELEC4010 Introduction to Management for Electrical Engineers
- TELE9310 Network Management
- TELE4333 Wireless Data Communication Systems
- TELE9308 Data Networks 1
- TELE4353 Mobile and Satellite Communication Systems
- TELE4363 Telecommunication Systems 2
- COMP9321 Operating Systems
- Other Year 4 Telecommunications Electives

**Entry Qualifications for Master of Engineering Science (8501, 8503)**

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 Degrees 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 Credit Units, 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.

---

**GRADUATE DIPLOMA PROGRAM**  
(Local students only)

---

**ELEC(A-F)S5458**  
Graduate Diploma in Electrical Engineering  
TELEAS5448  
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 specialist 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.

Program coordinators are as listed in the MEngSci program.

---

**Entry Qualifications for Graduate Diploma (5458, 5448)**

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).
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 Guide, appearing earlier in this book.

ELEC0806
Industrial Electrical Design
Staff Contact: School Office
U0C3 HPW3 S2

ELEC0807
Electrical Engineering 1E
Staff Contact: Mr Edward Spooner
U0C6 HPW4 S2
Prerequisite/s: PHYS1169 or PHYS1002 or PHYS1918.

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: Mr Edward Spooner
U0C3 HPW2 S1
Prerequisite/s: PHYS1169 or PHYS1002 or PHYS1918

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.

ELEC1010
Introduction to Electrical Engineering
Staff Contact: Dr lain Skinner
U0C3 HPW3 S1

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 Rodica Ramer
U0C6 HPW6 S1 S2
Corequisite/s: PHYS1131


ELEC1041
Digital Circuits
Staff Contact: Dr David Clements
U0C6 HPW4 S2 X1
Prerequisite/s: ELEC1011

Realisations of combinational circuits: MSI devices, ROMs, PLAs, synchronous, sequential logic circuits: latches, flip flops, counters, registers. Algorithmic state machines: systematic design procedures. A Synchronous sequential logic circuits, design applications. PLDs, VHDL.

ELEC2015
Electromagnetic Applications
Staff Contact: Associate Professor Fazleur Rahman
U0C3 HPW3 S2
Prerequisite/s: PHYS2939


ELEC2031
Circuits and Systems
Staff Contact: Dr Kevan Daly
U0C3 HPW3 S1 S2
Prerequisite/s: ELEC1011

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; Laplace Transforms; phasors; AC circuits (transient and steady state responses); complex power; frequency responses of circuits and systems; three-phase circuits.

ELEC2032
Electronics & Systems
Staff Contact: Dr John Kaye
U0C3 HPW3 X1 S2
Prerequisite/s: ELEC2031

Linear Time Invariant Circuits and Systems; continuous & discrete time systems; time invariance, causality; impulse and step responses; convolution integral and sum; relationship to frequency response; stability of circuits and systems. Transistor amplifier; stability, limit cycles. Linearisation of non-linear systems; non-linear circuits; non-linear elements (diodes, transistors, saturation); small signal analysis of resistive non-linear circuits; small signal analysis of transistor amplifiers.

ELEC2041
Microprocessors and Interfacing
Staff Contact: Dr Saeid Nooshabadi
U0C6 HPW4 S1
Prerequisite/s: COMP1011 and ELEC1041

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: PIAs, ACIAS. Interrupt-driven I/O: interrupt vectors, interrupt handlers, DMA controllers. Standard microcomputer 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: Mr Raymond Eaton
U0C3 HPW3 S2
Prerequisite/s: ELEC2041 or MECH3202 or (SOLA1051, ELEC1041)

Object oriented programming: structured programming, data abstraction, classes, overloading, inheritance, polymorphism, C++. Hardware requirements for real time applications; systems model of the computer, process-related interfaces (digital, analog, clocks), scaling, data transfer (polling, interrupts, DMA), serial data transmission, multi-plexing, bus systems, instrumentation bus. Software development: real-time specification standards. Real time

ELEC3004
Signal Processing and Transform Methods
Staff Contact: Dr Andrew Bradley
UOC6 HPW5 S1 S2
Prerequisite/s: ELEC2032 and MATH2859
The mathematics of signals and linear systems. Fourier series, Fourier and Laplace transforms, discrete Fourier and Z transforms. Processing and analysis of continuous (analogue) and discrete-time (digital) signals. Analogue filters: approximation theory, Butterworth, Bessel, Chebychev and elliptic filters. Filter impulse and frequency responses, stability, and sensitivity. Sampling continuous signals: the sampling theorem, reconstruction, and aliasing. The discrete Fourier transform (DFT) and the fast Fourier transform (FFT). Fundamentals of the design and realisation of finite impulse response (FIR) and infinite impulse response (IIR) digital filters. Digital processing of analog signals, including applications of digital signal processing (DSP) and programmable DSP chips. The representation and modelling of non-deterministic (random) signals, correlation functions, and power density spectra.

ELEC3005
Electric Energy 1
Staff Contact: Associate Professor Grantham
UOC6 HPW5 S1
Prerequisite/s: ELEC2015

ELEC3006
Electronics A
Staff Contact: Dr Andrew Dzurak
UOC6 HPW5 S1
Prerequisite/s: ELEC2032

ELEC3014
Systems and Control 1
Staff Contact: Associate Professor Peter Nelson
UOC6 HPW5 S2
Prerequisite/s: ELEC2032
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
Electric Energy 2
Staff Contact: Associate Professor Grantham
UOC6 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 application considerations, including DC machines, induction and synchronous motor drives. Computer-aided analysis of machines. Use of modern techniques of Power Electronics for application to variable speed drive systems, including DC-AC, DC-DC and AC-AC converters. Utilisation of electrical energy for lighting and industrial heating processes including discharge, induction and RF heating. Electrical safety of power equipment: equipment requirements for use in hazardous atmospheres; earthing and earth leakage protection.

ELEC3016
Electronics B
Staff Contact: Dr Andrew Dzurak
UOC6 HPW4 S2
Prerequisite/s: ELEC3006
Operating principles and fabrication technologies of devices used in electronic circuits and the resulting impact on circuit operation and design. Devices covered include pn junctions, BJTs & MOSFETs 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 Andrew Bradley
UOC6 HPW6 S2
Prerequisite/s: ELEC2042 or MECH3202
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, standads, patents, quality and reliability, safety, (electronic) manufacturing methods and systems, engineering innovations. 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. Electrical Drawing and Graphical Communications: Standards, projections, dimensioning, tolerancing, and drawing interpretation. 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: Mr Raymond Eaton
UOC6 HPW4 S2
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 multi-tasking; queuing models and realisations; pre-emptive scheduling; scheduling algorithms; intertask 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; implementations 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: School Office  
UOC6 HPW5  
Prerequisite/s: ELEC2032  
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: Dr John Kaye  
UOC3 HPW3 S1  
Prerequisite/s: 96 units of credit  
The purpose of this subject is to introduce students to key management concepts and techniques in the context 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: Dr John Kaye  
UOC3 HPW2 S2  
Prerequisite/s: 120 units of credit  
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 to 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 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 form 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 Eliathamby Ambikairajah  
UOC6 HPW4 S1  
Prerequisite/s: ELEC3004  

ELEC4205  
Electrical Energy Systems  
Staff Contact: Associate Professor Colin 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: Associate Professor Colin Grantham  
UOC6 HPW4 S2  
Prerequisite/s: ELEC3005  

ELEC4240  
Power Electronics  
Staff Contact: Associate Professor Fazlur 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.

ELEC4412  
Systems and Control 2  
Staff Contact: Dr David 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 frequency response design, classical PID control, discrete control continuous and discrete state space analysis, state variable feedback, pole placement and optimal control, robust control, nonlinear systems.

ELEC4413  
Systems and Control 3  
Staff Contact: Dr David Clements  
UOC6 HPW4 S2  
Prerequisite/s: ELEC3014  
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: Professor Branko Celler
UOC6 HPW4 S2
Prerequisite/s: ELEC3004
Note/s: ELEC3402 recommended.

ELEC4503
Electronics C
Staff Contact: Associate Professor Chee Kwok
UOC6 HPW4 S1
Prerequisite/s: ELEC3006

ELEC4522
Microelectronics Design and Technology
Staff Contact: Associate Professor Chee Kwok
UOC6 HPW4 S1
Prerequisite/s: ELEC3006
Review of technology for bipolar and MOS integrated circuits. Device models, layout rules. Analog circuit building blocks. Bipolar and CMOS operational amplifiers. CMOS logic, MOS Analog-Digital and Digital-Analog converters. Memory - DRAM/SRAM. Yield, reliability, failure analysis techniques and packaging. The laboratory program is aimed at understanding the internal design of some standard IC functions.

ELEC4532
Integrated Digital Systems
Staff Contact: Dr Saeid Nooshabadi
UOC6 HPW4 S2
Prerequisite/s: ELEC2041 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.

ELEC4910
Thesis Part A
Staff Contact: School Office
UOC3 HPW4 S1 S2
Prerequisite/s: 132 units of credit and weighted average mark of 65 and ELEC3017
The thesis is carried out in the last two sessions of the BE degree course. Under the guidance of a supervisor, directed laboratory and research work on an approved subject is carried out. 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 B involves the theoretical development or modelling. A written thesis report must be submitted on each project by Tuesday of Week 14 of the session in which ELEC4911 is undertaken.

ELEC4914
Project Part A
Staff Contact: School Office
UOC3 HPW4 S1 S2
Prerequisite/s: ELEC3017 and 132 units of credit.

ELEC4915
Project Part B
Staff Contact: School Office
UOC9 HPW10 S1 S2
Prerequisite/s: ELEC4914
The project is carried out in the last two sessions of the BE degree course. Under the guidance of a supervisor, directed laboratory and research work on an approved subject is carried out. Generally, the project 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 ELEC4914. Project Part B typically involves the theoretical development or modelling. A written project report must be submitted on each project by Tuesday of Week 14 of the session in which ELEC4915 is undertaken.

ELEC9201
Power System Planning and Economics
Staff Contact: Dr John Kaye
UOC6 HPW3 S1
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 the distributor. Review of practical approaches adopted internationally and in Australia.

ELEC9202
Power System Operation and Control
Staff Contact: Associate Professor Hugh Outhred
UOC6 HPW3 S2
Introduction to the main techniques currently used in the operation and control of power systems: economic dispatch and optimal power flow; unit commitment; fuel scheduling and management of storage hydro-electric releases; production costing, reliability calculations and operations planning. Operations in the spot market: bidding and market clearing, dispatch and commitment, storage operation. Renewable energy system.

ELEC9213
Electrical Energy Systems
Staff Contact: Associate Professor Trevor Blackburn
UOC6 HPW3 S1
Review of the basic concepts used in power system analysis: phasers, complex power, three phase 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.
ELEC9233
Electrical Safety
Staff Contact: Associate Professor Colin Grantham
UOC6 HPW3 S1

Effects of electric current passing through the human body; factors normally providing protection from electric shock; lightning hazards; earthing of power supplies; earthing of electrical enclosures; the need for bonding; protection of personnel: RCDs, affects of electric and magnetic fields and electromagnetic radiation; electro-surgical hazards; electrical fires and their investigation; electrical discharges; electrical safety and the law; hazardous areas and their classification; gas grouping; temperature classification; Ex d, Ex i, Ex e, Ex n, Ex p, Ex s, methods of protection; dust ignition proof; cabling and terminations for hazardous atmospheres; certification; marking; quality control and maintenance requirements for hazardous atmospheres.

ELEC9214
Power System Equipment
Staff Contact: Associate Professor Trevor Blackburn
UOC6 HPW3 S2

Operating characteristics and design features of the major equipment components of a power system. Includes a general treatment of equipment rating, thermal design, electromagnetic forces, equipment protection and data acquisition. Specific items of equipment include power transformers, instrument transformers, switches, rated designer, overhead and underground cables, surge arrestors, gas insulated systems. Protection of electrical equipment. Effects of electromagnetic fields on personnel. Condition monitoring and testing of power equipment.

ELEC9223
Power Engineering Seminar
Staff Contact: Mr Edward Spooner Mr Edward Spooner
UOC6 HPW3 S1 S2

Weekly seminars given by members of the staff, postgraduate students and outside speakers, covering aspects of power and energy engineering. Outside speakers will be drawn from other universities, research institutions and industry. The purpose of the course is to expose students to the range of research and development activities within the power engineering discipline. Subject is taken over two consecutive sessions commencing session 1 or session 2.

ELEC9225
Special Topic In Power
Staff Contact: Associate Professor Trevor Blackburn
UOC6 HPW3 S1 S2

The content of this subject changes to allow presentation of a special topic of current interest in a short course format.

ELEC9226
Electrical Services In Building
Staff Contact: Associate Professor Trevor Blackburn
UOC6 HPW3 S2


ELEC9231
Electrical Drive Systems
Staff Contact: Associate Professor Colin Grantham
UOC6 HPW3 S2

Excluded: ELEC4216


ELEC9240
Power Electronics
Staff Contact: Associate Professor Fazur Rahman
UOC6 HPW3 S1

Excluded: ELEC4240

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: Associate Professor Chee 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 Eliathamby Ambikairajah
UOC6 HPW3 S1


ELEC9344
Speech and Audio Processing
Staff Contact: Dr Eliathamby Ambikairajah
UOC6 HPW3 S2


ELEC9345
Neural Networks and Applications
Staff Contact: Dr Eliathamby Ambikairajah
UOC6 HPW3 S2


ELEC9350
Theory of Optical Fibres and Optical Signal Processing
Staff Contact: Professor Pak Chu
UOC6 HPW3 S1

**ELEC9353**  
*Microwave Circuits: Theory & Techniques*  
**Staff Contact:** Dr Rodica Ramer  
UOC6 HPW3 S1  

**ELEC9355**  
*Optical Communications Systems*  
**Staff Contact:** Professor Pak Chu  
UOC6 HPW3 S2  

**ELEC9370**  
*Digital Image Processing Systems*  
**Staff Contact:** Dr David Taubman  
UOC6 HPW3 S1  
The fundamentals of digital image processing with topics selected from the following: image models and physical imaging systems; visual perception; rendering systems; linear filtering; linear transforms; mathematical morphology; compression; tomographic image reconstruction; inverse problems in imaging; image enhancement; edge detection; feature extraction; and geometric diffusion.

**ELEC9403**  
*Real Time Computing and Control*  
**Staff Contact:** Associate Professor Tim Hesketh  
UOC6 HPW3 S1  
Examines the implementation of modern control techniques and associated instrumentation using distributed computers. Practical hardware aspects, including measurement and actuation, data conditioning, acquisition and transmission, microprocessor devices, and other distributed computing components. Commercial realisations ranging from PLCs to full process control computing systems. Software: executive operating systems, concurrency, control algorithms, numerical problems, languages and development 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:** Associate Professor Tim 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**  
*Human Movement Control Topics*  
**Staff Contact:** Associate Professor Peter 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.

**ELEC9411**  
*Introductory Physiology for Engineers*  
**Staff Contact:** Professor Branko Celler  
UOC6 HPW3 S1  
This subject is intended primarily for Biomedical Engineering students. It is compulsory for Strand A, part-time students ONLY who are unable to do PHPH2112. 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.

**ELEC9412**  
*Biomedical Instrumentation and Informatics*  
**Staff Contact:** Professor Branko 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 & Linear Control Systems*  
**Staff Contact:** Associate Professor Peter Neilson  
UOC6 HPW3  

**ELEC9422**  
*Analysis & Design of Nonlinear Controls*  
**Staff Contact:** Associate Professor Peter Neilson  
UOC6 HPW3 S2  
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 modelling and systems identification will be covered.
ELEC9501
Advanced Semiconductor Devices
Staff Contact: Dr Andrew Dzurak
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: Associate Professor Chee Yee Kwok
UOC6 HPW3 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; 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: Associate Professor Chee Yee 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. Nonvolatile memory, low voltage low power circuits.

ELEC9505
Microsystems Technology: Design and Microfabrication
Staff Contact: Associate Professor Chee Yee Kwok
UOC6 HPW3 S1

ELEC9930
Project Report (12 UOC)
Staff Contact: Associate Professor Chee Yee Kwok
UOC12 HPW6 S1 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.

TELE1010
Introduction to Telecommunications
Staff Contact: Dr Elaiathamby Ambikairajah
UOC3 HPW3 S1
Introduction to the nature and scope of telecommunications engineering, including basic communications theory, computing, data networks, electronics and communications systems. Careers for telecommunications engineers in public and private enterprise. Verbal and written communication and inter-personal skills in engineering.

TELE3013
Telecommunication Systems 1
Staff Contact: Dr Peng
UOC6 HPW4 S1 S2
Prerequisite/s: ELEC2032.
To present a general introduction to telecommunications in the form of an overview of signal acquisition, transmission and processing in communication systems. This subject is intended for electrical or computer engineering students not specialising in telecommunications and also as a necessary background for those intending to specialise. Overview of major communication systems (telephony, radio and TV, radar, navigation, etc.). Major signal types and their characteristics (speech, audio, video, data). Characteristics of typical communication channels. Methods of handling various channel problems (modulation, diversity, coding, etc.). Propagation and antennas. Basic analogue and digital modulation methods. Data modems and standards, ISDN. Introduction to data networks.

TELE3015
High Frequency Electromagnetics
Staff Contact: Dr Iain Skinner
UOC3 HPW3 S2

TELE3018
Data Networks 1
Staff Contact: Dr Hassan Mehrpour
UOC6 HPW4 S2
Prerequisite/s: COMP^02^ and ELEC2041
This subject provides an understanding of the technologies and network architectures surrounding tele-communications. The data communication interface. The OSI/ISO reference model. Flow and congestion control. Digital switching and multiplexing. The TCP/IP protocol suite. Packet switching. Internetworking with bridges and routers. LANs, MANs and WANs. Network security.

TELE4313
Optical Communications
Staff Contact: Professor Pak Chu
UOC6 HPW4 S1
Prerequisite/s: TELE3013

TELE4323
Digital Modulation and Coding
Staff Contact: Dr David Taubman
UOC6 HPW4 S1
Prerequisite/s: TELE3013
Provides detailed understanding of techniques used to process digital information in order to ensure its reliable delivery over noisy channels. Examines the fundamental resources available to telecommunication systems and develops techniques for understanding the implications of different modulation and coding techniques on these fundamental quantities. The course also provides a general understanding of the role of digital modulation and coding in practical digital communication systems.

**TELE4333**

**Wireless Data Communication Systems**

*Staff Contact: Dr Jinhong Yuan*

*UOC6 HPW4 S2*

*Prerequisite(s): TELE3013*


**TELE4343**

**Source Coding and Compression**

*Staff Contact: Dr David Taubman*

*UOC6 HPW4 S2*

*Prerequisite(s): TELE3013 and ELEC3004*

To present a comprehensive overview of source coding and signal compression, which is an essential and increasingly important component of modern digital communication and multimedia systems. This subject is aimed particularly at electrical or computer engineering students majoring in telecommunication or multimedia applications. Characteristics of analogue information sources (speech, audio, images, video). Sampling methods. Scalar and vector quantisation. Information and entropy, rate-distortion and quantisation analysis. Lossless coding methods. Lossy coding - reducing redundancy, removing irrelevance, quality measures. Basic waveform coding methods (PCM, DM, DPCM, etc.). Advanced waveform coding methods in one and two dimensions (e.g. transform, subband and predictive coding). Non-waveform coding, including vocoders and frequency domain methods. Major coding methods and standards for speech, audio, images and video. Real time transmission of speech, audio and video in telecommunication systems, including digital circuit multiplication and variable bit rate coding.

**TELE4352**

**Data Networks 2**

*Staff Contact: Dr Hassan Mehrpour*

*UOC6 HPW4 S1*

*Prerequisite(s): TELE3018*

This subject provides insight into how to design, analyze and evaluate performance of the telecommunication networks. The subject identifies the benefits of high speed networks such as effectiveness, cost and customer control. It also describes the functions and characteristics of several services and technologies, including Personal Communication Services (PCS), Frame Relay, Asynchronous Transfer Mode (ATM), SONET/SDH and Switched Multimegabit Data Services (SMDS). Protocol modelling and verification techniques. Asynchronous Transfer Mode (ATM), ATM LANs, multimedia communication. Analysis of protocols for data link, network and transport layers. Network design. Frame Relay. Switched Multimegabit Data Services (SMDS). Operating system views of communication.

**TELE4353**

**Mobile & Satellite Communication Systems**

*Staff Contact: Dr Predrag Rapajic*

*UOC6 HPW4 S2*

*Prerequisite(s): TELE4323*

A specialist subject, aimed to provide a fundamental understanding of the system architecture and system design, and the effect of the channel on the performance of two of the most important digital telecommunications systems, i.e. digital cellular mobile communication and digital satellite communication. It shows how digital modulation and coding techniques taught in TELE4323 Digital Modulation and Coding may be used to improve the reliability of each system. It also provides a general understanding of these systems from the network perspective. Modern communication systems from a systems point of view. Cellular mobile communication systems. Propagation-loss model. The mobile fading channel. Multiple access techniques. The GSM. Digital satellite communication systems. Satellite orbits. Station keeping. Multiple access techniques. System synchronisation. DAMA. Satellite packet communication. Mobile satellite networks.

**TELE4354**

**Network Management**

*Staff Contact: School Office*

*UOC6 HPW4 S1*

*Prerequisite(s): TELE4352*

This course will introduce students to methodologies, techniques and tools for the management of telecommunication systems and networks with specific examples from Internet SNMP, SNMPv2, RMON, RMON2 and the OSI/ISO based CMIS/CMIP. It will address issues associated with: configuration and name management, fault and performance management, security, and accounting management.

**TELE4363**

**Telecommunications Systems 2**

*Staff Contact: Dr William Dewar*

*UOC6 HPW4 S1*

*Prerequisite(s): TELE3013*

This course 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 course is intended for students who wish to major in telecommunication 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.

**TELE4910**

**Thesis Part A**

*Staff Contact: School Office*

*UOC3 HPW4 S1 S2*

*Prerequisite(s): 132 units of credit and weighted average mark of 65 and ELEC3017.*

**TELE4911**

**Thesis Part B**

*Staff Contact: School Office*

*UOC9 HPW10 S1 S2*

*Prerequisite(s): TELE4910*

The thesis is carried out in the last two sessions of the BE degree course. Under the guidance of a supervisor, directed laboratory and research work on an approved subject is carried out. 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 TELE4910. Thesis Part B typically involves the theoretical development or modelling. A written thesis report must be submitted on each project by Tuesday of Week 14 of the session in which TELE4911 is taken.

**TELE4914**

**Project Part A**

*Staff Contact: School Office*

*UOC3 HPW4 S1 S2*

*Prerequisite(s): ELEC3017 and 132 units of credit.*
The project is carried out in the last two sessions of the BE degree course. Under the guidance of a supervisor, directed laboratory and research work on an approved subject is carried out. Generally, the project 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 TELE4914. Project Part B typically involves the theoretical development or modelling. A written project report must be submitted on each project by Tuesday of Week 14 of the session in which TELE4915 is undertaken.

**TELE4915**
**Thesis Project Part B**
**Staff Contact:** School Office
**UOC9** HPW10 S1 S2
**Prerequisites:** TELE4914

The project is done in a major area, in which it is offered under the requirements for TELE9301. The project 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 TELE4914. Project Part B typically involves the theoretical development or modelling. A written project report must be submitted on each project by Tuesday of Week 14 of the session in which TELE4915 is undertaken.

**TELE9343**
**Principles of Digital Communication**
**Staff Contact:** Dr Predrag Rapajic
**UOC6** HPW3 S1


**TELE9337**
**Advanced Networking**
**Staff Contact:** Dr Hassan Mehrpour
**UOC6** HPW3 S2


**TELE9342**
**Relay and Modulation**
**Staff Contact:** Dr William Dewar
**UOC6** HPW3 S1

To provide an introduction into principles, structures and methods for constructing switching systems capable of supporting data, voice, image and video transport. The focus is on the design principles as well as the methods for constructing broadband integrated networks. A student who successfully completes this course will get an understanding of the trends in broadband networking, and the key switching technologies, develop an understanding of the B-ISDN standards and their implications, develop the understanding necessary to design, analyse and implement traffic and congestion control in switched networks and understand routing switched networks, especially ATM. Topics include: Fundamentals of Switching Systems; Evolution; Frame Relay; ISDN & ISDN Signalling; ATM and B-ISDN; ATM Routing; Physical Layers for Integrated Services Networks.

**TELE9302**
**Computer Networks**
**Staff Contact:** Professor Aruna Seneviratne
**UOC6** HPW3 S1

This course provides an introduction to fundamental concepts in the design and implementation of computer communication networks, their protocols, and applications. Examples will be drawn primarily from the Internet (e.g., TCP, UDP, and IP) protocol suite. A student who successfully completes this course will be able to demonstrate an understanding of the types of local area networks, and their performance characteristics, develop an understanding of issues associated with network layer addressing, and concepts such as subnetting and masquerading, appreciate the differences and limitations of different routing algorithms, understand the issues of end-to-end delivery of data and presentation of data and setup and configure Internets and Intranets. Topics include: Introduction of Computer Networking; Network Applications; Data Link Controls & LANs; Network Layer Service Models - Internetworking with IP; Internet Routing; Transport Layer Design Issues; Case Studies: WWW.

**TELE9303**
**Network Management**
**Staff Contact:** Professor Aruna Seneviratne
**UOC6** HPW3 S2

This subject complements courses in Switching Systems, and Computer Networks and gives students an understanding of the concepts of network management, introducing the components that are used to realise modern network management systems. A student who successfully completes this subject should be able to demonstrate an understanding of the technical issues involved in network management, explain strategic management issues, including the options created by emerging technologies integrate a number of network management tools to form a network management system, undertake practical experimentation in network configuration and demonstrate appropriate practical and problem solving skills. Topics include: Introduction to network administration; Fault management; Configuration and asset management; Accounting management; Performance management; Security management; Integrated network management.

**TELE9390**
**Project Report**
**Staff Contact:** Associate Professor Chee Yee Kwok
**UOC12** HPW6 S1 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.

**TELE9341**
**Advanced Networking**
**Staff Contact:** Dr Predrag Rapajic
**UOC6** HPW3 S1

The concept of Spread Spectrum (SS) Communications – historical background; Major Characteristics of SS-CDMA; Direct Sequence Spread Spectrum; Basic Features of DS-CDMA Systems, PN Sequences; CDMA System Processing Gain; Synchronization in CDMA; The BER Performance of DS-CDMA System; Interference Limited Capacity of a Single Cell CDMA System; Adaptive Multiuser Detection on Multipath Fading Channel; Diversity and Smart Antennas; Antenna Beam-Forming, and Space Division Multiple Access; Overview of Fundamental Concepts used in IS-95 CDMA; Speech Coding; Channel Coding (convolutional Codes); Maximum Likelihood Decoding (Viterbi Algorithm); Hadamard-Walsh Orthogonal Coding (orthogonal modulation); Concatenated Coding and Block Interleaving; IS-95 CDMA Link Capacity; CDMA 2000; Evolution of IS-95 to CDMA 2000; Conceptual Similarities and Differences between IS-95 and CDMA 2000.
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 8652, Master of Engineering Science in Geographic Information Systems 8655, 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

The degree of BE (Geomatic Engineering) is recognised by the Board of Surveyors of New South Wales as meeting requirements for entry as a candidate to become a Registered Surveyor in New South Wales. The degree 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 143, Bathurst NSW 2795.

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.
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 GMAT4700 Project Management 1 of the BE program, but must complete the following three M.Com courses:

- 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
BE

<table>
<thead>
<tr>
<th>Year</th>
<th>HPW</th>
<th>UOC</th>
</tr>
</thead>
<tbody>
<tr>
<td>S1</td>
<td>S2</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>HPW</th>
<th>UOC</th>
</tr>
</thead>
<tbody>
<tr>
<td>GMAT1100</td>
<td>Principles of Surveying</td>
<td>5</td>
<td>0</td>
</tr>
<tr>
<td>GMAT1300</td>
<td>Computing Applications in Geomatics</td>
<td>4</td>
<td>0</td>
</tr>
<tr>
<td>MATH1131</td>
<td>Mathematics 1A</td>
<td>6</td>
<td>0</td>
</tr>
<tr>
<td>or MATH 1141 Higher Mathematics 1A</td>
<td>6</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td>PHYS1189</td>
<td>Physics 1</td>
<td>6</td>
<td>0</td>
</tr>
<tr>
<td>GMAT1150</td>
<td>Survey Methods &amp; Computations</td>
<td>0</td>
<td>5</td>
</tr>
<tr>
<td>GMAT1200</td>
<td>Visualisation of Spatial Data</td>
<td>0</td>
<td>4</td>
</tr>
</tbody>
</table>

GMAT1400 Land Studies in Geomatics 0 5 6
MATH 1231 Mathematics 1B 0 6 6
or MATH1241 Higher Mathematics 1B

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

HPW S1 S2

<table>
<thead>
<tr>
<th>Year 2</th>
<th>HPW</th>
<th>UOC</th>
</tr>
</thead>
<tbody>
<tr>
<td>S1</td>
<td>S2</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>HPW</th>
<th>UOC</th>
</tr>
</thead>
<tbody>
<tr>
<td>GMAT2100</td>
<td>Electronic Surveying Instrumentation: Principles and Practice</td>
<td>5</td>
<td>0</td>
</tr>
<tr>
<td>GMAT2350</td>
<td>Computing for Spatial Information Sciences</td>
<td>3</td>
<td>0</td>
</tr>
<tr>
<td>GMAT2700</td>
<td>Geometry of Coord. Ref. Systems</td>
<td>5</td>
<td>0</td>
</tr>
<tr>
<td>MATH2829</td>
<td>Statistics SU</td>
<td>3</td>
<td>0</td>
</tr>
<tr>
<td>PHYS2969</td>
<td>Physics of Measurements</td>
<td>3</td>
<td>0</td>
</tr>
<tr>
<td>MATH 2019</td>
<td>Engineering Mathematics 2CE</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>GMAT2110</td>
<td>Electronic &amp; GPS Positioning Technologies</td>
<td>0</td>
<td>5</td>
</tr>
<tr>
<td>GMAT2200</td>
<td>Geographic Inf. Systems &amp; CAD</td>
<td>0</td>
<td>5</td>
</tr>
<tr>
<td>GMAT2300</td>
<td>Analysis of Observations</td>
<td>0</td>
<td>3</td>
</tr>
</tbody>
</table>

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

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>
</tr>
</thead>
<tbody>
<tr>
<td>S1</td>
<td>S2</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>HPW</th>
<th>UOC</th>
</tr>
</thead>
<tbody>
<tr>
<td>GMAT3200</td>
<td>Geospatial Information Technologies and Applications</td>
<td>5</td>
<td>0</td>
</tr>
<tr>
<td>GMAT3400</td>
<td>Cadastral Surveying 1</td>
<td>3</td>
<td>0</td>
</tr>
<tr>
<td>General Education course/s</td>
<td>2</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>Electives (Session 1)</td>
<td>12</td>
<td></td>
<td></td>
</tr>
<tr>
<td>GMAT3500</td>
<td>Photogrammetry &amp; Remote Sensing</td>
<td>0</td>
<td>5</td>
</tr>
<tr>
<td>GMAT3410</td>
<td>Land Economics &amp; Valuation</td>
<td>0</td>
<td>3</td>
</tr>
<tr>
<td>Electives (Session 2)</td>
<td>12</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Total Units of Credit 48
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.

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.

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.

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.

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.

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.

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.

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.

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.

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.

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.

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.

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.

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.

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.

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.

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.

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.

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.

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.

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.

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.

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.

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.

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.

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 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

<table>
<thead>
<tr>
<th>Session</th>
<th>UOC</th>
</tr>
</thead>
<tbody>
<tr>
<td>One Master of Commerce course</td>
<td>6</td>
</tr>
<tr>
<td>Electives</td>
<td>15</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>24</strong></td>
</tr>
</tbody>
</table>

**Electives:**
- GMAT4000 Thesis Part A 3
- GMAT4020 Project in Geomatic Engineering 6
- GMAT4400 Land Management and Development Project 3
- GMAT4410 Land Subdivision and Development 3
- GMAT4900 Principles of GNSS Positioning 6
- GEOG 3911 Environmental Impact Assessment 3
- CS & Eng. Elective 6

Session 2

<table>
<thead>
<tr>
<th>UOC</th>
</tr>
</thead>
<tbody>
<tr>
<td>GMAT4750 Project Management 2</td>
</tr>
<tr>
<td>Electives</td>
</tr>
<tr>
<td><strong>Total</strong></td>
</tr>
</tbody>
</table>

**Electives:**
- GMAT4001 Thesis Part B 9
- GMAT4450 Land Management and Development Project 2 3
- GMAT4910 Modern Navigation and Positioning Technologies 6
- CS&Eng Elective 6
- PLAN 1022 The Development Process 3
- PLAN 2012 Economic Development Planning 3
- PLAN 3032 Integrated Planning 3 – New Development 6
- 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 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 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 5496 or 5522.4003.

8652
Geomatic Engineering / in 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.

8652
Geomatic Engineering (External Mode Delivery)

Master of Engineering Science
MEngSc

Candidates are required to complete a program totalling at least 48 units of credit.

Core Courses
UOC

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>UOC</th>
</tr>
</thead>
<tbody>
<tr>
<td>GMAT9950</td>
<td>Modern Technology in Geomatic Engineering</td>
<td>6</td>
</tr>
<tr>
<td>GMAT9951</td>
<td>Land Information Systems</td>
<td>6</td>
</tr>
<tr>
<td>GMAT9952</td>
<td>GPS Surveying</td>
<td>6</td>
</tr>
<tr>
<td>GMAT9953</td>
<td>Remote Sensing</td>
<td>6</td>
</tr>
</tbody>
</table>

Additional subjects presented either in external or face to face mode can be selected from those offered by the Schools of Computer Science and Engineering, Civil Engineering, Geography, and School of Information Systems, Technology and Management.

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
UOC

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>UOC</th>
</tr>
</thead>
<tbody>
<tr>
<td>GEOG9006</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>GEOG9020</td>
<td>Application and Management of GIS</td>
<td>6</td>
</tr>
<tr>
<td>GMAT9604</td>
<td>Land Information Systems</td>
<td>6</td>
</tr>
</tbody>
</table>

Elective Courses
UOC

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>UOC</th>
</tr>
</thead>
<tbody>
<tr>
<td>COMP9311</td>
<td>Data Base Systems</td>
<td>6</td>
</tr>
<tr>
<td>ELEC9336</td>
<td>Digital Communication Networks</td>
<td>6</td>
</tr>
<tr>
<td>GEOG9012</td>
<td>Remote Sensing Applications</td>
<td>6</td>
</tr>
<tr>
<td>GEOG9018</td>
<td>Transport Applications of GIS</td>
<td>6</td>
</tr>
<tr>
<td>GEOG9021</td>
<td>Image Analysis in Remote Sensing</td>
<td>6</td>
</tr>
<tr>
<td>GMAT9107</td>
<td>Special Topic in Geomatic Engineering B</td>
<td>6</td>
</tr>
<tr>
<td>GMAT9532</td>
<td>Data Acquisition and Terrain Modelling</td>
<td>6</td>
</tr>
<tr>
<td>GMAT9600</td>
<td>Principles of Remote Sensing</td>
<td>6</td>
</tr>
<tr>
<td>GMAT9606</td>
<td>Microwave Remote Sensing</td>
<td>6</td>
</tr>
<tr>
<td>IMGT5110</td>
<td>Information Retrieval Systems</td>
<td>6</td>
</tr>
</tbody>
</table>

Other elective courses may be added with the approval of the Head of School.

The Masters degree program in Geographic Information Systems is offered in both the Faculty of Engineering and the Faculty of Science and Technology. Entry into either Faculty depends on the background of the applicant and the orientation of the proposed program.

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. It is run when there is sufficient demand for the program.

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 normally comprises one year of full-time study or two years of part-time study.

Core Courses
UOC

<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 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.

<table>
<thead>
<tr>
<th>Core courses UOC</th>
<th>GEOG9012 Remote Sensing Applications 6</th>
<th>GEOG9021 Image Analysis in Remote Sensing 6</th>
<th>GMAT9600 Principles of Remote Sensing 6</th>
<th>GMAT9606 Microwave Remote Sensing 6</th>
</tr>
</thead>
</table>

| 4 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 School.

<table>
<thead>
<tr>
<th>UOC</th>
<th>COMP1011 Computing 1A 6</th>
<th>COMP1021 Computing 1B 6</th>
<th>ELEC9370 Digital Image Processing Systems 6</th>
<th>ELEC9408 Computer Display Systems and Interactive Instrumentation 6</th>
</tr>
</thead>
<tbody>
<tr>
<td>GEOG9014 Computer Mapping and Data Display 6</td>
<td>GEOG9016 Principles of GIS 6</td>
<td>GEOL0360 Remote Sensing Applications in Geoscience 6</td>
<td>GMAT9604 Land Information Systems 6</td>
<td></td>
</tr>
<tr>
<td>GEOG9020 Application and Management of GIS 6</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### 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.

<table>
<thead>
<tr>
<th>Core courses UOC</th>
<th>CVEN8731 Project Management Framework 6</th>
<th>GMAT9604 Land Information Systems 6</th>
<th>GMAT9608 Cadastral Systems 6</th>
<th>GMAT9609 Land Registration Systems 6</th>
<th>SOCI5336 Sociology of Development 6</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 Elective</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### 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 alphanumeric order within organisational units. For academic advice regarding a particular course consult with the course staff. A guide to abbreviations and prefixes is included in the chapter Hand-Book Guide, 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
Overview of services provided by Surveyors/Geomatic Engineers.

GMAT0442
Surveying for Civil Engineers
Staff Contact: Associate Professor C Rizos
UOC3 HPW3 S1
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-finish electronic detail surveys, electronic data recording; horizontal and vertical curves and construction survey set outs; areas and volumes. surveys to monitor deformations of structures and mine walls; GPS (satellite positioning); and an introduction to consulting services available from Geomatic Engineers.

GMAT0443
Surveying for Mining Engineers
Staff Contact: School Office
UOC30 HPW3
To provide the fundamental principles and demonstrates the relevance of surveying to mining engineering. Topics include: Principles of surveying; levelling principles and techniques; contouring; theodolites; angle measurements, instrument and survey errors; distance measurement techniques; coordinate calculations; control surveys; traversing; area and volume calculations. Also an introduction to: GPS satellite positioning; deformation monitoring surveys; map projection coordinates and calculations; correlation of surface surveys with underground surveys; shaft plumbing; transfer of height and coordinates; concept of azimuth. Awareness of other contemporary surveying topics.

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, Classify 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: Associate Professor W Kearsley
UOC6 HPW5 S1
Introduction to the School: a 2 day workshop will be held in week 3 of the course to discuss the range of topics covered in surveying and spatial Information Systems, 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 & Computations
Staff Contact: Dr B R Harvey
UOC6 HPW5 S2
Prerequisite/s: GMAT 1100

GMAT1200
Visualisation of Spatial Data
Staff Contact: Dr B R Harvey
UOC6 HPW4 S2

GMAT1300
Computing Applications in Geomatics
Staff Contact: Dr E G Masters
UOC6 HPW4 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: Mr M B Green
UOC6 HPW5 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 us land 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 & Practice**  
*Staff Contact:* Associate Professor J M Rüeger  
*UOC6 HPW5 S1*  
*Prerequisites:* 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 & GPS Positioning Technologies**  
*Staff Contact:* Associate Professor J M Rüeger  
*UOC6 HPW5 S2*  
*Prerequisites:* GMAT1100, GMAT1150  
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 E G Masters  
*UOC6 HPW5 S2*  
*Prerequisites:* 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 B R Harvey  
*UOC3 HPW3 S2*  
*Prerequisites:* MATH 1231, MATH 2019, GMAT 1150  

**GMAT2350**

**Computing for Spatial Information Sciences**  
*Staff Contact:* Dr B R Harvey  
*UOC3 HPW3 S1*  
*Corequisites:* 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:* Associate Professor C Rizos  
*UOC6 HPW5 S1*  
Cartesian coordinate systems, applications of Cartesian coordinate transformations in geomatics. Mathematical transformations between geodetic, Cartesian and topocentric coordinate systems, ellipsoidal geometry, orthomorphic 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; geod models and reference ellipsoids, height systems, celestial coordinate systems. Geodetic coordinate systems and datums; definition of AGD, GDA and AHD.

**GMAT3100**

**Surveying Applications**  
*Staff Contact:* Associate Professor J M Rüeger  
*UOC6 HPW5 S1*  
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 B R Harvey  
*UOC6 HPW2 S2*  
*Notes:* Students are required to attend a one week survey camp during the mid-year recess equivalent to 3 contact hours per week followed by three hour per week processing during session.  
At camp, a survey project of substantial extent is carried out involving the processing of the field data and the preparation of plans and reports is done during session.
GMAT3200
Geospatial Information Tech. & App.
Staff Contact: Dr E G Masters
UOC6 HPW5 S1
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 geo-spatial 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.

GMAT3400
Cadastral Surveying 1
Staff Contact: Mr M B Green
UOC3 HPW3 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 mapping principles. Cadastral mapping in NSW.

GMAT3410
Land Economics & Valuation
Staff Contact: School Office
UOC3 HPW2 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: Mr M B Green
UOC3 HPW3 S2
Survey investigation for both artificial and natural boundaries; survey and title searching. Field note 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 & Remote Sensing
Staff Contact: Professor J C Trinder
UOC6 HPW5 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.

GMAT4000
Thesis Part A
Staff Contact: School Office
UOC3 HPW0 S1
Directed laboratory, investigatory, design, field or research work on an approved subject under the guidance of members of the academic staff. Each student is required to present a seminar and a written report on the work undertaken. Time devoted to the project is two hours per week in session 1 (Part A) for library methodology instruction and preliminary work, and eight hours per week in session 2 (Part B) to carry out the major part of the work.

GMAT4001
Thesis Part B
Staff Contact: School Office
UOC9 HPW6 S2
Directed laboratory, investigatory, design, field or research work on an approved subject under the guidance of members of the academic staff. Each student is required to present a seminar and a written report on the work undertaken. Time devoted to the project is two hours per week in session 1 (Part A) for library methodology instruction and preliminary work, and eight hours per week in session 2 (Part B) to carry out the major part of the work.

GMAT4020
Project in Geomatic Engineering
Staff Contact: School Office
UOC6 HPW5 S1 S2
Projects will involve small groups of students working as a team to complete the execution of specially designed multi-faceted selected tasks in Geomatic Engineering. Topics may be the remote sensing analysis of the environment from satellite images, a digital photogrammetric mapping task, setting up a precise geodetic control network, the use of precise GPS techniques to map the local road network and insert this data into a GIS system, a precise engineering survey or the development and analysis of a geospatial database of a region. Students will be required to present the results of their project in a well written report and verbally at a School Seminar.

GMAT4400
Land Management & Development Project 1
Staff Contact: School Office
UOC3 HPW2 S1
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. 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.

GMAT4410
Land Subdivision & Development
Staff Contact: School Office
UOC3 HPW3 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.

GMAT4450
Land Management and Development Project 2
Staff Contact: School Office
UOC3 HPW2 S2
Engineering design and plans: catchment details, road longitudinal and cross-sections, drainage layout, flow schedule, hydraulic grade line calculations, longitudinal sections of kerb profiles. Detention systems, infill subdivisions, shadow diagrams, driveway designs.
GMAT4700
Project Management 1
Staff Contact: School Office
UOC3  HPW0  S1


GMAT4750
Project Management 2
Staff Contact: School Office
UOC3  HPW3  S2

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.

GMAT4850
Geomatic Engineering for Sustainability
Staff Contact: School Office
UOC3  HPW3  S1


GMAT4900
Principles of GNSS Positioning
Staff Contact: School Office
UOC6  HPW5  S1

This course will introduce the student to reference coordinate systems and time systems, satellite orbital motion, signal propagation and satellite tracking observables. The principles of positioning using the current two Global Navigation Satellite Systems (GNSS) will be studied: the U.S. developed Global Positioning System (GPS) and Russia's Global Navigation Satellite System (GLONASS). The mathematical models for pseudo-range and carrier phase-based modes of positioning, for both single receiver (absolute) positioning and relative positioning implementations, will be developed. These principles will be illustrated using the Matlab GNSS toolkit, which allows the student to develop algorithms for real and simulated data processing. Local, regional and wide area differential positioning will also be considered. Land, marine and airborne positioning applications will be discussed.

GMAT4910
Modern Navigation & Positioning Technologies
Staff Contact: School Office
UOC6  HPW5  S2

This subject presents an overview of the various satellite-based and non-satellite navigation technologies and some of their applications. Particular emphasis will be placed on the role such positioning technologies will play in Intelligent Transport Systems (ITS). Various user receiver configurations, system augmentations and implementation issues will be analysed. These include: differential GPS (DGPS) schemes and services, real-time systems and their communication links, pseudo-range and carrier phase-based techniques, pseudolites, and combined GPS/GLONASS positioning. In addition, the role of other sensors (such as gyros, accelerometers and inertial navigation systems (INS)) and ancillary data (such as digital maps) can play in ITS positioning/navigation will be discussed. Data fusion techniques for integrating GPS (or GLONASS) with INS, such as Kalman Filtering, will be presented. Students will gain hands-on experience with a variety of navigation receiver and sensor technology.

GMAT9106
Special Topic in Geomatic Engineering A
Staff Contact: School Office
UOC6  HPW3  WKS14

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
UOC6  HPW3  WKS14

A special course 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.

GMAT9211
Introduction to Geodesy
Staff Contact: Associate Professor A H W Kearsley
UOC6  HPW3  WKS14  S2


GMAT9121
Network and Deformation Analysis
Staff Contact: School Office
UOC6  HPW3

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.

GMAT9212
GPS Satellite Surveying
Staff Contact: School Office
UOC6  HPW3  S1  S2

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.
GMAT9533
Land Use Mapping and Administration
Staff Contact: School Office
UOC6 HPW3 S1
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
UOC6 HPW3 WK514 S1

GMAT9604
Land Information Systems
Staff Contact: Dr E G Masters
UOC6 HPW3 WK514 S2

GMAT9606
Microwave Remote Sensing
Staff Contact: School Office
UOC6 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
UOC6 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
UOC6 HPW3 S2
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 Systems
Staff Contact: School Office
UOC6 HPW3 S2

GMAT9611
Land Law for Land Administration
Staff Contact: School Office
UOC6 HPW3 S2
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: Dr E G Masters
Note/s: By distance learning.

GMAT9951
Modern Technology in Geomatic Engineering
Staff Contact: A/Prof W Kearsley
UOC6 HPW3 WK514
Note/s: By distance learning.

GMAT9952
GPS Surveying
Staff Contact: A/Prof C Rizos
UOC6 HPW3 WK514
Note/s: By distance learning.

Staff Contact: School Office
UOC6 HPW3 S2
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 S1


Notes: 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
Ms G Pearson

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.
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 areas 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 and Mechatronic Engineering students may study special plans 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 MBiomedE). The special plans under 3710 commence in first year. Similarly Manufacturing Engineering and Management, Mechanical Engineering and Mechatronic 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).

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. 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 Institution of Naval Architects (RINA), London, as the academic qualification for corporate membership of that body.

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 Plan and Management Plan

Mechanical Engineering Plan

Mechatronic Engineering Plan

Naval Architecture Plan

<table>
<thead>
<tr>
<th>Year 1 of all plans</th>
<th>HPWS 1</th>
<th>UOC</th>
</tr>
</thead>
<tbody>
<tr>
<td>CHEM1817 Chemistry 1ME</td>
<td>3 3</td>
<td></td>
</tr>
<tr>
<td>MANF1130 Introduction to Manufacturing</td>
<td>7 6</td>
<td></td>
</tr>
<tr>
<td>MATH1131 Mathematics 1A</td>
<td>6 6</td>
<td></td>
</tr>
<tr>
<td>MATH1231 Mathematics 1B</td>
<td>6 6</td>
<td></td>
</tr>
<tr>
<td>MATS9250 Engineering Materials</td>
<td>3 3</td>
<td></td>
</tr>
<tr>
<td>MECH1120 Design and the Engineering Profession</td>
<td>3 3</td>
<td></td>
</tr>
<tr>
<td>MECH1300 Engineering Mechanics 1</td>
<td>4 6</td>
<td></td>
</tr>
<tr>
<td>MECH1400 Mechanics of Solids 1</td>
<td>4 6</td>
<td></td>
</tr>
<tr>
<td>MECH1500 Computing 1M</td>
<td>3 3</td>
<td></td>
</tr>
<tr>
<td>PHYS1169 Physics ICME</td>
<td>6 6</td>
<td></td>
</tr>
</tbody>
</table>

The award of the BE degree in Naval Architecture is recognised by the Royal Institution of Naval Architects (RINA), London, as the academic qualification for corporate membership of that body.
### 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 Australasian 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.

#### Year 3

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>HPW</th>
<th>S1</th>
<th>UOC</th>
</tr>
</thead>
<tbody>
<tr>
<td>AERO3101</td>
<td>Aerospace Design 1A</td>
<td>3</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>AERO3102</td>
<td>Aerospace Design 1B</td>
<td>3</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>
<td>3</td>
</tr>
<tr>
<td>AERO3610</td>
<td>Aerodynamics and Propulsion</td>
<td>6</td>
<td>6</td>
<td>3</td>
</tr>
<tr>
<td>AERO3620</td>
<td>Flight Dynamics and Systems</td>
<td>3</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>MECH3000</td>
<td>Professional Responsibilities</td>
<td>3</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>MECH3203</td>
<td>Engineering Experimentation A</td>
<td>2</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>MECH3211</td>
<td>Linear Systems Analysis</td>
<td>3</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>MECH3330</td>
<td>Vibration Analysis</td>
<td>3</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>MECH3400</td>
<td>Mechanics of Solids 3</td>
<td>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>
<td>3</td>
</tr>
<tr>
<td>MTRN3212</td>
<td>Principles of Control</td>
<td>3</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>General Education Elective</td>
<td>2</td>
<td>3</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>General Education Elective</td>
<td>2</td>
<td>3</td>
<td>3</td>
<td></td>
</tr>
</tbody>
</table>

#### Year 4

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>HPW</th>
<th>S1</th>
<th>UOC</th>
</tr>
</thead>
<tbody>
<tr>
<td>AERO4101</td>
<td>Aerospace Design 2A</td>
<td>3</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>AERO4102</td>
<td>Aerospace Design 2B</td>
<td>3</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>
<td>3</td>
</tr>
<tr>
<td>AERO4402</td>
<td>Analysis of Aerospace Structures 2B</td>
<td>3</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>AERO4610</td>
<td>Advanced Aerodynamics and Propulsion</td>
<td>6</td>
<td>6</td>
<td>3</td>
</tr>
<tr>
<td>AERO4620</td>
<td>Aerospace Vehicle Dynamics and Systems</td>
<td>6</td>
<td>6</td>
<td>3</td>
</tr>
<tr>
<td>MANF4430</td>
<td>Management for Engineers</td>
<td>6</td>
<td>6</td>
<td>3</td>
</tr>
<tr>
<td>MECH4001</td>
<td>Communications for Professional Engineers</td>
<td>3</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>MECH4003</td>
<td>Thesis A</td>
<td>---</td>
<td>6</td>
<td>9</td>
</tr>
<tr>
<td>MECH4004</td>
<td>Thesis B</td>
<td>---</td>
<td>6</td>
<td>9</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 function 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.

#### Year 3

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>HPW</th>
<th>S1</th>
<th>UOC</th>
</tr>
</thead>
<tbody>
<tr>
<td>ACCT9003</td>
<td>Introduction to Accounting Principles</td>
<td>2</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>MANF3210</td>
<td>Product Manufacture</td>
<td>6</td>
<td>6</td>
<td>3</td>
</tr>
<tr>
<td>MANF3300</td>
<td>Design of Manufacturing Facilities 1</td>
<td>4</td>
<td>6</td>
<td>3</td>
</tr>
<tr>
<td>MANF3420</td>
<td>Industrial Experimentation</td>
<td>2</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>MANF3500</td>
<td>Computers in Manufacturing 1</td>
<td>3</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>MANF3601</td>
<td>Manufacturing Operations Analysis A</td>
<td>3</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>MANF3602</td>
<td>Manufacturing Operations Analysis B</td>
<td>3</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>MECH3000</td>
<td>Professional Responsibilities</td>
<td>3</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>MECH3211</td>
<td>Linear Systems Analysis</td>
<td>3</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>MTRN3212</td>
<td>Principles of Control</td>
<td>3</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>MTRN3530</td>
<td>Computing Applications in Mechanical Systems</td>
<td>3</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>General Education Elective</td>
<td>2</td>
<td>3</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>General Education Elective</td>
<td>2</td>
<td>3</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>General Education Elective</td>
<td>2</td>
<td>3</td>
<td>3</td>
<td></td>
</tr>
</tbody>
</table>

#### Year 4

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>HPW</th>
<th>S1</th>
<th>UOC</th>
</tr>
</thead>
<tbody>
<tr>
<td>MANF4011</td>
<td>Analysis of Manufacturing Systems A</td>
<td>2</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>MANF4012</td>
<td>Analysis of Manufacturing Systems B</td>
<td>2</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>MANF4300</td>
<td>Design of Manufacturing Facilities 2</td>
<td>4</td>
<td>6</td>
<td>3</td>
</tr>
<tr>
<td>MANF4430</td>
<td>Management for Engineers</td>
<td>6</td>
<td>6</td>
<td>3</td>
</tr>
<tr>
<td>MANF4440</td>
<td>Strategic Manufacturing Management</td>
<td>3</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>MANF4500</td>
<td>Computers in Manufacturing 2</td>
<td>3</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>MANF4601</td>
<td>Computer Aided Production Management A</td>
<td>3</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>MANF4602</td>
<td>Computer Aided Production Management B</td>
<td>3</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>MECH4001</td>
<td>Communications for Professional Engineers</td>
<td>3</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>MECH4003</td>
<td>Thesis A</td>
<td>---</td>
<td>6</td>
<td>9</td>
</tr>
<tr>
<td>MECH4004</td>
<td>Thesis B</td>
<td>---</td>
<td>6</td>
<td>9</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-aided design, power generation, energy and environmental systems, gas and liquid handling, bio-mechanics, materials handling, control systems, mechatronics and robotics, and transport. An emphasis is placed on the application of engineering science, development and management in these fields.

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 course 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.

The list of courses below are revised from 2000 and are subject to Faculty approval.

<table>
<thead>
<tr>
<th>Year 3</th>
</tr>
</thead>
<tbody>
<tr>
<td>MECH3000 Professional Responsibilities 3 3</td>
</tr>
<tr>
<td>MECH3101 Machine Systems Design A 3 3</td>
</tr>
<tr>
<td>MECH3102 Machine Systems Design B 3 3</td>
</tr>
<tr>
<td>MECH3203 Engineering Experimentation A 2 3</td>
</tr>
<tr>
<td>MECH3204 Engineering Experimentation B 2 3</td>
</tr>
<tr>
<td>MECH3211 Linear Systems Analysis 3 3</td>
</tr>
<tr>
<td>MECH3300 Engineering Mechanics 3 3</td>
</tr>
<tr>
<td>MECH3330 Vibration Analysis 3 3</td>
</tr>
<tr>
<td>MECH3400 Mechanics of Solids 3 3</td>
</tr>
<tr>
<td>MECH3520 Programming and Numerical Methods 3 3</td>
</tr>
<tr>
<td>MECH3601 Thermofluid System Design 3 3</td>
</tr>
<tr>
<td>MECH3602 Advanced Thermodynamics 3 3</td>
</tr>
<tr>
<td>MTRN3212 Principles of Control 3 3</td>
</tr>
<tr>
<td>General Education Elective 2 3</td>
</tr>
<tr>
<td>General Education Elective 2 3</td>
</tr>
<tr>
<td>General Education Elective 2 3</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Year 4</th>
</tr>
</thead>
<tbody>
<tr>
<td>MANF4430 Management for Engineers 6 6</td>
</tr>
<tr>
<td>MECH4001 Communications for Professional Engineers 3 3</td>
</tr>
<tr>
<td>MECH4003 Thesis A --- 6</td>
</tr>
<tr>
<td>MECH4004 Thesis B --- 9</td>
</tr>
<tr>
<td>Technical Electives --- 12</td>
</tr>
<tr>
<td>Technical Electives --- 12</td>
</tr>
</tbody>
</table>

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 Technical Electives

Eighteen (18) 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.
### 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 program.

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 Australasian 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.

### 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. Overall, in the combined degree program, at least 84 Units of Credit must be taught by Science.

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.

#### Year 1

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</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>MATH1113</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></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Profession</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>MECH5000</td>
<td>Computing 1M</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>PHYS1169</td>
<td>Physics 1CME</td>
<td>6</td>
<td>6</td>
</tr>
<tr>
<td>Science course</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Science course</td>
<td></td>
<td></td>
<td></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 2A</td>
<td>6</td>
<td>6</td>
</tr>
<tr>
<td>MATH2039</td>
<td>Engineering Mathematics 2B</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>MATH2339</td>
<td>Statistics SM</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>MECH2601</td>
<td>Fluid Mechanics and Thermodynamics A</td>
<td>4</td>
<td>6</td>
</tr>
</tbody>
</table>

### Preferred Electives List

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>HPW</th>
<th>UOC</th>
</tr>
</thead>
<tbody>
<tr>
<td>COMP3111</td>
<td>Software Engineering</td>
<td>5 or 5</td>
<td>6</td>
</tr>
<tr>
<td>COMP3331</td>
<td>Computer Networks and Applications</td>
<td>5</td>
<td>6</td>
</tr>
<tr>
<td>ELEC3041</td>
<td>Real Time Engineering</td>
<td></td>
<td></td>
</tr>
<tr>
<td>MANF4500</td>
<td>Computers in Manufacturing 2</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>MTRN9211</td>
<td>Modelling and Control of</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Mechanatronic Systems</td>
<td>3</td>
<td>6</td>
</tr>
<tr>
<td>MTRN9222</td>
<td>Intelligent Machines</td>
<td>3</td>
<td>6</td>
</tr>
<tr>
<td>MTRN9223</td>
<td>Machine Condition Monitoring</td>
<td>3</td>
<td>6</td>
</tr>
<tr>
<td>MTRN9300</td>
<td>Mechanics of Manipulators</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### General Education Elective

- CHEM1817 Chemistry 1ME
- MANF1130 Introduction to Manufacturing
- MATH1113 Mathematics 1A
- MATH1231 Mathematics 1B
- MATS9520 Engineering Materials
- MECH1120 Design and the Engineering Profession
- MECH5000 Computing 1M
- PHYS1169 Physics 1CME
- Science course
- Science course

### Engineering Mathematics 2A

**Preferred**

- MATH2029 Engineering Mathematics 2A
- MATH2039 Engineering Mathematics 2B
- MATH2339 Statistics SM
- MECH1300 Engineering Mechanics 1
- MECH1400 Mechanics of Solids 1
- MECH2601 Fluid Mechanics and Thermodynamics A
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. Although the Arts and Social Sciences Faculty Handbook lists courses from the Faculties of Engineering, Life Sciences and Technology, it is not permissible for BEBA students to include these courses.

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 or in Mechatronic Engineering and a Master of Biomedical Engineering (BE MBiomedE) can both be completed in five years of concurrent study. The first four years are defined in a special Mechanical Engineering plan, or in a special Mechatronic Engineering plan, within the Bachelor of Engineering 3710 program. The fifth year is defined by plans within the Master of Biomedical Engineering program 3749. Program 3710 comes under the HECS system but 3749 does not. Both the engineering and biomedical components are described in the Graduate School of Biomedical Engineering section of this Handbook.

At the time of printing this Handbook the BEMBiomedE involving Mechatronic Engineering had only just been approved in principle. Final details of the schedule of courses will be available soon.
Bachelor of Engineering/Master of Commerce

A Bachelor of Engineering degree in Manufacturing Engineering and Management, or in Mechanical Engineering, or in Mechatronic Engineering, and a Master of Commerce degree (BE MCom) can both be completed in five years of concurrent study. The first four years are defined in a special Manufacturing Engineering and Management plan, or in a special Mechanical Engineering plan, or in a special Mechatronic Engineering plan, within the Bachelor of Engineering 3710 program. Details are given below. The fifth year is defined by plans within the Master of Commerce program 8404 which is described in the Faculty of Commerce and Economics Handbook. Program 3710 comes under the HECS system but 8404 does not.

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.

At the time of printing this Handbook the BEMCom involving Mechatronic Engineering had not yet been officially approved. Final details of the schedule of courses will be available soon.

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.

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 4</th>
<th>HPW</th>
<th>UOC</th>
</tr>
</thead>
<tbody>
<tr>
<td>ACCT5901</td>
<td>Accounting: a user perspective</td>
<td>3</td>
</tr>
<tr>
<td>ECON5103</td>
<td>Business Economics</td>
<td>3</td>
</tr>
<tr>
<td>IROB5700</td>
<td>Management, Work and Organisation</td>
<td>3</td>
</tr>
<tr>
<td>MANF4300</td>
<td>Design of Manufacturing Facilities 2</td>
<td>4</td>
</tr>
<tr>
<td>MANF4500</td>
<td>Computers in Manufacturing 2</td>
<td>3</td>
</tr>
<tr>
<td>MANF4601</td>
<td>Computer Aided Production Management A</td>
<td>3</td>
</tr>
<tr>
<td>MECH4001</td>
<td>Communications for Professional Engineers</td>
<td>3</td>
</tr>
<tr>
<td>MECH4003</td>
<td>Thesis A</td>
<td>---</td>
</tr>
<tr>
<td>MECH4004</td>
<td>Thesis B</td>
<td>---</td>
</tr>
</tbody>
</table>

Years 5

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 of Master 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:**
   
<table>
<thead>
<tr>
<th>UOC</th>
<th>Course Name</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>6</td>
<td>MANF8340 Factory Automation</td>
<td>6</td>
</tr>
<tr>
<td>6</td>
<td>MANF8410 Total Quality Management</td>
<td>6</td>
</tr>
<tr>
<td>6</td>
<td>MANF8472 Production Planning and Control</td>
<td>6</td>
</tr>
<tr>
<td>6</td>
<td>MANF8543 CAD/CAM</td>
<td>6</td>
</tr>
<tr>
<td>6</td>
<td>MANF8544 Concurrent Product and Process Design</td>
<td>6</td>
</tr>
<tr>
<td>6</td>
<td>MANF8560 Computer Integrated Manufacturing</td>
<td>6</td>
</tr>
</tbody>
</table>

   **Elective courses:**

<table>
<thead>
<tr>
<th>UOC</th>
<th>Course Name</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>6</td>
<td>MANF8601 Economic Decisions in Industrial Management</td>
<td>6</td>
</tr>
<tr>
<td>6</td>
<td>MANF8400 Industrial Management</td>
<td>6</td>
</tr>
<tr>
<td>6</td>
<td>MECH9410 Finite Element Applications</td>
<td>6</td>
</tr>
</tbody>
</table>

2. Industrial Management
   
   **Staff Contact:** Dr B Kayis
   
   **Core courses:**

<table>
<thead>
<tr>
<th>UOC</th>
<th>Course Name</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>6</td>
<td>MANF9400 Industrial Management</td>
<td>6</td>
</tr>
<tr>
<td>6</td>
<td>MANF9410 Total Quality Management</td>
<td>6</td>
</tr>
<tr>
<td>6</td>
<td>MANF9420 Managing Manufacturing Operations</td>
<td>6</td>
</tr>
<tr>
<td>6</td>
<td>MANF9471 Manufacturing Strategy</td>
<td>6</td>
</tr>
<tr>
<td>6</td>
<td>MANF9472 Production Planning and Control</td>
<td>6</td>
</tr>
<tr>
<td>6</td>
<td>MANF9601 Economic Decisions in Industrial Management</td>
<td>6</td>
</tr>
</tbody>
</table>

   **Elective courses:**

<table>
<thead>
<tr>
<th>UOC</th>
<th>Course Name</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>6</td>
<td>MANF9340 Factory Automation</td>
<td>6</td>
</tr>
<tr>
<td>6</td>
<td>MANF8543 CAD/CAM</td>
<td>6</td>
</tr>
<tr>
<td>6</td>
<td>MANF8544 Concurrent Product and Process Design</td>
<td>6</td>
</tr>
<tr>
<td>6</td>
<td>SESC9471 Industrial Ergonomics</td>
<td>6</td>
</tr>
</tbody>
</table>

3. Manufacturing Management (External A)
   
   **Staff Contact:** Prof H Kaebernick
   
   **Core courses:**

<table>
<thead>
<tr>
<th>UOC</th>
<th>Course Name</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>6</td>
<td>MANF9400 Industrial Management</td>
<td>6</td>
</tr>
<tr>
<td>6</td>
<td>MANF9410 Total Quality Management</td>
<td>6</td>
</tr>
<tr>
<td>6</td>
<td>MANF9420 Managing Manufacturing Operations</td>
<td>6</td>
</tr>
<tr>
<td>6</td>
<td>MANF9471 Manufacturing Strategy</td>
<td>6</td>
</tr>
<tr>
<td>6</td>
<td>MANF9472 Production Planning and Control</td>
<td>6</td>
</tr>
<tr>
<td>6</td>
<td>MANF9601 Economic Decisions in Industrial Management</td>
<td>6</td>
</tr>
</tbody>
</table>

   **Elective courses:**

<table>
<thead>
<tr>
<th>UOC</th>
<th>Course Name</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>6</td>
<td>MANF9340 Factory Automation</td>
<td>6</td>
</tr>
<tr>
<td>6</td>
<td>MANF8543 CAD/CAM</td>
<td>6</td>
</tr>
<tr>
<td>6</td>
<td>MANF8544 Concurrent Product and Process Design</td>
<td>6</td>
</tr>
<tr>
<td>6</td>
<td>SESC9471 Industrial Ergonomics</td>
<td>6</td>
</tr>
</tbody>
</table>

**Notes:**

This strand is available in Distance Delivery Mode in Singapore only.

4. Manufacturing Management (External B)
   
   **Staff Contact:** Prof H Kaebernick
   
   **Notes:**

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:**

<table>
<thead>
<tr>
<th>UOC</th>
<th>Course Name</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>6</td>
<td>MANF8340 Factory Automation</td>
<td>6</td>
</tr>
<tr>
<td>6</td>
<td>MANF8420 Managing Manufacturing Operations</td>
<td>6</td>
</tr>
<tr>
<td>6</td>
<td>MANF8455 Concurrent Product and Process Design</td>
<td>6</td>
</tr>
<tr>
<td>6</td>
<td>MANF8491 Manufacturing Strategy</td>
<td>6</td>
</tr>
<tr>
<td>6</td>
<td>MANF8472 Production Planning and Control</td>
<td>6</td>
</tr>
<tr>
<td>6</td>
<td>MANF8560 Computer Integrated Manufacturing</td>
<td>6</td>
</tr>
</tbody>
</table>

**Elective courses:**

<table>
<thead>
<tr>
<th>UOC</th>
<th>Course Name</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>6</td>
<td>CVEN8701 Engineering Economics and Financial Management</td>
<td>6</td>
</tr>
<tr>
<td>6</td>
<td>CVEN8703 Quality and Quality Systems</td>
<td>6</td>
</tr>
<tr>
<td>6</td>
<td>CVEN8706 Human Resources Management</td>
<td>6</td>
</tr>
<tr>
<td>6</td>
<td>CVEN8710 Management of Risk</td>
<td>6</td>
</tr>
<tr>
<td>6</td>
<td>CVEN8714 Resource Management</td>
<td>6</td>
</tr>
<tr>
<td>6</td>
<td>CVEN8718 Strategic Management for Engineering</td>
<td>6</td>
</tr>
<tr>
<td>6</td>
<td>CVEN8720 Problem Solving and Decision Making</td>
<td>6</td>
</tr>
<tr>
<td>6</td>
<td>SESC9471 Industrial Ergonomics</td>
<td>6</td>
</tr>
</tbody>
</table>

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, 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:**
   - 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
   - MATH5245 Computational Fluid Dynamics
   - MATH5305 Finite Differential Schemes for PDE's
   - MATH5315 High Performance Computing
   - MATH5325 Mesh Generation and Visualisation
   - MECH9610 Advanced Fluid Dynamics
   - MECH9620 Computational Fluid Dynamics
   - MECH9750 Industrial Applications of Heat Transfer

3. Computational Engineering (The Structural Analysis Strand)
   **Staff Contact:** A/Prof DW Kelly
   - MATH5115 Analysis of Finite Element Methods
   - MATH5315 High Performance Computing
   - MATH5325 Mesh Generation and Visualisation
   - MECH9131* Advanced CAD Modelling and Applications
   - MECH9310 Advanced Vibration Analysis
   - MECH9400 Mechanics of Fracture and Fatigue
   - MECH9410 Finite Element Applications
   *or MANF9543* Computer Aided Design/Computer Aided Manufacturing

4. Mechatronic Engineering
   **Staff Contact:** Dr RA Willgoss
   **Core courses:**
   - MTRN9201 Digital Logic Fundamentals for Mechanical Engineers 6
   - MTRN9202 Microprocessor Fundamentals for Mechanical Engineers 6
   - MTRN9211 Modelling and Control of Mechatronic Systems 6
   - MTRN9221 Industrial Robotics 6
   **Elective courses:**
   - MTRN9222 Artificially Intelligent Machines 6
   - MTRN9223 Machine Condition Monitoring 6
   - MTRN9300 Mechanics of Manipulators 6

5. Noise and Vibration
   **Staff Contact:** A/Prof RB Randall
   - MECH8323 Environmental Noise 6
   - MECH8324 Building Acoustics 6
   - 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
   - MTRN8223 Machine Condition Monitoring 6

6. Noise and Vibration (by distance)
   **Staff Contact:** Prof E Leonardi
   - MECH8310 Advanced Vibration Analysis
   - MECH8311 Fundamentals of Vibration
   - MECH8312 Fundamentals of Noise and Vibration Measurement
   - MECH8323 Environmental Noise
   - MECH8324 Building Acoustics
   - MECH8325 Fundamentals of Noise
   - MECH8326 Advanced Noise
   - MTRN8223 Machine Condition Monitoring

7. Refrigeration and Air Conditioning
   **Staff Contact:** A/Prof RB Randall
   - MECH9325 Fundamentals of Noise
   - MECH9326 Advanced Noise
   - MECH9610 Advanced Fluid Dynamics
   - MECH9620 Computational Fluid Dynamics
   - MECH9720 Solar Thermal Energy Design
   - MECH9730 Multiphase Flow
   - MECH9740 Power Plant Engineering
   - MECH9742 Power Production Assessment
   - MECH9750 Industrial Applications of Heat Transfer
   - MECH9751 Refrigeration and Air Conditioning 1
   - MECH9752 Refrigeration and Air Conditioning 2
   - MECH9753 Refrigeration and Air Conditioning Design 1
   - MECH9754 Refrigeration and Air Conditioning Design 2
   - MECH9757 Ambient Energy Air Conditioning
   - MECH9761 Internal Combustion Engines

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.

AER03101
Aerospace Design 1A
Staff Contact: J R Page
UOC3 HPW3 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.

AER03102
Aerospace Design 1B
Staff Contact: J R Page
UOC3 HPW3 S2
Prerequisite/s: AER03101
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.

AER03400
Analysis of Aerospace Structures 1
Staff Contact: Associate Professor D W Kelly
UOC3 HPW3 S2
Prerequisite/s: 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.

AER03610
Aerodynamics and Propulsion
Staff Contact: Dr N A Ahmed
UOC6 HPW6 S2
Prerequisite/s: MECH2602

AER03620
Flight Dynamics and Systems
Staff Contact: J R Page
UOC3 HPW3 S1
Prerequisite/s: MECH2300
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-off 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.

AER04101
Aerospace Design 2A
Staff Contact: J R Page
UOC3 HPW3 S1
Prerequisite/s: AER03102
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 AER04102.

AER04102
Aerospace Design 2B
Staff Contact: J R Page
UOC3 HPW3 S2
Prerequisite/s: AER04101
Building on work in AER04102, project teams complete their initial design study, produce a group report and an individual portfolio, and present their findings.

AER04401
Analysis of Aerospace Structures 2A
Staff Contact: Associate Professor D W Kelly
UOC3 HPW3 S1
Prerequisite/s: AER03400, MECH3400
Excluded: MECH9410, NAVL4401
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.

AER04402
Analysis of Aerospace Structures 2B
Staff Contact: Associate Professor D W Kelly
UOC3 HPW3 S2
Prerequisite/s: AER04401
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.

AER04610
Advanced Aerodynamics and Propulsion
Staff Contact: Dr N A Ahmed
UOC6 HPW6 S1
Prerequisite/s: AER03610

AER04620
Aerospace Vehicle Dynamics and Systems
Staff Contact: J R Page
UOC6 HPW6 S2
Prerequisite/s: AER03620
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.
AERO9010
Project Aerospace Engineering
Staff Contact: J R Page
UOC6 S1 S2
Notes: The project must be completed in no more than two sessions.

AERO9105
Aerospace Vehicle Design and Manufacture
Staff Contact: J R Page
UOC6 HPW6 S1
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.

AERO9415
Finite Element Analysis and Applications for Aerospace Structures
Staff Contact: Associate Professor D W Kelly
UOC6 HPW3 S1
Excluded: MECH9410
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.

AERO9543
Cad/Cam for Aerospace Structures
Staff Contact: Associate Professor K Hoang
UOC6 HPW3 S1

AERO9606
Aerodynamics
Staff Contact: Dr N A Ahmed
UOC6 HPW4 S1 S2
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.

AERO9607
Flight Dynamics
Staff Contact: J R Page
UOC6 HPW3 S2

AER09705
Aerospace Propulsion
Staff Contact: Dr R Casey
UOC6 HPW4 S1 S2

MANF0420
Production Management
Staff Contact: Dr B Kayis
UOC6 HPW6 S1
Excluded: MANF4430
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: Associate Professor P Mathew
UOC6 HPW7 S2
Excluded: MANF1100, MANF1110, MANF1120
Notes: 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. Students who have done appropriate technology-based courses at school or who have an appropriate trade or certificate qualification or are suitably employed, may seek an exemption for the practical training classes.

The relationship between product design and manufacturing processes is introduced with theoretical and practical classes. Description and elementary 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.

MANF3210
Product Manufacture
Staff Contact: Associate Professor P Mathew
UOC6 HPW6 S1
Prerequisite/s: MANF1130
Corequisite/s: MECH2101, MECH2411
Design for economic manufacture. Geometric analysis of product designs and the technology and economics of manufacturing and assembly processes. The principle and technology underlying dimensional metrology for quality product manufacture. The analysis provides a basis for rational process selection and the refinement of product design to suit the chosen manufacturing methods.

MANF3300
Design of Manufacturing Facilities 1
Staff Contact: Dr B Kayis
UOC6 HPW4 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 K C Chan
UOC3 HPW2 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: Professor H Kaebernick
UOC3 HPW3 S2
Prerequisite/s: ELECT0807, MANF1130, 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
UOC3 HPW3 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 Operation Analysis B
Staff Contact: Associate Professor R M Kerr
UOC3 HPW3 S2
Prerequisite/s: MATH2839, MECH1500
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: Professor H Kaebernick
UOC3 HPW2 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: Professor H Kaebernick
UOC3 HPW2 S2
Prerequisite/s: MANF4011
Further project work, continuing from activities in MANF4011 Manufacturing Systems A.

MANF4300
Design of Manufacturing Facilities 2
Staff Contact: Dr K C Chan
UOC6 HPW4 S2
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
Management for Engineers
Staff Contact: Dr B Kayis
UOC6 HPW6 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".

MANF4440
Strategic Manufacturing Management
Staff Contact: Associate Professor R M Kerr
UOC3 HPW3 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: Professor H Kaebernick
UOC6 HPW3 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: Professor H Kaebernick
UOC3 HPW3 S1
Prerequisite/s: MANF3601
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
UOC3 HPW3 S2
Prerequisite/s: MANF3602
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: Associate Professor P Mathew
UOC6 HPWO S2
Excluded: MANF9340
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 intelligence in manufacturing. Communication networks in a factory environment. Strategies for factory automation.

MANF8420
Managing Manufacturing Operations
Staff Contact: Dr B Kayis
UOC6 HPWO S2
Excluded: MANF9420
Managing manufacturing operations as a competitive weapon, strategic linkage of operations through quality, value added
MANF8471
Manufacturing Strategy
Staff Contact: Associate Professor R M Kerr
UOC6 HPW0 S1
Excluded: MANF9471
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: Associate Professor R M Kerr
UOC6 HPW0 S2
Excluded: GSDE3102, MANF9472
Industry dynamics; Porters 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: Professor H Kaebernick
UOC6 HPW0 S1
Excluded: MANF9544

MANF8560
Computer Integrated Manufacture
Staff Contact: Associate Professor K Hoang
UOC6 HPW0 S1 S2
Excluded: MANF9560
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 maintenance, material handling. Shared CIM and AI in CIM will also be discussed.

MANF9000
Research Thesis Manufacturing Engineering and Management (Full time)
Staff Contact: Professor M Behnia
UOC48 HPW0 S1 S2
Excluded: MANF9001
Research Thesis Manufacturing Engineering and Management (Part time)
Staff Contact: Professor M Behnia
UOC24 HPW0 S1 S2
Excluded: MANF9001
Project Manufacturing Engineering and Management
Staff Contact: Professor H Kaebernick
UOC12 HPW0 S1 S2
Note/s: The project must be completed in no more than two sessions.

MANF9340
Factory Automation
Staff Contact: Associate Professor P Mathew
UOC6 HPW3 S2
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 S2
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 S1
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 S2
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: Associate Professor R M Kerr
UOC6 HPW3 S1
Excluded: MANF9471
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: Associate Professor R M Kerr
UOC6 HPW3 S2
Excluded: MANF8472

Industry dynamics; Porters 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. Optimized Production Technology and synchronized 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: Professor H Kaebernick
UOC6 HPW3 S1 S2

MANF9543
Computer Aided Design/Computer Aided Manufacture
Staff Contact: Associate Professor K Hoang
UOC6 HPW3 S1
Excluded: AERO9543

Note/s: Enrolments 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: Professor H Kaebernick
UOC6 HPW3 S1
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: Associate Professor K Hoang
UOC6 HPW3 S2
Prerequisite/s: MANF9543
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 S1

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: A J Barratt
UOC3 HPW3 S1

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 S S Leong
UOC4 HPW4 S2

Prerequisite/s: As a suitable preparation for this course, it is strongly recommended that students have taken either 2 unit HSC Science (Physics) or 3 unit HSC Science multistrand or 2 unit Industrial Arts (Engineering Science) or equivalent

Excluded: MECH0440, MECH1300


MECH0440
Engineering Statics
Staff Contact: Dr S S Leong
UOC3 HPW3 S2

Prerequisite/s: As a suitable preparation for this course, it is strongly recommended that students have taken either 2 unit HSC Science (Physics) or 3 unit HSC Science multistrand or 2 unit Industrial Arts (Engineering Science) or equivalent

Excluded: MECH0330, MECH1300


MECH1120
Design and the Engineering Profession
Staff Contact: Associate Professor R B Frost
UOC3 HPW3 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: Associate Professor R A J Ford
UOC6 HPW4 S1 S2

Prerequisite/s: As a suitable preparation for this course, it is strongly recommended that students have taken either 2 unit HSC Science (Physics) or 3 unit HSC Science multistrand or 2 unit Industrial Arts (Engineering Science) or equivalent

Corequisite/s: MATH1131 or MATH1141

Note/s: Excluded MECH0330


MECH1400
Mechanics of Solids 1
Staff Contact: Professor E J Hahn
UOC6 HPW4 S1 S2

Corequisite/s: MECH1300 or MECH0330 or MECH0440

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 M J Tordon
UOC3 HPW3 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 style, 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: Associate Professor R B Frost
UOC3 HPW3 S1
Prerequisite/s: MANF1130, MECH1400
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: Associate Professor R B Frost
UOC3 HPW3 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: Professor K P Byrne
UOC3 HPW3 S1 S2
Prerequisite/s: MATH1231 or MATH1341, MECH1300
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 H L Stark
UOC3 HPW3 S1 S2
Prerequisite/s: MATH11231 or MATH11241
Corequisite/s: MECH1400
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 H L Stark
UOC3 HPW3 S2
Prerequisite/s: MECH2411

MECH2601
Fluid Mechanics and Thermodynamics A
Staff Contact: Professor G L Morrison
UOC6 HPW4 S1
Prerequisite/s: MATH1131 or MATH1141, PHYS1169

MECH2602
Fluid Mechanics and Thermodynamics B
Staff Contact: Professor G L Morrison
UOC6 HPW4 S2
Prerequisite/s: MECH2601

MECH3000
Professional Responsibilities
Staff Contact: Associate Professor R B Frost
UOC3 HPW3 S2
Prerequisite/s: MATH1231 or MATH1341, MECH1300
Professional ethics, responsibility, the environment, liability and intellectual property. Written communication and oral reporting.

MECH3091
Co-Operative Training A
Staff Contact: Professor E J Hahn
UOC24 HPW0 S1
Prerequisite/s: 144 units of credit
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: Professor E J Hahn
UOC24 HPW0 S2
Prerequisite/s: 144 units of credit
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: A J Barratt
UOC3 HPW3 S1
Prerequisite/s: MECH2102, MECH2300, 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: A J Barratt
UOC3 HPW3 S2
Prerequisite/s: MECH2102, MECH2300, MECH2412
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.

MECH3203
Engineering Experimentation A
Staff Contact: Dr M J Tordon
UOC3 HPW2 S1
Prerequisite/s: ELEC0807, MECH2411, MECH2602
Scientific method, engineering method; experimental program; report
writing; error analysis; principles of transducers; selection of
instruments.

MECH3204
Engineering Experimentation B
Staff Contact: Dr M J Tordon
UOC3 HPW2 S2
Prerequisite/s: ELEC0807, MECH2411, MECH2602
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: Z Vulovic
UOC3 HPW3 S1
Prerequisite/s: MATH2029, 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.

MECH3300
Engineering Mechanics 3
Staff Contact: Associate Professor J E Baker
UOC3 HPW3 S2
Prerequisite/s: MATH2029, MECH2300
Satellite motion. Gyroscopic torque. Geometry of gear tooth profiles;
standard and non-standard gear proportions. Gear trains; epicyclic
gears. Static and dynamic balancing of rotating and reciprocating
mass systems. Kinematics and kinetics of mechanisms.

MECH3330
Vibration Analysis
Staff Contact: Associate Professor R A J Ford
UOC3 HPW3 S2
Prerequisite/s: MATH2029, MECH2300
Excluded: MECH2310, MECH3310, MECH9311
Single-degree of freedom vibrating systems: free/forced,
damped/undamped response, transmissibility. Whirling of shafts.
Harmonic analysis. Vibration measuring instruments. Linear
Introduction to the analysis of continuous systems.

MECH3400
Mechanics of Solids 3
Staff Contact: Professor E J Hahn
UOC3 HPW3 S1
Prerequisite/s: MATH2029, MATH2039, 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 L Maclaine-cross
UOC3 HPW3 S1
Prerequisite/s: MATH2029, MECH1500
Excluded: MANF3900, 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.

MECH3601
Thermofluid System Design
Staff Contact: Professor G L Morrison
UOC3 HPW3 S1
Prerequisite/s: MECH2602
Basic concepts of heat transfer, units, dimensions, exchange
mechanism. Steady state conduction, multi dimensional conduction.
Structure of boundary layers. Internal and external laminar and
turbulent forced convection. Heat exchanger design. Radiative
heat transfer. Dimensional analysis. Modelling of turbomachines
and thermal systems. Experiments and heat transfer measurements.

MECH3602
Advanced Thermodynamics
Staff Contact: Associate Professor C V Madhusudana
UOC3 HPW3 S2
Prerequisite/s: MECH2602
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: School Office
UOC3 HPW3 S2
Prerequisite/s: MECH3000
Corequisite/s: MECH4003
Development of skills in the use of various media of communication.
Communication within the organisational and social context of
engineering. Presenting oral and written reports. Conference
organisation and participation. Group projects in communications.
Report on industrial training.

MECH4003
Thesis A
Staff Contact: Dr M Chowdhury
UOC6 HPW0 S1 S2
Prerequisite/s: MECH3000
Excluded: MECH4000
To be taken in the second last 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
UOC6 HPWO S1 S2
Prerequisites: MECH4003
Corequisites: MECH4001
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 session 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.

MTRN4201

Advanced Digital Logic
Staff Contact: Dr J Kataputilya
UOC3 HPW3 S1
Prerequisites: ELEC0807
Excluded: MECH4201, MECH9201, MTRN9201

Review of number theory; boolean algebra; basic properties; representation of logical statements; positive and negative truth logic. Use of circuit diagram 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.

MECH8310

Advanced Vibration Analysis
Staff Contact: Associate Professor R B Randall
UOC6 HPWO S2
Prerequisites: MECH3310 or MECH3330 or MECH8311 or MECH9311 or equivalent
Excluded: MECH4310, MECH9310

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.

MECH8311

Fundamentals of Vibration
Staff Contact: Associate Professor R A J Ford
UOC6 HPWO S1
Excluded: MECH3310, MECH3330, MECH9311


MECH8312

Fundamentals of Noise and Vibration Measurement
Staff Contact: Associate Professor R B Randall
UOC6 HPWO S1
Excluded: MECH9312


MECH8323

Environmental Noise
Staff Contact: Associate Professor R B Randall
UOC6 HPWO S1


MECH8324

Building Acoustics
Staff Contact: Associate Professor R B Randall
UOC6 HPWO S2

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.

MECH8325

Fundamentals of Noise
Staff Contact: Dr J M Challen
UOC6 HPWO S1
Excluded: MECH4321, MECH9325


MECH8326

Advanced Noise
Staff Contact: Dr J M Challen
UOC6 HPWO S2
Prerequisites: MECH8325 or MECH9325
Excluded: MECH4322, MECH9326

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.

MECH8730

Two Phase Flow and Heat Transfer
Staff Contact: Professor M Behnia
UOC6 HPWO S1
Prerequisite/s: MECH3601, MECH3602, or equivalent
Note/s: Excluded MECH4730, MECH9730

MECH9000
Research Thesis Mechanical Engineering (Full time)
Staff Contact: Professor M Behnia
UOC48 HPW0 S1 S2

MECH9001
Research Thesis Mechanical Engineering (Part time)
Staff Contact: Professor M Behnia
UOC24 HPW0 S1 S2

MECH9010
Project Mechanical Engineering
Staff Contact: Associate Professor R B Randall
UOC12 HPW0 S1 S2

Notes: The project must be completed in no more than two sessions.

MECH9120
Design Technology
Staff Contact: Associate Professor R B Frost
UOC6 HPW3 S1
Prerequisite/s: MECH2102 or equivalent
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: A J Barratt
UOC6 HPW3 S1
Excluded: MECH4131. Student numbers are limited due to computer terminal availability.

Development of CAD modelling systems, 2D and 3D, wire frame, surface representation and solids. Advanced modelling techniques of complex geometry, surfaces, boadline operations and solids manipulation. Programming and database interfacing in a CAD environment. Development of engineering based applications using these facilities.

MECH9325
Fundamentals of Noise
Staff Contact: Dr J M Challen
UOC6 HPW3 S1
Excluded: MECH4321, MECH8325


MECH9326
Advanced Noise
Staff Contact: School Office
UOC6 HPW3 S2
Prerequisite/s: MECH4321 or MECH8325 or MECH9325
Excluded: MECH4322, MECH8326

The Helmholtz resonator. Transmission line formulation 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.

MECH9400
Mechanics of Fracture and Fatigue
Staff Contact: Dr K Zarrabi
UOC6 HPW3 S2
Prerequisite/s: MECH3400 or equivalent
Excluded: MECH4400


MECH9410
Finite Element Applications
Staff Contact: Professor D W Kelly
UOC6 HPW3 S1
Prerequisite/s: MECH3400 or equivalent
Excluded: AERO9415, MECH4410


MECH9620
Computational Fluid Dynamics
Staff Contact: Professor E Leonardi
UOC6 HPW3 S1


MECH9730
Two Phase Flow and Heat Transfer
Staff Contact: Professor M Behnia
UOC6 HPW3 S1
Prerequisite/s: MECH3601, MECH3602 or equivalent
Excluded: MECH4730, MECH8730

MECH9740
Power Plant Engineering
Staff Contact: Professor M Behnia
UOC6 HPW3 S2
Prerequisite/s: MECH2602 or equivalent
Excluded: MECH4740


MECH9751
Refrigeration and Air Conditioning 1
Staff Contact: Professor E Leonard
UOC6 HPW3 S2
Excluded: MECH4751


MECH9752
Refrigeration and Air Conditioning 2
Staff Contact: Dr I L Macalinden-cross
UOC6 HPW3 S1
Prerequisite/s: MECH9751 or equivalent


MECH9757
Ambient Energy Air Conditioning
Staff Contact: Dr I L Macalinden-cross
UOC6 HPW3 S2
Prerequisite/s: MECH3602 or equivalent


MECH9761
Internal Combustion Engines 1
Staff Contact: Professor B E Milton
UOC6 HPW3 S1
Excluded: MECH4700


MECH9920
Special Topic in Mechanical Engineering
Staff Contact: Associate Professor R B Randall
UOC6 HPW3 S2

The syllabus changes to allow presentation of a special topic of current interest particularly by visitors with recognised expertise in the topic.

MTRN3201
Digital Logic for Mechatronics
Staff Contact: Dr M Tordon
UOC6 HPW3 S1
Excluded: MECH4201, MECH9201, MTRN9201


MTRN3202
Microprocessor Control
Staff Contact: Dr J Katupitiya
UOC3 HPW3 S2
Prerequisite/s: ELEC0807
Excluded: MECH3202, MECH9202, MTRN9202

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.

MTRN3212
Principles of Control of Mechanical Systems
Staff Contact: Associate Professor R A Willgoss
UOC3 HPW3 S1
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.

MTRN3530
Computing Applications in Mechanical Systems
Staff Contact: Dr J Katupitiya
UOC3 HPW3 S1
Prerequisite/s: MECH1500
Excluded: MECH3510, MECH3530

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.

MTRN4221
Industrial Robotics
Staff Contact: Associate Professor R A Willgoss
UOC3 HPW3 S1
Prerequisite/s: MECH3204, MTRN3212, MTRN3530

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.

MTRN8223
Machine Condition Monitoring
Staff Contact: Associate Professor R B Randall
UOC6 HPW0 S1
Excluded: MECH4223, MTRN9223

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.
MTRN9201
Digital Logic Fundamentals for Mechanical Engineers
Staff Contact: Dr M Forador
UOC6 HPW3 S1
Excluded: MECH4201, MECH9201, MTRN3201

MTRN9202
Microprocessor Fundamentals for Mechanical Engineers
Staff Contact: Dr J Katupitiya
UOC6 HPW3 S2
Prerequisite/s: MTRN9201
Note/s: Excluded: MECH4211 and MECH9211

MTRN9211
Modelling and Control of Mechatronic Systems 1
Staff Contact: Dr J Katupitiya
UOC6 HPW3 S2
Prerequisite/s: MTRN3212
Note/s: Excluded: MECH4211 and MECH9211
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.

MTRN9221
Industrial Robotics
Staff Contact: Dr RA Willgoss
UOC6 HPW3 S1
Note/s: Excluded: MECH4221 and MECH9221

MTRN9222
Artificially Intelligent Machines
Staff Contact: Dr RA Willgoss
UOC6 HPW3 S1
Prerequisite/s: MTRN3530 or equivalent
Note/s: Excluded: MECH4222 and MECH9222
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.

MTRN9223
Machine Condition Monitoring
Staff Contact: Associate Professor R B Randall
UOC6 HPW3 S1
Prerequisite/s: MECH3204, MTRN3212 or equivalent
Excluded: MECH4223, MTRN8223
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.

MTRN9300
Mechanics of Manipulators
Staff Contact: Associate Professor J E Baker
UOC6 HPW3 S2
Prerequisite/s: MECH3300 or equivalent
Excluded: MECH4300

NAVL3100
Principles of Ship Design
Staff Contact: P J Helmore
UOC3 HPW3 S1
Prerequisite/s: NAVL3303
Corequisite/s: NAVL3604

NAVL3110
Ship Practice
Staff Contact: P J Helmore
UOC3 HPW3 S1
Corequisite/s: NAVL3603

NAVL3400
Ship Structures 1
Staff Contact: Dr M Chowdhury
UOC3 HPW3 S2
Prerequisite/s: MATH2029, MATS9520, MECH2412, MECH3400

NAVL3603
Ship Hydromechanics A
Staff Contact: Associate Professor L J Doctors
UOC6 HPW6 S1
Prerequisite/s: MATH2029, MECH2300, MECH2602
NAV3604
Ship Hydromechanics B
Staff Contact: Associate Professor L J Doctors
UOC3 HPW3 S2
Prerequisite/s: NAVL3603
Corequisite/s: MECH3330

NAV3700
Ship Propulsion
Staff Contact: P J Helmore
UOC3 HPW3 S2
Prerequisite/s: NAVL3603
Corequisite/s: NAVL3604
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.

NAV4101
Design of High Speed Craft
Staff Contact: Associate Professor L J Doctors
UOC3 HPW3 S1
Prerequisite/s: NAVL3100, NAVL3604
Corequisite/s: NAVL4401
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.

NAV4102
Design of Yachts
Staff Contact: Associate Professor L J Doctors
UOC3 HPW3 S2
Prerequisite/s: NAVL3100, NAVL3604
Corequisite/s: NAVL4402

NAV4111
Ship Design Project A
Staff Contact: Dr P K Pal
UOC3 HPW3 S1
Prerequisite/s: NAVL3700
Corequisite/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.

NAV4112
Ship Design Project B
Staff Contact: Dr P K Pal
UOC3 HPW3 S2
Prerequisite/s: NAVL4111
Corequisite/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.

NAV4401
Ship Structures 2A
Staff Contact: Associate Professor D W Kelly
UOC3 HPW3 S1
Prerequisite/s: MECH3400, NAVL3400
Excluded: AERO4401, MECH9410
Application of MSC/PATRAN and MSC/NASTRAN to structural analysis. Structural modelling, mesh generation, resources required for solution, evaluation of results. Applications to analysis of practical structures including structural vibrations and prediction of stiffness and ultimate strength.

NAV4402
Ship Structures 2B
Staff Contact: Dr M Chowdhury
UOC3 HPW3 S2
Prerequisite/s: NAVL4401

NAV4710
Ship Standards
Staff Contact: P J Helmore
UOC3 HPW3 S1
Prerequisite/s: NAVL4710

NAV4720
Marine Engineering
Staff Contact: P J Helmore
UOC3 HPW3 S2
Prerequisite/s: NAVL4710
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 mining 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 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 vacations. A minimum of 80 days needs to be completed before graduation. The School assists students as much as possible in securing suitable vacation employment.

(The following program will be introduced in 2001 subject to approval)

<table>
<thead>
<tr>
<th>Year 1</th>
<th>HPW</th>
<th>UOC</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>S1</td>
<td>S2</td>
</tr>
<tr>
<td>MINE1010</td>
<td>4</td>
<td>0</td>
</tr>
<tr>
<td>MATH1131</td>
<td>6</td>
<td>0</td>
</tr>
<tr>
<td>PHYS1169</td>
<td>6</td>
<td>0</td>
</tr>
<tr>
<td>GEOL5200</td>
<td>4</td>
<td>0</td>
</tr>
<tr>
<td>MINE1020</td>
<td>0</td>
<td>4</td>
</tr>
<tr>
<td></td>
<td>MATS9410</td>
<td>Materials for Mining Engineers</td>
</tr>
<tr>
<td></td>
<td>MINE1300</td>
<td>Applied Mechanics</td>
</tr>
<tr>
<td></td>
<td>CHEM1817</td>
<td>Chemistry 1 ME</td>
</tr>
<tr>
<td></td>
<td>MATH1231</td>
<td>Maths 1B</td>
</tr>
<tr>
<td>Total</td>
<td>20</td>
<td>20</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Year 2</th>
<th>HPW</th>
<th>UOC</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>S1</td>
<td>S2</td>
</tr>
<tr>
<td>MINE2310</td>
<td>Structural Mechanics</td>
<td>4</td>
</tr>
<tr>
<td>MINE2500</td>
<td>Fluids and Thermodynamics</td>
<td>4</td>
</tr>
<tr>
<td>MINE2700</td>
<td>Mining Data Analysis</td>
<td>2</td>
</tr>
<tr>
<td>MATH2029</td>
<td>Engineering Maths 1</td>
<td>6</td>
</tr>
<tr>
<td></td>
<td>General Education Elective</td>
<td>2</td>
</tr>
<tr>
<td>MINE2010</td>
<td>Mining Project Development</td>
<td>0</td>
</tr>
<tr>
<td>MINE2320</td>
<td>Mining Stress Analysis</td>
<td>0</td>
</tr>
<tr>
<td>GMAT3443</td>
<td>Mine Surveying</td>
<td>0</td>
</tr>
<tr>
<td>MATH2039</td>
<td>Engineering Maths 2</td>
<td>0</td>
</tr>
<tr>
<td>ELEC0809</td>
<td>Electric Power Engineering</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td>General Education Elective</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td>General Education Elective</td>
<td>0</td>
</tr>
<tr>
<td>Total</td>
<td>20</td>
<td>20</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Year 3</th>
<th>HPW</th>
<th>UOC</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>S1</td>
<td>S2</td>
</tr>
<tr>
<td>GEO5300</td>
<td>Mine Geology</td>
<td>2</td>
</tr>
<tr>
<td>MINE3500</td>
<td>Mining Geomechanics</td>
<td>4</td>
</tr>
<tr>
<td>MINE3610</td>
<td>Excavation Engineering</td>
<td>5</td>
</tr>
<tr>
<td>MINE3620</td>
<td>Mine Infrastructure and Services</td>
<td>3</td>
</tr>
<tr>
<td>MINE3710</td>
<td>Mine Economics &amp; Business Systems</td>
<td>4</td>
</tr>
<tr>
<td>MINE3720</td>
<td>Mining Management 1</td>
<td>0</td>
</tr>
<tr>
<td>MINE3400</td>
<td>Mining Systems</td>
<td>0</td>
</tr>
<tr>
<td>MINE3500</td>
<td>Mine Workplace Environment</td>
<td>0</td>
</tr>
<tr>
<td>MINE3600</td>
<td>Mineral Processing</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td>General Education</td>
<td>0</td>
</tr>
<tr>
<td>Total</td>
<td>18</td>
<td>19</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Year 4</th>
<th>HPW</th>
<th>UOC</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>S1</td>
<td>S2</td>
</tr>
<tr>
<td>MINE4210</td>
<td>Mine Planning</td>
<td>5</td>
</tr>
<tr>
<td>MINE4300</td>
<td>Geotechnical Engineering OR</td>
<td>4</td>
</tr>
<tr>
<td>MINE8140</td>
<td>Mining Geomechanics</td>
<td>B</td>
</tr>
<tr>
<td>MINE4700</td>
<td>Mining Management 2</td>
<td>5</td>
</tr>
<tr>
<td>MINE4410</td>
<td>Industry Applications</td>
<td>4</td>
</tr>
<tr>
<td>MINE4220</td>
<td>Coal Mine Design &amp; Evaluation Project OR</td>
<td>0</td>
</tr>
<tr>
<td>MINE4230</td>
<td>Metal Mine Design &amp; Evaluation Project</td>
<td>0</td>
</tr>
<tr>
<td>MINE4500</td>
<td>Environmental &amp; Social Impacts of Mining</td>
<td>0</td>
</tr>
<tr>
<td>MINE4420</td>
<td>Thesis A</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td>Elective</td>
<td>0</td>
</tr>
<tr>
<td>Total</td>
<td>18</td>
<td>18</td>
</tr>
</tbody>
</table>

Internal Electives (Select one)

<table>
<thead>
<tr>
<th>HPW</th>
<th>UOC</th>
</tr>
</thead>
<tbody>
<tr>
<td>S1</td>
<td>S2</td>
</tr>
<tr>
<td>MINE4800</td>
<td>Mine Simulation &amp; Modelling</td>
</tr>
<tr>
<td>MINE4805</td>
<td>Mineral Process Technology</td>
</tr>
<tr>
<td>MINE4810</td>
<td>Computational Methods in Geomechanics</td>
</tr>
</tbody>
</table>

(*B indicates block teaching)

OR students may select from the following Electives

1. Students may enrol in 1 6UC course from the following graduate courses offered by the Institute of Environmental Studies (IES), subject to availability and approval of the IES and the Head of School.
IEST5001 Frameworks for Environmental Management
IEST5002 Tools for Environmental Management
SCTS5317 Fundamental Knowledge in Environmental Management: Social Science
ECON5125 Fundamental Knowledge in Environmental Management: Economics
LAWS3439 Fundamental Knowledge in Environmental Management: Law
BIOS9001 Fundamental Knowledge in Environmental Management: Ecology

In lieu of 1 Mining elective (3UC) and MINE4500 (3UC)
2. With the approval of the Head of School, students may undertake MINE8770 Mining Law in lieu of MINE4700 Mining Management 2
3. With the approval of the Head of School, students may undertake MINE8780 Environmental Management in Mining in lieu of MINE4500 and 1 3UC Elective.

Note: Where courses are selected from the Mining Engineering Postgraduate Coursework Program, it is expected that students will have at least a credit average in their previous studies.

BE(Mining Engineering)/MCom Fast-track 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 6U0C courses 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.

<table>
<thead>
<tr>
<th>S1</th>
<th>S2</th>
<th>HPW</th>
<th>HPW</th>
<th>UC</th>
</tr>
</thead>
<tbody>
<tr>
<td>ACCT5901 Accounting: A User Perspective</td>
<td>3</td>
<td>0</td>
<td>6</td>
<td></td>
</tr>
<tr>
<td>ECON5103 Business Economics</td>
<td>3</td>
<td>0</td>
<td>6</td>
<td></td>
</tr>
<tr>
<td>Commerce Core Elective</td>
<td>0</td>
<td>3</td>
<td>6</td>
<td></td>
</tr>
<tr>
<td>MINE4210 Mine Planning</td>
<td>5</td>
<td>0</td>
<td>6</td>
<td></td>
</tr>
<tr>
<td>MINE4300 Geotechnical Engineering</td>
<td>4</td>
<td>0</td>
<td>6</td>
<td></td>
</tr>
<tr>
<td>MINE4220 Mine Design and Evaluation Project</td>
<td>0</td>
<td>7</td>
<td>9</td>
<td></td>
</tr>
<tr>
<td>MINE4430 Thesis B</td>
<td>0</td>
<td>6</td>
<td>6</td>
<td></td>
</tr>
<tr>
<td>Mining Elective</td>
<td>0</td>
<td>3</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>15</td>
<td>19</td>
<td>48</td>
<td></td>
</tr>
</tbody>
</table>

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 program Authorities. There may be restrictions on course availability due to timetabling constraints.

Please note that there may 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 Program Authorities.

A number of coursework Masters degrees and Graduate Diplomas are available through the School of Mining Engineering. In addition,
Postgraduate Study

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

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
MINE8210 Management Systems - Projects, Processes, Contracts and Contractors
MINE8220 Mine Feasibility, Planning and Project Evaluation

Elective Courses:
Select 4 from the following List of 6UoC 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
MINE9910 Mine Ventilation
GBAT9104 Management of Innovation and Technical Change
GBAT9106 Information Systems Management
GBAT9112 Managing Occupational Health and Safety
IROB5690 Strategic People Management

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 Geomechanics
MINE8760 Mine Geology and Geophysics for Mining Operations

Elective Courses:
Select 4 from the following List of 6 Units of Credit Courses
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

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 of 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 only be offered 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 4 from the following List of 6 Units of Credit Courses
1 course to be undertaken in Session 1 and 3 in Session 2.
MINE8130 Technology Management in Mining
MINE8140 Mining Geomechanics
MINE8210 Management Systems - Projects, Processes, Contracts and Contractors
MINE8220 Mine Feasibility, Planning and Project Evaluation
MINE8230 Mine Sampling, Grade Control and Reserves Definition
MINING ENGINEERING

MINE8710 Mine Slope Stability
MINE8720 Advanced Rock Mechanics
MINE8730 Mechanised Excavation Engineering
MINE8740 Blasting and Rock Fragmentation
MINE8750 Advanced Soil Mechanics and Mine Fill
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
MINE9910 Mine Ventilation
GBAT9104 Management of Innovation and Technical Change
GBAT9106 Information Systems Management
GBAT9112 Managing Occupational Health and Safety
IROB5690 Strategic People Management

5045
Mining Engineering
Graduate Diploma

This program provides professional development for mining engineers and other mining personnel in mine ventilation. This area of study has been recognised in several Wardens' inquiries into mining disasters as the fundamental knowledge deficiency that led to the loss of life in many disasters. Recommendations were made in the final report from Moura No4 enquiry that a position of statutory ventilation officer be created and that such persons appointed to these positions must have undertaken a recognised study program in mine ventilation. To this end the NSW Legislature have written this requirement in the COAL MINES (UNDERGROUND) REGULATION 1999 - SECT 75 Division 2 Ventilation officers. This clause states that an appointment on or after 1 September 2000 must have successfully completed the current Ventilation Officer Training Course (conducted by the School of Mining Engineering at the University of New South Wales (or a Program specified as an equivalent course – including this Graduate Diploma which will replace the Ventilation Officer Training Course).

This program consists of 6, 6 units of credit core courses, each presented in Block Teaching format.

MINE9901 Mine Atmospheric Behaviour
MINE9902 Mine Ventilation Networks and Analysis
MINE9903 Mine Fans and Airflow Distribution
MINE9904 Underground Hazards
MINE9905 Instrumentation/Monitoring & Spontaneous Combustion
MINE9906 Ventilation Planning and Management

It is assumed that applicants for this program are currently employed in the Australian mining industry, as much of the assessment will depend on students having access to a mine site. Intending applicants should contact the Head of School before applying for entry as all applications must be approved by the Head, School of Mining Engineering.

7335
Graduate Certificate in Mining Engineering

The School of Mining Engineering offers 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
MINE9910 Mine Ventilation
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 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.

MINE1010
Introduction to Mining Engineering
Staff Contact: Professor J Galvin
UOC6 HPW4 S1
The course provides students with:
- an appreciation of the role of a mining engineer and career path options.
- an overview of mining systems.
- an opportunity to apply their studies in fundamental engineering and physical principles to mining engineering
- an introduction to engineering risk management
At the completion of this course, the student should have a basic knowledge of mining operations and an introductory appreciation of the importance and relevance of the science and engineering principles to mining engineers and an awareness of the broad range of career paths available to a mining engineer.
The course aims to make students familiar with operations they may encounter in their first industrial training and to shape their attitudes towards safety and risk management.
The course covers the role of the mining engineer and career path options; history and current status of mining in Australia; the significance of geology in mining; basic rock types and structures; basic mining operations; mining equipment; and an introduction to risk management, mine ventilation, explosives and blasting.

Note: Site visits and industry lectures are a requirement of this course and may involve additional personal expense.

MINE1020
Mining Industry Practice
Staff Contact: Dr CR Daly
UOC6 HPW4 S2
Assumed Knowledge: MINE1010
The course aims to build on the students earlier introduction by developing their understanding in areas associated with processes and practices in the minerals industry. The course covers:
- mineral economics and markets;
- environmental responsibilities, management and rehabilitation.
- communication needs within the industry and society and common techniques used to convey information. These include computer packages, web pages, internet, email, role plays, presentation skills, technical drawing and graphical presentation, report writing, resume preparation, research methodologies.
- an overview of engineering drawing fundamentals.
- risk management - MISHC Component 1: Introduction to risk management.

Note: Site visits and industry lectures are a requirement of this course and may involve additional personal expense.

MINE1300
Applied Mechanics
Staff Contact: Dr J Watson
UOC6 HPW4 S2
To provide students with an understanding of the basic engineering principles governing the statics, kinematics and dynamics of rigid bodies as applied to mechanical components.
Statics: definition of force and moment, static equilibrium of rigid bodies, statical equivalence of systems of forces, centre of mass, centroid, centre of pressure, frictional forces.
Kinematics: linear and angular motion, motion in a plane, relative displacement, velocity and acceleration.
Dynamics: equations of motion for rigid body, work and energy, impulse and momentum, strain energy.

MINE2010
Mining Project Development
Staff Contact: Dr P Hagan
UOC6 HPW4 S2
Assumed Knowledge: MINE1020
The course provides an understanding of the processes and systems that are part of the life cycle of a mining project as well as the community and industry issues that need to be considered. The course covers the following core mining processes:
- mineral exploration and sampling methods
- resource and reserve estimation
- mine planning – methods used to optimise ore recovery and the mining process
- mine operations – mining systems, equipment and facilities
- mineral processing – processes improve mineral quality and to extract metals from ores
- mine project development including issues relating to community, environment, market, legislation, financing, infrastructure and construction

Note: Site visits and industry lectures are a requirement of this course and may involve additional personal expense.

MINE2310
Structural Mechanics
Staff Contact: Dr J O Watson
UOC6 HPW4 S1
Assumed Knowledge: MINE1300
To provide students with an understanding of the principles of analysis and design of structures and the concepts of stress and strain.
Basic definition of force, displacement, stress, strain and elastic material properties.
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. Shear stresses in beams. Continuous beams: Slope-deflection equations, stiffness matrix and nodal force vector, computer analysis. Definition of stress in three dimensions. Stress transformation in two dimensions; principal stresses in two dimensions. Mohr’s circle of stress. Definition of strain and strain-displacement relations in two dimensions; strain transformation and principal strains in two dimensions; isotropic elasticity.

MINE2320
Mining Stress Analysis
Staff Contact: Dr J O Watson
UOC3 HPW3 S2
Assumed Knowledge: MINE2310
To provide an understanding of stress analysis that can be applied to geotechnical engineering.
Stress transformation and principal stresses in three dimensions; strain-displacement relations in three dimensions; strain transformation and principal strains in three dimensions; equations of equilibrium, boundary conditions; strain compatibility and the Airy stress function; stress in thick walled tubes under pressure; stresses around circular tunnel; anisotropic elasticity; the equivalent continuum; elastoplasticity.
MINING ENGINEERING

Soil Mechanics
Staff Contact: Dr CR Daly
UOC6 HPW4 S1
Assumed Knowledge: MINE1300

This course provides an understanding of the principles of soil and rock mechanics and the impacts of these principles in mining and tunnelling practice.


Rock Mechanics: principles applied to mining; stress, strain, deformational behaviour and stiffness; time dependency and stress in rock, rock properties, rock failure criteria, discontinuities in rock, rock mass classification, stresses around excavations, laboratory techniques and experiments.

Note: Site visits and industry lectures are a requirement of this course and may involve additional personal expense.

MINING ENGINEERING

Fluids & Thermodynamics
Staff Contact: Dr J O Watson
UOC6 HPW4 S1
Assumed Knowledge: MINE1300

This course provides an understanding of the various technologies applied to mining systems. Case studies and scope will include coal, metallic and extractive industries.

Note: Site visits and industry lectures are a requirement of this course and may involve additional personal expense.

MINING ENGINEERING

Mining Data Analysis
Staff Contact: Dr CR Daly
UOC3 HPW2 S1
Assumed Knowledge: MATH1231

Mining and minerals processing involves materials which are variable in composition and physical characteristics. Mining Engineers are required to make decisions and projections on the basis of incomplete information and experimentation. They need to manage a range of risks on the basis of probability and levels of confidence. These activities require the use of statistical tools developed to provide quantitative information from variable data with known levels of confidence. This course provides the basis for designing investigations, presenting data, and forming statistically valid engineering conclusions.

Precision, accuracy, approximation, bias. Samples and sampling. Averages (mean, median, mode). Graphical data analysis. Arithmetic, logarithmic and exponential relationships. Correlation coefficients (r). Index numbers and time series. Review of probability, random variables and their properties. Quantiles and percentiles. The normal and binomial distribution. 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-tests. Simple and multiple linear regression. Design and analysis of investigations, analysis of variance and introduction to factorial designs. Applications will be drawn primarily from the fields of mining and minerals engineering.

Note: Site visits and industry lectures are a requirement of this course and may involve additional personal expense.

MINING ENGINEERING

Mining Geomechanics
Staff Contact: Professor B Hebblewhite
UOC6 HPW4 S1
Assumed Knowledge: MINE2320

This course provides an understanding of the principles of soil and rock mechanics and the impacts of these disciplines in mining engineering practice.


Rock Mechanics: principles applied to mining; stress, strain, deformational behaviour and stiffness; time dependency and stress in rock, rock properties, rock failure criteria, discontinuities in rock, rock mass classification, stresses around excavations, laboratory techniques and experiments.

Note: Site visits and industry lectures are a requirement of this course and may involve additional personal expense.

MINING ENGINEERING

Mining Systems
Staff Contact: A/Prof D Laurence
UOC6 HPW5 S2

This course provides a comprehensive understanding of mining systems that are used in coal mines, metal mines and extractive industries. History, significance and characteristics of global and Australian mining industry; location of mines; political and environmental constraints to mining; Australia’s mineral potential; advanced ore reserve estimation; geostatistics and orebody modelling. Mining systems and selection criteria for various mining methods including thick seam coal mining, heap leach, solution mining, underground mining, and placer mining. Mining sequence; production planning and scheduling; equipment selection: systems approach; ancillary operations; productivity; capital and operating costs. Environment, health and safety and risk management techniques applied to mining systems. Case studies and scope will include coal, metallic and extractive industries.

Note: Site visits and industry lectures are a requirement of this course and may involve additional personal expense.
Shaft sinking methods (both vertical and inclined shafts): conventional and mechanical boring. Ground treatment by chemical injection and freezing methods. Tunnel services and fitout.

**Note:** Site visits and industry lectures are a requirement of this course and may involve additional personal expense.

**MINE320**

*Mine Infrastructure & Services*

*Staff Contact:* Dr P Hagan

UOC9 HPW3 S1

This course provides an understanding of the materials handling systems used in mining as well as the various infrastructure needs of a mining operation including power reticulation and control systems.


Mechanics of hoisting and design of mine winding systems. Winding cycle diagrams and power requirements for hoisting. Winding ropes. Safety aspects, maintenance of haulage and winding systems.


**Note:** Site visits and industry lectures are a requirement of this course and may involve additional personal expense.

**MINE3710**

*Mine Economics and Business Systems*

*Staff Contact:* A/Prof D Laurence

UOC6 HPW4 S1

The course provides an understanding of management principles and perspectives that can be applied in mining. The Mine Economics component of this course reflects the fact that mining is an economic activity. It will cover the principles and techniques of project evaluation and the construction of fully integrated and internally consistent technical/financial computer models of mining projects. The Business Systems component will cover issues vital to a mine manager's successful running of a mining enterprise.

Topics covered in the Mine Economics component will include:

- the time value of money; discounted cash flow evaluation techniques; technical/financial model examples and assignments;
- commodity markets, revenue estimation, risk analysis and project financing;
- company financial statements and underlying accounting principles;
- the feasibility study process;
- determination of economic cut-off grades and resources and reserves estimation.

**MINE3720**

*Mining Management 1*

*Staff Contact:* D Chalmers

UOC6 HPW4 S2

The course deals with techniques to manage projects, processes, contracts, contractors and people; Change hazards and risks – MISHC Component 3: Minerals Industry Risk Analysis Methodology, Introduction to Major Hazards; Loss control. The course is underpinned with a range of case studies.

**MINE3800**

*Mineral Processing*

*Staff Contact:* Dr A C Partridge

*Assumed Knowledge:* PHYS1169, CHEM1817, MINE2500 (or equivalents)

UOC3 HPW3 S2

Minerals Engineering is the link between mining and the utilisation of mineral resources, and is a key operation in the minerals industry. By a combination of breakage, sizing, separation, and dewatering processes, valuable components in mined material are concentrated into products suitable for subsequent hydrometallurgical or pyrometallurgical processing or direct utilisation. Minerals engineering processes are applied in the treatment of precious metal and gemstone deposits, base metal ores, heavy mineral beach sands, coal, and industrial minerals such as clays and aggregates.

This introductory course provides a description of the principal unit processes and their applicability, and of the mineral properties and characteristics of mined materials on which they are based. On completion, you will be able to carry out calculations relating to the characterisation of mined materials, carry out materials balance calculations for simple mineral processing circuits, and nominate appropriate processes for their beneficiation. For many of those processes you will also be able to determine equipment sizes for specified duties.


A series of laboratory investigations forms part of the course.

**MINE4210**

*Mine Planning*

*Staff Contact:* A/Prof D Laurence

UOC6 HPW5 S1


**MINE4220**

*Coal Mine Design and Evaluation Project*

*Staff Contact:* D. Chalmers

UOC9 HPW7 S2

The course provides the means of integrating the technical, economic and management knowledge as presented within the mining engineering program whilst conforming to industry and community expectations. Technical design and project evaluation of a coal deposit is a core focus of the course. The work draws on the course content from previous courses and is undertaken in teams. The teams are required to prepare and present a feasibility study of a coal mining project. Teamwork, project management and presentations skills are assessed in addition to the technical analysis and content of the final feasibility study. *A minimum of 80 days of approved industrial training is required for successful completion of this course.*

**MINE4230**

*Metal Mine Design and Evaluation Project*

*Staff Contact:* A/Prof D Laurence

UOC9 HPW7 S2

The course provides the means of integrating the technical, economic and management knowledge as presented within the mining engineering program whilst conforming to industry and community expectations. Technical design and project evaluation of a metalliferous deposit is a core focus of the course. The work draws on the course content from previous courses and is undertaken in teams. The teams are required to prepare and present a feasibility study of a metal mining project. Teamwork, project management and presentations skills are assessed in addition to the technical analysis and content of the final feasibility study. *A minimum of 80 days of approved industrial training is required for successful completion of this course.*
MINE4300
Geotechnical Engineering
Staff Contact: Professor B Hebblewhite
UOC6 HPW4 S1
Assumed Knowledge: MINE3300
This course provides an extended understanding of the principles of mining geomechanics and identifies the practical applications and methodologies within mining engineering. Hazard and condition mapping; mine shaft geomechanics; mining excavation design; stope design; geotechnical instrumentation; data interpretation; application of numerical modelling; surface mining geomechanics; diggability/rippability; pillar and roadway design; bolting mechanics; reinforcement systems; subsidence engineering; rockburst/outburst mechanics; regional mine stability; longwall support mechanics; caving mechanics and windblasts; ground control management. Case studies will be used to highlight the above topics.

Note: Site visits and Industry lectures are a requirement of this course and may involve additional personal expense.

MINE4410
Industry Applications
Staff Contact: Dr P Hagan
UOC6 HPW4 S1
The course provides the student with an awareness of current issues in the mining industry. The course also covers the processes associated with initiating a research project. A series of seminars are presented by invited speakers from within the university, other research establishments and selected industrial operations covering topics of special interest.

Candidates are required to select a topic for a research project related to mining, minerals engineering or other approved topic approved by the Head of School. It is strongly suggested that candidates evaluate various topic options in the period prior to commencement of the course, preferably during the period of Industrial Training. The research project may take the form of an engineering analysis, experimental investigation, theoretical study or design project. Candidates are required to carry out a literature review of the chosen research topic and submit a project plan.

MINE4420
Thesis A
Staff Contact: Dr PC Hagan
UOC6 HPW6 S2
Assumed Knowledge: MINE4410
The course provides the opportunity of demonstrating the student’s capabilities in undertaking a major research project in an area associated with the mining industry. 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.

MINE4430
Thesis B
Staff Contact: Dr P Hagan
UOC6 HPW4 S2
Assumed Knowledge: MINE4410
The course provides the opportunity of demonstrating the student’s capabilities in undertaking a minor research project in an area associated with the mining industry. 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. This course is only available to students undertaking the BE(Mining)/MCom combined program or in programs where the 9 unit of credit MINE4920 is inappropriate due to workload.

MINE4500
Environmental and Social Impacts of Mining
Staff Contact: A/Prof D Laurence
UOC3 HPW2 S2
The course provides an understanding of the impacts both positive and negative that mining may have on society. International perspective and treaties; sustainability; corporate responsibility; legislative and regulatory framework; environmental impact assessment; environmental management systems, ISO 14000 series; Corporate reporting; Code for environmental management; environmental economics; environmental auditing; risk management. Best practice environmental management techniques in exploration; air quality; waste rock; tailings; quarries; acid mine drainage; cyanide; rehabilitation; mine closure; monitoring; social impact; open pit voids; case studies.

Ethics and professional codes of conduct.

MINE4700
Mining Management 2
Staff Contact: A/Prof D Laurence
UOC6 HPW5 S1
This course provides an understanding of certain critical management issues of fundamental importance to the mining industry. The course material includes:

- risk management – MISHC Component 4
- application of risk analysis to mine planning and mineral processing
- risk management models and systems
- risk management in thesis
- principles and practice of emergency preparedness
- modern mining, safety and environmental legislation

MINE4800
Mine Simulation and Modelling
Staff Contact: Dr C Daly
UOC3 HPW3 S2
The course aims to provide students with knowledge and skills in the use of various computer software tools that are used in industry. Computer simulation and its applicability to mining planning and mine operations. Evaluation of a number of commercial software programs. Design and evaluation of mining systems using simulation and associated techniques. Data visualisation and its role in ore deposit modelling.

MINE4805
Mineral Process Technology
Staff Contact: Dr A C Partridge
UOC3 HPW3 S2
Assumed Knowledge: MINE3800 (may be taken as a co-requisite with approval of Head of School)

Descriptions of principal unit processes are given in MINE3800. This course extends that work by a closer examination of the underlying basis of those unit processes, and aspects of circuit design, equipment selection and process optimisation. On completion, you will be able to carry out advanced calculations relating to the characterisation of mined materials and process performance, and will be able to use such information for process simulation. You will also be familiar with basic flowsheet and plant design considerations, and of the instrumentation and control systems incorporated in mineral processing and coal preparation plants.

MINE8110
Computational Methods in Geomechanics
Staff Contact: Dr J Watson
UOC6 HPW3 S2
Assumed Knowledge: MINE2320
To provide students with an understanding of the theory and practice of finite difference, finite element and boundary element methods applied to problems of geomechanics. Boundary value problems, solution of Poisson's equation by finite differences, variational principle for Poisson's equation, stiffness matrix and equivalent nodal force vector, finite elements and matrix assembly, variational statement and finite elements for elasticity, isoparametric elements, modelling techniques, elastoplastic finite element analysis. Indirect and direct boundary element methods for Poisson's equation, isoparametric boundary elements, direct method for elasticity.

MINE8110
Mining Processes and Systems
Staff Contact: Professor B Hebblewhite
UOC6 HPW Block
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: Professor B Hebblewhite
UOC6 HPW Block
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: Professor B Hebblewhite
UOC6 HPW Block
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: Professor B Hebblewhite
UOC6 HPW Block
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: Dr P C Hagan
UOC6 HPW Block
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: Professor B Hebblewhite
UOC6 HPW Block
This course addresses the process of mine feasibility planning and project evaluation commencing from the resource assessment stage. This course 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: Professor B Hebblewhite
UOC6 HPW Block
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: Professor B Hebblewhite
UOC6 HPW Block
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: Professor B Hebblewhite
UOC6 HPW Block
This course will expand on components of the MINE Mining Geomechanics course to provide 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 PCs Hagan
UOC6 HPW Block
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 tunnelling; 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
UOC6 HPW Block
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
UOC6 HPW Block
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: Professor B Hebblewhite
UOC6 HPW Block
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, microseisismics, 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 - engineer 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
UOC6 HPW Block
This 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
UOC6 HPW Block
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
UOC6 HPW Block
Commodities: supply and demand; business cycles; exchange rates; metal and coal markets and hedging; long-term contracts and the spot market; commodity 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. 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.
ENGINEERING

MINE9901
Mine Atmospheric Behaviour
Staff Contact: D. Chalmers
UOC6 HPW Block

MINE9902
Mine Ventilation Networks and Analysis
Staff Contact: D. Chalmers
UOC6 HPW Block

MINE9903
Mine Fans and Airflow Distribution
Staff Contact: D. Chalmers
UOC6 HPW Block

MINE9904
Underground Hazards
Staff Contact: D. Chalmers
UOC6 HPW Block

MINE9905
Instrumentation/Monitoring and Spontaneous Combustion
Staff Contact: D. Chalmers
UOC6 HPW Block

MINE9906
Ventilation Planning and Management
Staff Contact: D. Chalmers
UOC6 HPW Block

MINE9910
Mine Ventilation
Staff Contact: D. Chalmers
UOC6 HPW Block
This course will provide an understanding of the basic principles of mine ventilation and environmental control. The emphasis will be on the practical aspects of ventilation and involve both classroom and underground sessions. Course participants should be able to apply their knowledge to solve their practical problems at their individual mine sites. Individual access to a mine site is a requirement of this course.
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.
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):

<table>
<thead>
<tr>
<th>COURSE TITLE</th>
<th>HPW</th>
<th>UOC</th>
</tr>
</thead>
<tbody>
<tr>
<td>PTRL3016 Well Drilling Equipment &amp; Operations</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>PTRL3017 Drilling Fluids and Cementing</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>PTRL3018 Drilling and Production Laboratory</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>PTRL3019 Petroleum Project Evaluation (M)</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>PTRL3020 Risk Analysis and Management (M)</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>PTRL3021 Design Project</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>PTRL3022 Petroleum Thermodynamics</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>General Education</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>Total</td>
<td>HPW Session 1 20</td>
<td>HPW Session 2 23</td>
</tr>
<tr>
<td></td>
<td>Units Session 1 24</td>
<td>Units Session 2 24</td>
</tr>
</tbody>
</table>

Stage 4

<table>
<thead>
<tr>
<th>COURSE TITLE</th>
<th>HPW</th>
<th>UOC</th>
</tr>
</thead>
<tbody>
<tr>
<td>PTRL4010 Integrated Reservoir Description Project (M)</td>
<td>6</td>
<td>12</td>
</tr>
<tr>
<td>PTRL4011 Integrated Reservoir Analysis Project (M)</td>
<td>4</td>
<td>8</td>
</tr>
<tr>
<td>PTRL4012 Integrated Drilling &amp; Economics Project (M)</td>
<td>10</td>
<td>8</td>
</tr>
<tr>
<td>PTRL4013 Well Completion &amp; Stimulation</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>PTRL4014 Drilling System Design &amp; Optimisation</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>PTRL4015 Numerical Reservoir Simulation</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>PTRL4016 Natural Gas Engineering</td>
<td>3</td>
<td>3</td>
</tr>
</tbody>
</table>

Electives:
- LAWS2361 Environmental Law or 4 8
- LAWS2031 Occupational Health & Safety Law (M) 4 or
- GEOL5412 Special Topics in Petroleum Geoscience 6 8

Total

| HPW Session 1 | 18 |
| HPW Session 2 | 18 |
| Units Session 1 | 24 |
| Units Session 2 | 24 |

Note/s:
- Total number of Units of Credit (UOC): 192
- UOC Management oriented (M): 48 = 25%

Petroleum Engineering
GradDip

Program is also offered in open learning.

<table>
<thead>
<tr>
<th>COURSE</th>
<th>TITLE</th>
</tr>
</thead>
<tbody>
<tr>
<td>GEOL5031**</td>
<td>Introduction to Petroleum Geology</td>
</tr>
<tr>
<td>GEOL5312**</td>
<td>Petroleum Geology &amp; Geophysics</td>
</tr>
<tr>
<td>PTRL5007 / 6007*</td>
<td>Reservoir Engineering</td>
</tr>
<tr>
<td>PTRL5009 / 6009*</td>
<td>Drilling Equipment &amp; Operations</td>
</tr>
<tr>
<td>PTRL5018 / 6018*</td>
<td>Well Completions &amp; Stimulation</td>
</tr>
<tr>
<td>PTRL5022 / 6022*</td>
<td>Drilling Systems Design &amp; Optimisation</td>
</tr>
<tr>
<td>PTRL5107 / 6107*</td>
<td>Formation Evaluation</td>
</tr>
<tr>
<td>CVEN8706* / 9706</td>
<td>Human Resources Management</td>
</tr>
<tr>
<td>CVEN8707* / 9707</td>
<td>Contracts Management</td>
</tr>
<tr>
<td>CVEN8710* / 9710</td>
<td>Management of Risk</td>
</tr>
<tr>
<td>CVEN8714* / 9714</td>
<td>Resource Management</td>
</tr>
<tr>
<td>CVEN8888* / 9888</td>
<td>Environmental Management</td>
</tr>
<tr>
<td>GEOL9151*</td>
<td>Petroleum Geology</td>
</tr>
<tr>
<td>GEOL9152*</td>
<td>Petroleum Geophysics</td>
</tr>
<tr>
<td>PTRL5001 / 6001*</td>
<td>Fluid Dynamics in Porous Media</td>
</tr>
<tr>
<td>PTRL5003 / 6003*</td>
<td>Well Pressure Testing</td>
</tr>
<tr>
<td>PTRL5004 / 6004*</td>
<td>Numerical Reservoir Simulation</td>
</tr>
</tbody>
</table>
**Graduate Certificate (Petroleum Engineering)**

Open Learning Programs

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Title</th>
<th>UOC</th>
</tr>
</thead>
<tbody>
<tr>
<td>Petroleum Production Economics</td>
<td>6</td>
<td></td>
</tr>
<tr>
<td>Drilling Mud – Formulation, Selection &amp; Maintenance</td>
<td>6</td>
<td></td>
</tr>
<tr>
<td>Reservoir Characterisation</td>
<td>6</td>
<td></td>
</tr>
<tr>
<td>Well Control &amp; Blowout Prevention</td>
<td>6</td>
<td></td>
</tr>
<tr>
<td>Casing Design &amp; Cementing</td>
<td>6</td>
<td></td>
</tr>
<tr>
<td>Practical Aspects of Well Planning &amp; Drilling Cost Estimates</td>
<td>6</td>
<td></td>
</tr>
<tr>
<td>Directional, Horizontal &amp; Multilateral Drilling</td>
<td>6</td>
<td></td>
</tr>
<tr>
<td>Advanced Recovery Methods</td>
<td>6</td>
<td></td>
</tr>
</tbody>
</table>

**Note/s:**

- **GEOL5031 & GEOL5312** are to be taken together, and will be treated/discharged as one 6UC-subject.
- To qualify for a GradDip in 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 S1</th>
<th>S2</th>
<th>UOC S1</th>
<th>S2</th>
</tr>
</thead>
<tbody>
<tr>
<td>Petroleum 12</td>
<td>10</td>
<td>8</td>
<td>10</td>
<td>8</td>
</tr>
<tr>
<td>Petroleum 13</td>
<td>3</td>
<td>3</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>Petroleum 14</td>
<td>3</td>
<td>3</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>Petroleum 16</td>
<td>3</td>
<td>3</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>Environmental Law or Occupational Health and Safety</td>
<td>4</td>
<td>8</td>
<td>4</td>
<td>8</td>
</tr>
<tr>
<td>Business Economics</td>
<td>3</td>
<td>6</td>
<td>3</td>
<td>6</td>
</tr>
<tr>
<td>Accounting: A User Perspective</td>
<td>3</td>
<td>6</td>
<td>3</td>
<td>6</td>
</tr>
<tr>
<td>Commerce Core Elective</td>
<td>3</td>
<td>6</td>
<td>3</td>
<td>6</td>
</tr>
<tr>
<td>Total HPW Session 1</td>
<td>18</td>
<td>21</td>
<td>18</td>
<td>21</td>
</tr>
<tr>
<td>Units Session 1</td>
<td>24</td>
<td>24</td>
<td>24</td>
<td>24</td>
</tr>
<tr>
<td>Total HPW Session 2</td>
<td>24</td>
<td>24</td>
<td>24</td>
<td>24</td>
</tr>
<tr>
<td>Four Non-Core Commerce Electives</td>
<td>12</td>
<td>24</td>
<td>12</td>
<td>24</td>
</tr>
</tbody>
</table>

**Stage 5**

| Four Non-Core Commerce Electives | 12 | 24 | 12 | 24 |

**Total**

| Petroleum Engineering Part Time External (Open-Learning Program)

8655

**Petroleum Engineering MEngSc (Petroleum Engineering)**

This program is designed to cater for upstream oil and gas personnel who are interested in expanding their knowledge base. The candidates shall have an appropriate degree of Bachelor plus a minimum of one year of petroleum industry experience.

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Title</th>
<th>UOC</th>
</tr>
</thead>
<tbody>
<tr>
<td>GEOL9151</td>
<td>Petroleum Geology</td>
<td>6</td>
</tr>
<tr>
<td>Petroleum Engineering</td>
<td>6</td>
<td></td>
</tr>
<tr>
<td>Reservoir Engineering</td>
<td>6</td>
<td></td>
</tr>
<tr>
<td>Well Drilling Equipment &amp; Operations</td>
<td>6</td>
<td></td>
</tr>
<tr>
<td>Well Completions &amp; Stimulation</td>
<td>6</td>
<td></td>
</tr>
<tr>
<td>Reservoir Characterisation</td>
<td>6</td>
<td></td>
</tr>
<tr>
<td>Contracts Management</td>
<td>6</td>
<td></td>
</tr>
<tr>
<td>Management of Risk</td>
<td>6</td>
<td></td>
</tr>
<tr>
<td>Environmental Management</td>
<td>6</td>
<td></td>
</tr>
<tr>
<td>Petroleum Geophysics</td>
<td>6</td>
<td></td>
</tr>
<tr>
<td>Fluid Dynamics in Porous Media</td>
<td>6</td>
<td></td>
</tr>
<tr>
<td>Well Pressure Testing</td>
<td>6</td>
<td></td>
</tr>
<tr>
<td>Numerical Reservoir Simulation</td>
<td>6</td>
<td></td>
</tr>
<tr>
<td>Petroleum Production Economics</td>
<td>6</td>
<td></td>
</tr>
<tr>
<td>Drilling Mud – Formulation, Selection &amp; Maintenance</td>
<td>6</td>
<td></td>
</tr>
<tr>
<td>Drilling Systems Design &amp; Optimisation</td>
<td>6</td>
<td></td>
</tr>
<tr>
<td>Well Control &amp; Blowout Prevention</td>
<td>6</td>
<td></td>
</tr>
<tr>
<td>Casing Design &amp; Cementing</td>
<td>6</td>
<td></td>
</tr>
<tr>
<td>Practical Aspects of Well Planning &amp; Drilling Cost Estimates</td>
<td>6</td>
<td></td>
</tr>
<tr>
<td>Directional, Horizontal &amp; Multilateral Drilling</td>
<td>6</td>
<td></td>
</tr>
<tr>
<td>Advanced Recovery Methods</td>
<td>6</td>
<td></td>
</tr>
<tr>
<td>Formation Evaluation</td>
<td>6</td>
<td></td>
</tr>
</tbody>
</table>

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.
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 H A Salisch
UOC3 HPW3 S1


PTRL1011
Reservoir Rock Properties & Fluid Flow
Staff Contact: Dr P M Wong
UOC3 HPW3 S2


PTRL1012
Reservoir Fluid Properties
Staff Contact: Dr P M Wong
UOC3 HPW3 S2


PTRL1013
Computing for Petroleum Engineers
Staff Contact: Dr P M Wong
UOC3 HPW3 S2

Basic computing concepts. Scientific programming. Introduction to mathematical and statistical software. Spreadsheets and spreadsheet applications. Reservoir mapping techniques. Practical sessions on solving petroleum engineering problems.

PTRL1014
Petroleum Exploration & Development in Australia
Staff Contact: Dr H A Salisch
UOC3 HPW3 S2


PTRL2009
Field Development Geology
Staff Contact: Mr D Tamhane
UOC3 HPW3 S1


PTRL2010
Communication Skills & Business Practices for Engineers
Staff Contact: Mr G W Allinson
UOC6 HPW6 S1

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, farms, company annual reports, company special reports, oil and gas marketing, reserves reporting, relations with Governments and partners.

PTRL2012
Formation Evaluation 1
Staff Contact: Dr H A Salisch
UOC3 HPW3 S2


PTRL2013
Rock & Fluid Properties Laboratory
Staff Contact: Associate Professor S S Rahman
UOC3 HPW3 S2

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.

PTRL3008
Reservoir Engineering A
Staff Contact: Professor W V Pinczewski
UOC3 HPW3 S1


PTRL3009
Reservoir Engineering B
Staff Contact: Professor W V Pinczewski
UOC3 HPW3 S2


Well Testing
Staff Contact: Dr I Kutasov
UOC3 HPW3 S2


Reservoir Characterisation
Staff Contact: Dr P M Wong
UOC3 HPW3 S2


Petroleum Production Engineering
Staff Contact: Dr I Kutasov
UOC3 HPW3 S2


Well Drilling Equipment & Operations
Staff Contact: Associate Professor S S Rahman
UOC3 HPW3 S1

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 hook up, 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 & Cementing
Staff Contact: Dr I Kutasov
UOC3 HPW3 S1

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 & Production Laboratory
Staff Contact: Associate Professor S S Rahman
UOC3 HPW3 S2

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: Mr G W Allinson
UOC3 HPW3 S1


Risk Analysis and Management
Staff Contact: Mr G W Allinson
UOC3 HPW3 S2

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: Mr G W Allinson
UOC6 HPW3 S1

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.

Petroleum Thermodynamics
Staff Contact: Professor W V Pinczewski
UOC3 HPW3 S1

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.

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.

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.

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, Electrical Engineering/Biomedical Engineering, Computer Engineering/Biomedical Engineering, Chemical Engineering/Biomedical Engineering, and in Telecommunication Engineering/Biomedical Engineering. 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, the Master of Engineering Science in Biomedical Engineering, and the Graduate Diploma in Biomedical Engineering. Opportunities are provided for graduate research leading to the award of the degrees of Master of Science, Master of Engineering and Doctor of Philosophy.

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 program. 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 may require up to 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.
Bachelor of Engineering/Master of Biomedical Engineering

BE MBiomedE

At the time of printing, the course structure was under review. Please contact the School for further information, and details of the new course structure for the following concurrent degrees:

Bachelor of Engineering (Chemical)/Master of Biomedical Engineering

Bachelor of Engineering (Computer)/Master of Biomedical Engineering

Bachelor of Engineering (Electrical)/Master of Biomedical Engineering

Bachelor of Engineering (Mechanical)/Master of Biomedical Engineering

Bachelor of Engineering (Telecommunications)/Master of Biomedical Engineering

Formal graduate programs in Biomedical Engineering are offered. These are: the Master of Biomedical Engineering, the Master of Engineering Science in Biomedical Engineering, and the Graduate Diploma in Biomedical Engineering.
Postgraduate Study

Opportunities are provided for graduate research leading to the award of the degrees of Master of Science, Master of Engineering and Doctor of Philosophy.

Course Work Programs

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

<table>
<thead>
<tr>
<th>General Subjects</th>
</tr>
</thead>
<tbody>
<tr>
<td>BIOM9060 Biomedical Systems Analysis 6</td>
</tr>
<tr>
<td>BIOM9510 Introductory Biomechanics (1) 6</td>
</tr>
<tr>
<td>BIOM9551 Biomechanics of Physical Rehabilitation 6</td>
</tr>
<tr>
<td>BIOM9601 Biomedical Applications of Microcomputers 6</td>
</tr>
<tr>
<td>BIOM9621 Biological Signal Analysis 6</td>
</tr>
<tr>
<td>BIOM9701 Dynamics of the Cardiovascular System 6</td>
</tr>
<tr>
<td>ELEC9411 Introductory Physiology for Engineers P 6</td>
</tr>
</tbody>
</table>

Session 2

<table>
<thead>
<tr>
<th>General Subjects</th>
</tr>
</thead>
<tbody>
<tr>
<td>BIOM9010 Biomedical Engineering Practice 3</td>
</tr>
<tr>
<td>BIOM9012 Biomedical Statistics 6</td>
</tr>
<tr>
<td>BIOM9027 Medical Imaging 6</td>
</tr>
<tr>
<td>BIOM9311 Mass Transfer in Medicine 6</td>
</tr>
<tr>
<td>BIOM9321 Physiological Fluid Mechanics 6</td>
</tr>
<tr>
<td>BIOM9332 Biocompatibility 6</td>
</tr>
<tr>
<td>BIOM9541 Mechanics of the Human Body 6</td>
</tr>
<tr>
<td>BIOM9561 Mechanical Properties of Biomaterials 6</td>
</tr>
<tr>
<td>BIOM9612 Medical Instrumentation 6</td>
</tr>
</tbody>
</table>

Notes:
- HR Highly recommended
- P Part-time students only
- (1) For students with no mechanics background

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

<table>
<thead>
<tr>
<th>General Subjects</th>
</tr>
</thead>
<tbody>
<tr>
<td>BIOM9060 Biomedical Systems Analysis 6</td>
</tr>
<tr>
<td>BIOM9510 Introductory Biomechanics (1) 6</td>
</tr>
<tr>
<td>BIOM9551 Biomechanics of Physical Rehabilitation (2) 6</td>
</tr>
<tr>
<td>BIOM9601 Biomedical Applications of Microcomputers (3) 6</td>
</tr>
<tr>
<td>BIOM9621 Biological Signal Analysis 6</td>
</tr>
<tr>
<td>BIOM9701 Dynamics of the Cardiovascular System 6</td>
</tr>
<tr>
<td>ELEC9411 Introductory Physiology for Engineers (4) 6</td>
</tr>
</tbody>
</table>

Notes:
- UOC

Session 2

<table>
<thead>
<tr>
<th>General Subjects</th>
</tr>
</thead>
<tbody>
<tr>
<td>BIOM9010 Biomedical Engineering Practice (4) 3</td>
</tr>
<tr>
<td>BIOM9012 Biomedical Statistics 6</td>
</tr>
<tr>
<td>BIOM9027 Medical Imaging 6</td>
</tr>
<tr>
<td>BIOM9311 Mass Transfer in Medicine 6</td>
</tr>
<tr>
<td>BIOM9321 Physiological Fluid Mechanics 6</td>
</tr>
<tr>
<td>BIOM9332 Biocompatibility 6</td>
</tr>
<tr>
<td>BIOM9541 Mechanics of the Human Body (2) 6</td>
</tr>
<tr>
<td>BIOM9561 Mechanical Properties of Biomaterials (2) 6</td>
</tr>
<tr>
<td>BIOM9612 Medical Instrumentation 6</td>
</tr>
<tr>
<td>BIOM9913 Project Report (5) 12</td>
</tr>
</tbody>
</table>

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.

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: School Office
UOC6 HPW1 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 S1 S2
Thesis topic for BE(Elec)/MBiomedE students only.

BIOM5911
Thesis Part B
Staff Contact: School Office
UOC6 HPW8 S1 S2
Thesis topic for BE(Elec)/MBiomedE students only.

BIOM9010
Biomedical Engineering Practice
Staff Contact: School Office
UOC6 HPW2 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.

BIOM9012
Biomedical Statistics
Staff Contact: School Office
UOC6 HPW3 S2

BIOM9027
Medical Imaging
Staff Contact: School Office
UOC6 HPW3 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: School Office
UOC6 HPW3 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 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: School Office
UOC6 HPW3 S2
Prerequisite/s: BIOM901, BIOM9040
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: School Office
UOC6 HPW3 S1
Prerequisite/s: BIOM901
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 date, the optimum design of experiments, and methods of control.

BIOM9101
Mathematical Modelling for Biomedical Engineers
Staff Contact: School Office
UOC6 HPW3 S1
Note/s: This course is also for students with 1 year university maths or less.

BIOM9311
Mass Transfer in Medicine
Staff Contact: School Office
UOC6 HPW3 S2

BIOM9321
Physiological Fluid Mechanics
Staff Contact: School Office
UOC6 HPW3 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: School Office
UOC6 HPW3 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.
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.

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 automated systems. Data recording, tracking and validation. Routes to innovation in a clinical laboratory.


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.


A reasonably advanced background in microprocessors is required. Entry to course is by 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 (e.g., bedside ECG monitor).

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.

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: School Office
UOC6 HPW3 S1
Notes: 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
Project Report
Staff Contact: School Office
UOC6 S1 S2
Projects are undertaken at the Graduate School or other relevant
institutions towards the end of the program. Topics are chosen in
collaboration with a supervisor from the Graduate School.
Graduate Programs in Business and Technology

Director
Dr John Toohey
Adjunct Professor, Faculty of Engineering

Deputy Director and Business Manager
Mr Michael McGuirk
Adjunct Associate Professor, Faculty of Engineering

Graduate Programs in Business and Technology (GPBT) is a joint initiative between the Faculty of Engineering and the Faculty of Commerce and Economics. It is administratively located within the Faculty of Engineering.

GPBT currently offers the Master of Business and Technology (MBT) with the Graduate Diploma in Business and Technology (GradDip) and the Graduate Certificate in Business and Technology (GradCert). The Faculty of Engineering is the Course Authority for the MBT, GradDip and GradCert.

The MBT, GradDip, and GradCert are business qualifications with a technological orientation and are offered by distance education and face to face.

Master of Business and Technology (MBT) Program

The MBT is a business program which address technology as core to business. Courses in the MBT Program aim at providing 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 organisations and family commitments. Study guides required for the completion of the program are provided and are assisted by web supported classes. Textbooks are purchased separately.

Assessment, as far as possible, is centered 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 the Graduate Certificate in Business and Technology (GradCert) or proceeding to the second level, the Graduate Diploma in Business and Technology (GradDipBT). 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>ACCT5912</td>
<td>Accounting: A Users Perspective 6</td>
</tr>
<tr>
<td>ACCT5980</td>
<td>Value Based Management in a Global Economy 6</td>
</tr>
<tr>
<td>ACCT5981</td>
<td>Strategic Resource Management 6</td>
</tr>
<tr>
<td>ACCT5982</td>
<td>Managing Agile Organisations 6</td>
</tr>
<tr>
<td>ACCT5983</td>
<td>Managing Strategic Change 6</td>
</tr>
<tr>
<td>ACCT5984</td>
<td>Managing Intangible Resources 6</td>
</tr>
<tr>
<td>ACCT5985</td>
<td>The Innovative Organisation 6</td>
</tr>
<tr>
<td>ECON5109</td>
<td>Business Economics 6</td>
</tr>
<tr>
<td>FINS5560</td>
<td>Corporate Finance 6</td>
</tr>
<tr>
<td>GBAT9101</td>
<td>Project Management 6</td>
</tr>
<tr>
<td>GBAT9102</td>
<td>Management of Manufacturing Systems 6</td>
</tr>
<tr>
<td>GBAT9103</td>
<td>Environmental Management 6</td>
</tr>
<tr>
<td>GBAT9104</td>
<td>Management of Innovation and Technical Change 6</td>
</tr>
<tr>
<td>GBAT9105</td>
<td>Risk Management 6</td>
</tr>
<tr>
<td>GBAT9106</td>
<td>Information Systems Management 6</td>
</tr>
<tr>
<td>GBAT9107</td>
<td>Maintenance Management 6</td>
</tr>
<tr>
<td>GBAT9109</td>
<td>Energy Management 6</td>
</tr>
<tr>
<td>GBAT9111</td>
<td>Organisation for Quality Improvement 6</td>
</tr>
</tbody>
</table>
Course Descriptions

Descriptions of all courses are presented in 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.

GBAT9112 Managing Occupational Health and Safety 6
GBAT9113 Strategic Management of Business and Technology 6
GBAT9114 Marketing for Technical Managers 6
GBAT9115 Information Technology for Managers 6
LEGT9101 Business Law and Technology 6
IROB5690 Strategic People Management 6
TBA Advanced Information Technologies for Managers 6
TBA E-Business: Strategy and Management 6
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 Business and Technology GradDip

Candidates must complete a minimum program totaling 48 Units of Credit (normally 8 courses at 6 units of credit each) 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 Business and Technology or if they wish, to proceed to the Masters. For further information, contact the MBT Co-ordinator, Graduate Programs in Business and Technology.

The Graduate Diploma in Business and Technology 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.

7333 Graduate Certificate in Business and Technology

Graduate Certificate in Business and Technology (GradCert) is available to candidates who do not have tertiary qualifications, but do have at least four years of relevant experience.

Candidates must successfully complete four courses totaling 24 units of credit with a minimum of a credit grade average, which will then entitle them to upgrade to the Graduate Diploma in Business and Technology.

Alternatively, candidates may choose to exit the program at this point and graduate with the GradCert.

The GradCert is based on open learning principles and can normally be completed in two academic sessions. The maximum period is four academic sessions. In special circumstances extensions may be granted.

TBA Advanced Information Technologies for Managers
Staff contact: School office
UOC 6 HPW 1.5 S2
The ongoing information technology revolution presents major challenges for managers. Inadequate understanding of the opportunities and risks associated with the use of new technologies inhibits managers' ability to use these to maximum benefit. This course will explore advanced information technologies and their application in modern organisations. It will look at both the advantages and limitations of some of the leading-edge information technology architectures (solutions). The course will also cover the latest IT trends, outlining new technologies on the horizon, and provide a forward-looking perspective for managers of the 21st century.

TBA E-Business: Strategy and Management
Staff contact: School office
UOC 6 HPW 1.5 S2
Drawing on the application of Information Technology for competitive advantage, the course will look at the potential effects of e-business on the value chain, product differentiation, strategic relationships and market share. Important technologies are emerging in the vital areas of data transfer and personal interaction - these will set the foundations for the future management of e-business. Topics in the course include the potential impact of e-business both business-to-business and business-to-consumer transactions, security and communications, legal and ethical issues, EDI and Electronic Payments Systems and revenue generation strategies.

ACCT5912 Accounting: A User Perspective
Staff Contact: School Office
UOC 6 HPW1.5 X1 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 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.

ACCT5980 Value Based Management in a Global Economy
Staff contact: School office
UOC 6 HPW 1.5 S2
Value Based Management in a Global Economy 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.

ACCT5981 Strategic Resource Management
Staff Contact: School Office
UOC 6 HPW1.5 S1 S2
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 orientated. The link between strategy, resourcing 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 shareholders and customers.
ACCT 5982
Managing Agile Organisations
Staff contact: School office
UOC 6 HPW 1.5 S1 X1
Managing Agile Organisations seeks to develop the managerial perspectives and competences required for the emergent knowledge economy. It addresses the new challenges posed by fast moving service life cycles, workforce empowerment, the virtual structuring of organisations, globalisation, and heightened ambiguity. It examines how these challenges will be met by managers in agile organisations, as they negotiate time and space, interactions and discourse, power and culture, diversity and commitment, and innovation and change.

ACCT5983
Managing Strategic Change
Staff Contact: School Office
UOC6 HPW1.5 S1 S2
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.

ACCT 5984
Managing intangible resources
Staff contact: School office
UOC 6 HPW 1.5 S2
In the new knowledge economy advantage is seen to accrue to those organisations that can manage invisible or intangible resources well. This course aims to identify such resources and examine their use in achieving superior strategic and financial performance. Illustrative topics include: the management of knowledge, customer and supplier relationships, people and their capabilities, and "externalities" such as the natural environment and social capital. "Triple line management" systems will be explored as hallmarks of the future. The course is based on the premise that long term, sustainable value creation is achievable only through collaborative organisational practices where the contribution of all stakeholders is recognised and rewarded.

ACCT5985
The Innovative Organisation
Staff Contact: School Office
UOC6 HPW1.5 S1 S2
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.

ECON5109
Business Economics
Staff contact: School office
UOC 6 HPW 1.5 S2
An understanding of economics is essential for the long run viability of business. The economic environment in which business operates will have a vital bearing on day to day decisions. "Business Economics" lays the foundations for such knowledge. It provides a basic introduction to those economic principles which are important for business, as well as providing general economists to enable students to read and understand economic reports and to be able to communicate with and understand business persons, economists and policy makers.

FINS5560
Corporate Finance
Staff contact: School office
UOC 6 HPW 1.5 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. The course develops distinct conceptual frameworks and specialised tools for solving real world financial problems at both the personal and corporate level. Examples include funds management, mergers and acquisitions, capital raisings, portfolio selection of financial securities, public floats and the pricing of assets in the stock market. Illustrations from real-life corporate practices are used to highlight the importance and relevance of financial management to the realisation of corporate objectives.

GBAT9101
Project Management
Staff Contact: School Office
UOC6 HPW1.5 X1 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 a single 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: School Office
UOC12 HPW1.5 S1 S2
MMS 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: School Office
UOC6 HPW1.5 X1 S1 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 avoiding 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 & Technical Change
Staff Contact: School Office
UOC6 HPW1.5 X1 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: School Office
UOC6 HPW1.5 X1 S1 S2
All Managers must manage risk because decisions must be made in a fast changing and uncertain world. Organisations are increasingly implementing integrated risk management programs in which the same process is applied to all types of risk whether financial or technical. This course follows the risk management process described by AS/NZS4360 Risk Management and discusses how it is applied.
to issues of interest to the class. The particular focus is on risks which arise in a technical context such as project management, outsourcing, liability, IT, the environment and safety. Students undertake a case study of relevance to the particular interests.

**GBAT9106**  
**Information Systems Management**  
**Staff Contact:** School Office  
**UC6**  
**HPW1.5**  
**X1 S1 S2**  
This course 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). The course takes a management viewpoint of the issues and only addresses technicalities by way of brief introductions where needed to support the managerial theme.

**GBAT9107**  
**Maintenance Management**  
**Staff Contact:** School Office  
**UC6**  
**HPW1.5**  
**X1 S1 S2**  
This is a subject for anybody who wishes to examine how managers should interact with the physical world, and in particular the assets that are used by a business to generate wealth. The core understanding of reasons for failure, legacies from design and how to look for signs of failure are brought into systematic business processes that embrace all people within the organisation. The underlying principle is that managers should not necessarily be experts in applying the technology, but they have to understand the right questions to ask and to ensure that their staff is working with correct procedures and within the correct strategy, suitable for their business and the nature of the assets. The course is very hands-on and the student will appreciate the breadth of challenges facing the modern asset manager.

**GBAT9109**  
**Energy Management**  
**Staff Contact:** School Office  
**UC6**  
**HPW1.5**  
**X1 S1 S2**  
Provides an understanding of the major energy sources and the technical, economic and other factors affecting their availability, quality, markets and environmental implications relating to their use. The existing and future pattern of energy uses are outlined along with the long-term transition to sustainable sources. The material outlines various methods and means of assessing existing and potential energy sources in meeting the present and future the demands of business and technology-based enterprises.

**GBAT9111**  
**Organisation for Quality Improvement**  
**Staff Contact:** School Office  
**UC6**  
**HPW1.5**  
**X1 S1 S2**  
In the past few years, organisations have radically changed the way they design and produce goods and services; they have redesigned jobs and work systems, quality management systems, material management and inventory systems, and they have changed the technologies they use. We cannot avoid seeing how quality has developed into the most important competitive weapon. In this course, you will be provided with both the strategic importance of Quality and its role in lean production, concurrent engineering, cellular production, flexible manufacturing systems and related methods, analytical tools that you can use in the real world.

**GBAT9112**  
**Managing Occupational Health and Safety**  
**Staff Contact:** School Office  
**UC6**  
**HPW1.5**  
**X1 S1 S2**  
Workplace injury involves organisations in insurable costs (workers' compensation premium) and uninsurable 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 analysis and application of management techniques.
The Centre for Photovoltaic Engineering was formerly part of the School of Electrical Engineering. It comprises three centres established by the Australian Research Council, the Photovoltaics Special Research Centre, the Key Centre for Teaching and Research in Photovoltaic Engineering and the Special Research Centre for Third Generation Photovoltaics. The need for the latter has arisen due to rapid growth and evolution in the photovoltaics industry in recent years, with considerable demand by industry for University of New South Wales’ (UNSW) developed technologies and appropriately trained engineers across the entire photovoltaic and renewable energy sectors.

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 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.

**Undergraduate Study**

**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 cell efficiencies for well over a decade while also being responsible for developing the most successfully commercialized new PV technology world-wide over the last 15 years. During this period, Australian manufacturers have grown to the size whereby Australia is now the largest manufacturer per capita. Australia’s market share is predicted to continue increasing in an industry that is growing world-wide at more than 30% per year.

Course materials cover all aspects of PV engineering and also provide a broad education in solar energy, renewable energy technologies and sustainable energy. Most course material can be categorized into one of five major areas: device theory; photovoltaic technology and manufacturing; photovoltaic applications and system design; policy, analysis and modelling; and renewable energy technologies and sustainable energy. Throughout the course, considerable emphasis is placed on gaining hands-on experience of working with PV devices, modules and systems.

**Second Area of Specialization**

A unique feature of the degree is that in 2nd year, students are able to enrol in one 18 units of credit 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 Photovoltaic Engineering office in room 128 of the Electrical Engineering building.

**Undergraduate Program Outlines**

SOLAAA13642  
*Photovoltaics and Solar Energy – Full-time Program*

**Bachelor of Engineering**

**BE**

**Year 1**

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Description</th>
<th>HPW</th>
<th>UOC</th>
</tr>
</thead>
<tbody>
<tr>
<td>SOLA1040</td>
<td>Introduction to Solar Energy, Photovoltaics &amp; Computing 1A</td>
<td>4</td>
<td>0</td>
</tr>
<tr>
<td>SOLA1041</td>
<td>Introduction to Solar Energy, Photovoltaics &amp; Computing 2A</td>
<td>0</td>
<td>3</td>
</tr>
<tr>
<td>SOLA1042</td>
<td>Chemical Processes for Photovoltaic Systems</td>
<td>0</td>
<td>3</td>
</tr>
<tr>
<td>SOLA1043</td>
<td>Digital Circuits</td>
<td>6</td>
<td>0</td>
</tr>
<tr>
<td>SOLA1044</td>
<td>Higher Mathematics 1A</td>
<td>6</td>
<td>0</td>
</tr>
<tr>
<td>SOLA1045</td>
<td>Higher Mathematics 1B</td>
<td>6</td>
<td>0</td>
</tr>
<tr>
<td>SOLA1046</td>
<td>Higher Physics 1A</td>
<td>6</td>
<td>0</td>
</tr>
<tr>
<td>SOLA1047</td>
<td>Higher Physics 2B</td>
<td>6</td>
<td>0</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. Students may also formulate their own strands subject to School Office approval.

**Year 2**

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Description</th>
<th>HPW</th>
<th>UOC</th>
</tr>
</thead>
<tbody>
<tr>
<td>SOLA2048</td>
<td>Introduction to Electronic Devices</td>
<td>2.5</td>
<td>3</td>
</tr>
<tr>
<td>ELEC2021</td>
<td>Real Time Instrumentation</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>MATH2581</td>
<td>Linear Algebra</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>MATH2021</td>
<td>Statistics EE</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>MATH2031</td>
<td>General Education Electives</td>
<td>4</td>
<td>0</td>
</tr>
</tbody>
</table>

* Total 18 21.5 48

**Year 3**

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Description</th>
<th>HPW</th>
<th>UOC</th>
</tr>
</thead>
<tbody>
<tr>
<td>SOLA3040</td>
<td>Professional Electives</td>
<td>8</td>
<td>18</td>
</tr>
<tr>
<td>SOLA3050</td>
<td>Sustainable Strand (continued)</td>
<td>5</td>
<td>0</td>
</tr>
<tr>
<td>SOLA3045</td>
<td>Sustainable Energy</td>
<td>2.5</td>
<td>3</td>
</tr>
<tr>
<td>SOLA3050</td>
<td>Applied Photovoltaics</td>
<td>4</td>
<td>0</td>
</tr>
<tr>
<td>SOLA3040</td>
<td>Solar Cells and Systems</td>
<td>0</td>
<td>4</td>
</tr>
<tr>
<td>SOLA3045</td>
<td>Renewable Energy Product</td>
<td>2.5</td>
<td>0</td>
</tr>
<tr>
<td>SOLA4911</td>
<td>Reliability</td>
<td>5</td>
<td>0</td>
</tr>
<tr>
<td>SOLA4911</td>
<td>General Education</td>
<td>0</td>
<td>4</td>
</tr>
</tbody>
</table>

* Total 18 16 48

**Year 4**

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Description</th>
<th>HPW</th>
<th>UOC</th>
</tr>
</thead>
<tbody>
<tr>
<td>ELEC3021</td>
<td>Professional Electives</td>
<td>4</td>
<td>12</td>
</tr>
<tr>
<td>ELEC3022</td>
<td>Introduction to Management for Electrical Engineers</td>
<td>6</td>
<td>0</td>
</tr>
<tr>
<td>ELEC3023</td>
<td>Ethics and Electrical Engineering Practice</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>SOLA4010</td>
<td>Building Integrated Photovoltaics</td>
<td>0</td>
<td>6</td>
</tr>
<tr>
<td>SOLA4012</td>
<td>Grid Connected Photovoltaic Systems</td>
<td>0</td>
<td>6</td>
</tr>
<tr>
<td>SOLA4912</td>
<td>Thesis Part A</td>
<td>5</td>
<td>0</td>
</tr>
<tr>
<td>SOLA4913</td>
<td>Thesis Part B</td>
<td>0</td>
<td>10</td>
</tr>
</tbody>
</table>

* Total 17 18.5 48

**Years 2 & 3 Strand Options**

**Strand 1  Computing and Control**

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Description</th>
<th>HPW</th>
<th>UOC</th>
</tr>
</thead>
<tbody>
<tr>
<td>COMP1011</td>
<td>Computing 1A</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>ELEC2001</td>
<td>Microprocessors and Interfacing</td>
<td>4</td>
<td>0</td>
</tr>
</tbody>
</table>

**Strand 2  Electronics**

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Description</th>
<th>HPW</th>
<th>UOC</th>
</tr>
</thead>
<tbody>
<tr>
<td>ELEC2002</td>
<td>Circuits and Systems</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>ELEC2003</td>
<td>Electronics A</td>
<td>6</td>
<td>0</td>
</tr>
<tr>
<td>ELEC2004</td>
<td>Electronics B</td>
<td>0</td>
<td>5</td>
</tr>
<tr>
<td>or ELEC2005</td>
<td>Electrical Engineering Design</td>
<td>0</td>
<td>5</td>
</tr>
</tbody>
</table>

**Strand 3  Electric Energy**

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Description</th>
<th>HPW</th>
<th>UOC</th>
</tr>
</thead>
<tbody>
<tr>
<td>MATH3011</td>
<td>Several Variable Calculus</td>
<td>4</td>
<td>0</td>
</tr>
<tr>
<td>PHYS2011</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>ELEC3006</td>
<td>Electrical Energy 1</td>
<td>5</td>
<td>0</td>
</tr>
</tbody>
</table>

**Strand 4  Communications**

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Description</th>
<th>HPW</th>
<th>UOC</th>
</tr>
</thead>
<tbody>
<tr>
<td>ELEC2006</td>
<td>Circuits and Systems</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>MATH2020</td>
<td>Complex Analysis</td>
<td>2</td>
<td>5</td>
</tr>
<tr>
<td>MATH3050</td>
<td>Transform Methods</td>
<td>0</td>
<td>3</td>
</tr>
<tr>
<td>TELE3013</td>
<td>Telecommunications Systems</td>
<td>5</td>
<td>0</td>
</tr>
</tbody>
</table>

**Strand 5  Mathematics**

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Description</th>
<th>HPW</th>
<th>UOC</th>
</tr>
</thead>
<tbody>
<tr>
<td>MATH2011</td>
<td>Several Variable Calculus</td>
<td>4</td>
<td>0</td>
</tr>
<tr>
<td>MATH3020</td>
<td>Complex Analysis</td>
<td>0</td>
<td>2.5</td>
</tr>
<tr>
<td>MATH2090</td>
<td>Discrete Mathematics</td>
<td>3</td>
<td>0</td>
</tr>
<tr>
<td>MATH3090</td>
<td>Mathematical Methods EE</td>
<td>0</td>
<td>4</td>
</tr>
</tbody>
</table>

**Strand 6  Mechanical Engineering**

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Description</th>
<th>HPW</th>
<th>UOC</th>
</tr>
</thead>
<tbody>
<tr>
<td>MECH2060</td>
<td>Fluid Mechanics and Thermodynamics A</td>
<td>4</td>
<td>0</td>
</tr>
<tr>
<td>MECH2061</td>
<td>Fluid Mechanics and Thermodynamics B</td>
<td>0</td>
<td>4</td>
</tr>
<tr>
<td>MECH3060</td>
<td>Thermofluid System Design</td>
<td>3</td>
<td>0</td>
</tr>
<tr>
<td>MECH3061</td>
<td>Advanced Thermodynamics</td>
<td>3</td>
<td>3</td>
</tr>
</tbody>
</table>

**Strand 7  Civil Engineering**

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Description</th>
<th>HPW</th>
<th>UOC</th>
</tr>
</thead>
<tbody>
<tr>
<td>CVEN3012</td>
<td>Statics</td>
<td>3</td>
<td>0</td>
</tr>
<tr>
<td>CVEN3014</td>
<td>Mechanics of Solids</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>CVEN2013</td>
<td>Engineering Materials</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>CVEN3014</td>
<td>Introduction to Structures</td>
<td>2</td>
<td>0</td>
</tr>
<tr>
<td>CVEN3016</td>
<td>Engineering Management</td>
<td>2</td>
<td>2</td>
</tr>
</tbody>
</table>
The program selected by each student must be approved by the credit point requirements. Students in Photovoltaics and Solar Energy who contact the Photovoltaic Engineering Centre office prior to year 3 can also be chosen from the subjects listed as electives. Substitution is not permitted if it unduly restricts the range of 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. There are no special rules on what to include in each year. Students who commence a course but subsequently do not wish to proceed with both areas of study, or who fail to maintain a creditable performance, need to revert to a single degree program with appropriate credit for subjects completed. AUSTUDY support is available for the five years of the combined degree programs. 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 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 who commence a course but subsequently do not wish to proceed with both areas of study, or who fail to maintain a creditable performance, need to revert to a single degree program with appropriate credit for subjects completed. AUSTUDY support is available for the five years of the combined degree programs. 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 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 Degree 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 when 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-enroll 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-sessional 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.

- 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:

- SOLA9001 Photovoltaics
- SOLA9002 Solar Cells and Systems
- SOLA9003 High Efficiency Solar Cells
- SOLA9004 Solar Energy
- SOLA9005 Advanced Semiconductor Devices
- ELEC9502 Integrated Circuit Technology
- SOLA9006 Solar Cell Technology & Manufacturing
- SOLA9007 Grid Connected Photovoltaics

Additional subjects are being developed on an ongoing basis so students should consult the Photovoltaic 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.

5458
Graduate Diploma in Electrical Engineering

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.
Course Descriptions

SOLA1050/1051
Introduction to Solar Energy, Photovoltaics and Computing
Staff Contact: Professor S R Wenham
UOC6 HPW4 in S1, HPW5 in S2
Notes: HPW4 in S1, HPW3 in S2.
An overview is given of solar energy, its harnessing and its conversion into electricity via various converter technologies. In particular, an overview is given of solar cells and their applications with emphasis on visual presentations and interesting case histories. The interesting area of "solar cars" is considered in detail as an example of a high profile application of photovoltaic (PV) devices and systems that deals with state-of-the-art technology. Trends in the PV industry are considered, particularly with regard to costs, industry growth and technology innovation. Insight is given into the types of jobs carried out by PV engineers including manufacturing, research, system design, system analysis and fault diagnosis, policy and analysis, marketing, quality control and testing, training/education, maintenance, electronics design and interfacing, etc. In general, one lecture each week will be given by guest lecturers who are experts from industry, end-user groups, research, government and other major areas of photovoltaics that are covered in this degree program.

SOLA1060
Chemical Processes for Photovoltaic Systems
Staff Contact: Associate Professor C Honsberg
UOC3 HPW2 S2
Prerequisite/s: Assumed knowledge to the level of high school chemistry.
Introduction to the chemical processes associated with photovoltaic devices and systems with particular emphasis on the fabrication of solar cells. Revision of high school chemistry and its relevance to photovoltaic devices and corresponding systems. Revised material includes: atomic and molecular structure and bonding; chemical equilibrium; rates of reactions; ionic equilibria; metals, electrochemistry and corrosion; electrical properties of materials including metals, insulators and semiconductors. Emphasis will be placed on the application of these chemical principles to photovoltaic engineering. Examples include: junction formation through doping in semiconductors; oxidation and reduction reactions in semiconductor processing; corrosion in photovoltaic systems leading to a study of cathodic protection and life expectancy; storage of energy; and chemical handling and safety.

SOLA2020
Photovoltaic Technology and Manufacturing
Staff Contact: Professor S R Wenham
UOC6 HPW5 S1
Sufficient theory relating to the operating principles of solar cells is covered to give an appreciation of the strengths and weaknesses of the dominant commercial cell technologies. Trends in commercial cell technology and the corresponding manufacturing processes and environment are considered. The impact of various processing and device parameters on performance, yields and product reliability are studied. Insight is given into complete production processes for both screen-printed solar cells and buried contact solar cells. In-line quality control techniques are studied with laboratory classes used to give students first-hand experience in their use as well as exposing them to manufacturing processes. Students will also be given the opportunity to take control of the "virtual production line" to adjust the equipment controls and processing parameters to try and optimize performance and maximize yields, etc. In-line quality control procedures are available to the student to aid in this optimization and will prove to be particularly useful in identifying and rectifying computer generated faults associated with the production. Other laboratory work focuses on the use, measurement and analysis of encapsulated modules of cells. Modules with a range of faults are examined and techniques for fault diagnosis developed.

SOLA2051/2052
Project in Photovoltaics and Solar Energy
Staff Contact: Dr J Cotter & Professor S R Wenham
UOC12 HPW3 S1
A range of projects are available for involvement by groups of students of various sizes. Each project will have a research component, some experimental work, preparation of a report or presentation and may involve an oral presentation to the class. Examples of projects include monitoring and analyzing existing installations, installing new PV or thermal or wind generation systems, developing multimedia presentations for disseminating information on photovoltaics and solar energy, system design, modelling, etc. New projects regularly become available allowing the students some level of choice. The lectures each week allow the presentation of complementary material as well as providing opportunities for group presentations as appropriate. In the early weeks of the subject, students will be taught how to program in C++ and JAVA, with many of the projects involving the use and application of these programming skills.

SOLA2060
Introduction to Electronic Devices
Staff Contact: Associate Professor C Honsberg
UOC3 HPW2.5 S2
Operation, circuit characteristics, basic design principles and applications of a range of semiconductor devices. Material covered includes pn junction theory, bipolar junction transistors, avalanche diodes, MOSFET's, basic digital circuits, solar cells, light emitting diodes, semiconducting lasers, photodetectors and optical fibres in basic communication circuits. Transient and high speed analysis of electronic components are studied. Basic processing steps in semiconductor device fabrication are considered.

SOLA3050
Sustainable Energy
Staff Contact: Associate Professor C Honsberg
UOC3 HPW2.5 S1
Includes a broad introduction into issues in sustainable energy, including topics such as environmental impact, life-cycle costing, energy payback time, and the context of energy systems within a social framework. Included in the discussion will be an overview of environmental concerns with present energy generating systems, particularly relating to greenhouse gas concerns. Specific examples of sustainable energy included in the course will be an overview of wind power, solar thermal systems, photovoltaic energy, hydro-power and biomass.

SOLA3054
Renewable Energy Product Reliability
Staff Contact: Professor M A Green
UOC3 HPW2.5 S1
Given the generally high capital cost of renewable products, the reliability and durability of these products are of prime importance in determining economic returns. This course acquaints the student with the skills and techniques required to design product for reliable performance and to evaluate the likely reliability of new product. Case studies include photovoltaic modules, inverters and wind generators.

SOLA3507
Solar Cells and Systems
Staff Contact: Associate Professor C Honsberg
UOC6 HPW4 S2
Prerequisite/s: SOLA3540
Harnessing of sunlight by using solar cells to convert it directly into electricity. The main emphasis is placed on applications including systems design, construction and operation with this subject building on the material introduced in the subject Applied Photovoltaics. Grid-connected systems receive particular attention. Factors important in the design of solar cells are also studied with regard to their
effects on spectral response, temperature sensitivity, resistive losses, current generation and open circuit voltages. A range of solar cell technologies are considered both at the laboratory and commercial levels. Advanced concepts and designs for photovoltaic modules and batteries are considered. Experience will be gained with the computer-aided design procedures for photovoltaic systems. Management and entrepreneurial approach in relation to starting a small business within the photovoltaic industry are considered.

SOLA3540
Applied Photovoltaics
Staff Contact: Professor S R Wenham
UOC6 HPW4 S1

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.

SOLA4010
Building Integrated Photovoltaics
Staff contact: Dr M Watt and Ms A Bruce
UOC 3 HPW2.5 S2
Prerequisite: SOLA3540

The use of PV as an integral part of a building structure is one of the fastest growing PV markets worldwide. This course will examine the architectural and engineering aspects of using PV as a building material. It will include building envelope performance requisites, active and passive solar design principles, planning requirements, coordination between electrical and building trades, system maintenance and monitoring. In particular, the course will cover techniques for integration of PV in design (shape, size, orientation, colour), mechanical systems (especially multi-functional elements), electrical systems (grid connection and/or direct use) and building operation, control and maintenance.

SOLA4012
Grid-Connected Photovoltaic Systems
Staff Contact: Professor M A Green & Professor H R Outhred & Mr T Spooner
UOC3 HPW4 S1
Prerequisite/s: SOLA3540

This course familiarizes students with issues relevant to the use of photovoltaics in systems connected to the electricity distribution network with the aim of attaining competency in design and specification. The types of systems considered include residential, building integrated, distributed grid-support and central station. System components, design, operation, safety, standards and economics are addressed making extensive use of past field experience and site visits where appropriate.

SOLA4910
Thesis Part A
Staff Contact: School Office
UOC6 HPWS S1 or S2

SOLA4911
Thesis Part B
Staff Contact: School Office
UOC12 HPW10 S1 or S2
Prerequisite/s: ELEC4910

The Thesis Project is carried out in the last two sessions of the BE degree course for full-time students. Six hours per week in the first session, and twelve 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. 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 together with laboratory tests. Each student is required to present a seminar as part of the requirements for SOLA4910, Thesis Part A.

Satisfactory performance in subject SOLA4910 is a prerequisite for progress to subject SOLA4911. 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 SOLA4911, Thesis Part B.

SOLA5011
Solar Cells: Operating Principles and Technology
Staff Contact: Professor M A Green
UC6 HPW4 S2
Prerequisite/s: SOLA2060

This is an intermediate course directed at developing a thorough understanding of the operation of semiconductor p-n junctions and hence solar cells. Emphasis is upon developing an understanding of the relevant properties of semiconductors and how these affect the photovoltaic properties of solar cells. Based on the understanding of cell properties developed in the first half of the course, the second half of the course explores design, fabrication and operational issues relevant to the photovoltaic technologies of current interest: silicon, III-V compound, cadmium telluride, copper indium selenide, amorphous silicon and nanocrystalline dye cells.

SOLA5050
Renewable Energy Policy and International Programs
Staff Contact: School Office
UOC3 HPW2.5 S1
Corequisite/s: SOLA3050

This course will review the objectives and strategies of renewable energy policies world-wide. It will examine policy drivers, including environmental impact, community service obligations and industry development, as well as policy instruments and how they are applied, including taxation, legislation, tariffs, targets and incentives. The policies and strategies will be illustrated with international case studies of renewable energy programs.

SOLA5051
Life Cycle Assessment
Staff contact: School Office
UOC 3 HPW2.5 S1
Corequisite: SOLA3050

This course will deal with life cycle analysis and its use for life cycle assessment of energy systems. Methodologies, boundary issues, data bases and applications will be studied. The uses of LCA will be illustrated with industrial case studies and with studies aimed at quantifying externalities associated with different electricity generation technologies.

SOLA5052
Biomass
Staff contact: Dr M Watt & A/Prof HR Outhred
UC 6 HPW4 S1
Prerequisite: SOLA1060, Corequisite: SOLA3050

This course will introduce a range of biomass energy sources, including forestry, wastes and crops, as well as various technologies for their conversion into useful fuels or power. The course will cover liquid and gaseous fuels, including ethanol, however, the emphasis will be on electricity generation technologies, including combustion and gasification systems, biogas and landfill gas systems, combined heat and power production.

SOLA5053
Wind Energy Converters
Staff Contact: Associate Professor C B Honsberg
UC6 HPW4 S2
Prerequisite/s: PHYS1231, SOLA3050

This course will cover the principles of wind energy and wind power, as well as the design and operation of different types of wind energy converters. It will include machines for water pumping, remote area power supply and grid electricity generation. It will cover issues of site selection, monitoring and analysing wind data, estimating output from wind generators, integrating wind generators into hybrid power systems or the grid, economics, standards and environmental impacts.
SOLA5055
Renewable Energy Engineering
Staff Contact: Prof M.A. Green
UOC3 HPW2.5 S1

This course will be conducted by external specialists where appropriate provides a working knowledge of other areas of engineering with which the renewable energy engineer is likely to interface. One section deals with relevant engineering materials; another deals with the design of footings and support structures for such equipment, while a third section deals with mechanics, thermodynamics and heat transfer.

SOLA5058 (UG) SOLA9008 (PG)
Special Topic in Photovoltaics
Staff Contact: Professor S P Wenham
UOC0 HPW0

This syllabus changes to allow presentation of a special topic of current interest particularly by visitors with recognised expertise in the topic.

SOLA5059
Industrial Elective
Staff Contact: School Office
UOC6 HPW0

Prerequisites: Students must be in at least the third stage of part-time BE degree program or second year of the full-time program

Each Industrial Elective (6 units of credit) represents one year of appropriate quality industrial experience or equivalent in a suitable field. 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 12 Units of Credit can be taken and the credits may be substituted for certain courses in program 3642 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 SOLA4911. An Industrial elective cannot be claimed for work submitted for credits as SOLA4911 Thesis. Details of the procedure for registering and the requirements to be met can be obtained from the Centre for Photovoltaic Engineering.

SOLA5058 (UG) SOLA9003 (PG)
High Efficiency Silicon Solar Cells
Staff Contact: Professor M A Green
UOC3 HPW3 S2

Prerequisites: SOLA2060 (or equivalent), SOLA3540

This is an advanced level subject for those with a good background in semiconductor device physics and an interest in silicon solar cells or related devices. After a brief review of the crystal structure, energy bands and phonon spectra of silicon, the course examines silicon's optical, recombination and transport properties in some detail. Next comes a discussion of efficiency limits upon photovoltaic energy conversion, with particular emphasis upon light trapping and the potential for exceeding conventional limits. After discussion of presently achievable surface and bulk material properties, the final section of the course studies in detail the design of silicon cells upon both crystalline and multicrystalline substrates and under concentrated and non-concentrated sunlight.

SOLA5060
Industrial Elective
Staff Contact: School Office
UOC3

Prerequisites: Students must be in at least the third stage of part-time BE degree program or second year of full-time program.

Each Industrial Elective (3 units of credit) represents 6 months of appropriate quality industrial experience or equivalent in a suitable field. 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 12 Units of Credit can be taken and the credits may be substituted for certain courses in program 3642 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

SOLA5061
Industrial Elective
Staff Contact: School Office
UOC3

Prerequisites: Students must be in at least the third stage of part-time BE degree program or second year of full-time program.

Each Industrial Elective (3 units of credit) represents 6 months of appropriate quality industrial experience or equivalent in a suitable field. 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 12 Units of Credit can be taken and the credits may be substituted for certain courses in program 3642 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 SOLA4911. An Industrial elective cannot be claimed for work submitted for credits as SOLA4911 Thesis. Details of the procedure for registering and the requirements to be met can be obtained from the Centre for Photovoltaic Engineering.

SOLA9001
Photovoltaics
Staff Contact: Professor S P Wenham
UOC6

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.

SOLA9002
Solar Cells and Systems
Staff Contact: Professor S P Wenham
UOC6

Harnessing of sunlight by using solar cells to convert it directly into electricity. The main emphasis is placed on applications including systems design, construction and operation with this subject building on the material introduced in the subject Applied Photovoltaics. Grid-connected systems receive particular attention. Factors important in the design of solar cells are also studied with regard to their effects on spectral response, temperature sensitivity, resistive losses, current generation and open circuit voltages. A range of solar cell technologies are considered both at the laboratory and commercial levels. Advanced concepts and designs for photovoltaic modules and batteries are considered. Experience will be gained with the computer-aided design procedures for photovoltaic systems. Management and entrepreneurial approach in relation to starting a small business within the photovoltaic industry are considered.

SOLA9003
High efficiency Solar Cells
Refer to SOLA5506.

SOLA9004
Solar Energy
Staff Contact: Associate Professor C B Honsberg
UOC6 HPW0

SOLA9005
Advanced Semiconductor Devices
Staff Contact: Associate Professor C B Honsberg
U0C6
Notes: Excluded ELEC4512

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.

SOLA9006
Solar Cell Technology and Manufacturing
Staff Contact: Professor S.R Wenham
U0C6

A basic introduction to solar cell operation is provided leading to a study of the types of industrial processes used in large scale manufacturing. Dominant commercial cell technologies are covered in detail including evaluation of the relative strengths and weaknesses of each. A "virtual" production line is used to give students direct control of and exposure to the manufacturing environment and techniques for optimizing performance of mass produced devices. Production issues such as yields and in-line quality control are considered. Assignment work includes having students take control of the virtual production line for the purposes of performance optimization, fault diagnosis and maximizing of yields.

SOLA9007
Grid-Connected Photovoltaics
Staff Contact: Professor M.A Green
U0C6

Traditionally, solar cells have been used to provide small amounts of power for “stand alone” systems in remote areas. However, over recent years, the most rapidly growing market sector has been in applications that are connected to the standard electricity supply network, particularly grid-connected private homes. Other significant applications of this type include central station and building integrated photovoltaics. This course explores the technical and broader issues relevant to such applications. System components, principally inverters, and operational issues, such as “islanding” and its prevention, are treated in detail.

SOLA9008
Special Topic in Photovoltaics
Staff Contact: School Office
U0C9  HPW0

This syllabus changes to allow presentation of a special topic of current interest particularly by visitors with recognised experience in the topic.
where costs are dominated by those of the constituent materials, be it silicon wafers or glass sheet, it is likely that photovoltaics must evolve, in its most mature form, to a "third generation" of high-efficiency thin-film technology. By high-efficiency, what is meant is energy conversion values double or triple the 15-20% range presently targeted.

The Centre for Third Generation Photovoltaics was one of a small number of research Centres selected for funding as a Commonwealth Government Special Research Centre in the year 2000. It was established specifically to identify and accelerate the development of such "third generation" devices. The aim is to bring the most promising of these approaches to a "proof of concept" stage during the anticipated 9-year life of the Centre. There are outstanding opportunities with the Centre for "state of the art" research at postgraduate and postdoctoral levels in semiconductor device physics and technology, computer simulation of optical devices, electronic materials engineering, and semiconductor device fabrication and characterisation areas.

Centre for Advanced Numerical Computation in Engineering and Science

Director
Professor CAJ Fletcher

Administrative Contact Officer
Ms Rosita Lang

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 workstations, 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 organises 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: School Office
UOC6 HPW3 S2
Notes: Please note: Attendance at a 5 day full-time course, 14-18 July 2000 is required.

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...
The Centre also plays an important role in offering continuing funding through ARC Large, ARC-SPIRT, Sugar Research and government bodies. It aims to be a focus for inter-disciplinary studies within the School of Chemical Engineering and Industrial Chemistry. The Centre for Particle and Catalyst Technologies is located within the School allowing the UNSW team to maintain its international reputation for expertise in particulate systems.

Other special objectives of the Centre include the promotion of testing facilities available within the University. A wide range of industries, including pharmaceutical, chemical, and water, regularly send samples for particle characterisation. In addition to short-term projects the Centre has been successful in attracting long-term industrial research contracts and research grants (such as funding from Jod Engineers and The Sugar Research Institute). This has resulted in the 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 (particularly in the areas of Particle Characterisation and Powder Technology).

The Centre houses much state-of-the-art equipment that allows staff and students to characterise particulate material in terms of size (from 5 nm to 2 mm), surface area, pore size (microporous to macroporous), and other important physical and chemical properties. The characteristics of particulate materials influence their behaviour both as raw materials and products in many industries.

Many measurement techniques have been developed within the Centre allowing the UNSW team to maintain its international reputation for expertise in particulate systems.

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. It aims to be a focus for inter-disciplinary particle and catalyst research within the School, the University, and the wider community.

Over the previous five years the Centre has continually received funding through ARC Large, ARC-SPIRT, Sugar Research Development Corporation, and CRC-Waste Management and Pollution Control grants. This funding has acted to support research by the Centre in fields such as flocculation and floc characterisation, car exhaust catalysts, the development of novel magnetic photocatalysts, solid-liquid separation, and computational modeling of particulate systems. In all, 26 PhD students and 4 Research Fellows and Associates work in the Centre on these and other related projects.

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 Masters 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, Physical-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 invigilant and additional continuing education courses in the fields of Water and Wastewater Treatment and Solid Waste and Management.
The Centre for Water and Waste technology 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 through 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
Associate Professor AD Owen

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, photovoltaic, 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 enquiries 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 has close links, and collaborative projects operating with research institutes in Italy, France, Germany, Denmark, Finland, The Netherlands, the United Kingdom, Romania, the United States, Canada and Thailand. It also maintains connections with membrane groups in China, Indonesia, Japan, Korea, Malaysia, India and Singapore.

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 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 S2  
Prerequisite/s: ACCT9001  
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 S1  
Excluded: ACCT1501, ACCT9001, ACCT9002, ACCT9062  
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.

**ACTL4002**  
Actuarial Theory & Practice B  
Staff Contact: School Office  
Enrolment Requires School approval  
UOC6 HPW3  
This course, along with ACTL4001 Actuarial Theory and Practice A, develops the theory and practice underlying the actuarial management of risk-based and other products offered by financial institutions. The course draws examples from actuarial practice and discusses implications for life insurance, general insurance, superannuation, asset-liability management and other areas where actuaries are involved in product design, pricing, reserving, investment and surplus management. The course emphasises recent developments in actuarial theory. This course, along with ACTL4001, corresponds to the Part II courses of the professional examinations of The Institute of Actuaries of Australia.

**ANAT2200**  
Basic Histology  
Staff Contact: Professor Phil Waite  
UOC3 HPW3 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: Professor Phil Waite  
UOC3 HPW3 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 Elizabeth Tancred  
UOC6 HPW6 S2  
This course provides an introduction to the fundamental principles of human structure. It includes an introduction to the histology of basic tissues; an overview of the functional anatomy of the major body systems; human development, growth and aging; human evolution; body imaging. This course is designed for students who do not plan to major in Anatomy, but may be used as a prerequisite for ANAT3411 Neuroanatomy and, in exceptional circumstances, for ANAT3121 Visceral Anatomy.

**ANAT3131**  
Functional Anatomy 1  
Staff Contact: Dr Priti Pandey  
UOC6 HPW6 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 prospected specimens, X-rays and surface anatomy; students will also carry out their own dissections of the upper limb.

**ANAT3141**  
Functional Anatomy 2  
Staff Contact: Dr Dzung Vu  
UOC6 HPW6 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 prospected 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: Dr Priti Pandey
UO6C HPW6 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. This course 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: Dr Dzung Vu
UO6C HPW6 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. This course will include an assessable research affiliation program, incorporating discussion and evaluation of a research project, and submission of a research report based on literature within the subject area.

BIOS1101 Evolutionary and Functional Biology
Staff Contact: Associate Professor Adam
UO6C HPWS S2

Note/s: Practical and tutorial seat assignments must be obtained at the Biological Science Student Office (Rm G27 Biological Sciences Bld) BEFORE Session 2 starts. The Guide is available for purchase at the same time.

The course examines the evolutionary history of life on earth from origins to humans and the relationship between environment, adaptation and function. Animal (particularly human) and plant physiology are covered with an emphasis placed on adaptation to Australian context.

BIOS1201 Molecules, Cells and Genes
Staff Contact: Associate Professor Adam
UO6C HPWS S1

Assumed Knowledge: HSC Exam Score: Physics 53-100, or Chemistry 53-100, or Geology 53-100, or Biology 53-100, or 3 unit Science 90-150, or 4 unit Science 1-50

Note/s: Assumed knowledge for BIOS1201 is minimal. If you believe that your academic background is not appropriate, but would like to do Biology, please consult the Director. 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 it for details of the course and assessments. The course commences in Week 1.

The course is concerned with the basic characteristics of all life. The chemistry of life is covered with emphasis on the ways in which living things construct and break down macromolecules. Theway in which the genetic code controls these processes depends to a great extent on the structure and function of cell components, and cell biology is a major component of the course. The final topic is genetics - the way in which the genetic code is inherited and the ways in which it can be modified.

BIOS3301 Population and Community Ecology for Environmental Engineers
Staff Contact: Professor Barry Fox
UO3C HPW3 S2

Note/s: Restricted to 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.

BIOT3100 Fundamentals of Biotechnology
Staff Contact: Dr Foong
UO6C HPW2 S1 S2

Note/s: Restricted to programs 3055, 3100 and 3040.

This subject introduces important fundamental principles of biotechnology including fermentation and biocatalysis, protein synthesis and engineering and recombinant DNA technology. The applications of these principles are then explored in a series of lectures focusing on environmental biotechnology, drug recovery and production, plant biotechnology, bioresources and the economics of bioprocesses. The subject is designed to provide an understanding of the principles and applications of biotechnology both in its own and as alternatives to chemical synthesis.

CHEM1011 Fundamentals of Chemistry 1A
Staff Contact: Dr Peter Chia
UO6C HPW6 S1 S2


CHEM1021 Fundamentals of Chemistry 1B
Staff Contact: Dr Peter Chia
UO6C HPW6 X1 S2
Prerequisite/s: CHEM1011


CHEM1031 Higher Chemistry 1C
Staff Contact: Dr Peter Chia
UO6C HPW6 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 of organic compounds. Includes advanced laboratory work.

CHEM1041 Higher Chemistry 1D
Staff Contact: Dr Peter Chia
UO6C HPW6 S2
Prerequisite/s: CHEM1031


CHEM1817 Chemistry 1ME
Staff Contact: Dr Peter Chia
UO3C HPW3 S2

Excluded: CHEM1101, CHEM1201

Note/s: Restricted to Plan 3610, 3663, 3680, 3685, 3700 and 3985 program 0176 Alternative courses are available to avoid timetable clashes Please consult with School of Chemistry.

CHEM2011
Physical Chemistry
Staff Contact: Associate Professor Roger Read
UOC6 HPW6 S2
Prerequisite/s: CHEM1101 and CHEM1201 or CHEM1011 and CHEM1021 or CHEM1031 and CHEM1041 and MATH1021 or MATH1031 or MATH1231 or MATH1241
Notes: Alternative courses are available to avoid timetable clashes. Please consult with School of Chemistry.

CHEM2021
Organic Chemistry
Staff Contact: Associate Professor Roger Read
UOC6 HPW6 S2
Prerequisite/s: CHEM1101, 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: Associate Professor Roger Read
UOC6 HPW6 S1
Prerequisite/s: CHEM1101, CHEM1201
Excluded: CHEM2839
Notes: Alternative courses are available to avoid timetable clashes. Please consult with School of Chemistry.

CHEM2041
Chemical and Spectroscopic Analysis
Staff Contact: Associate Professor Roger Read
UOC6 HPW6 S1
Prerequisite/s: CHEM1101 and CHEM1201 or CHEM1011 and CHEM1021 or CHEM1031 and CHEM1041 and MATH1021 or MATH1031 or MATH1231 or MATH1241
Excluded: CHEM2849
Notes: Alternative courses are available to avoid timetable clashes. Please consult with School of Chemistry.
Principles and applications of chemical and analytical spectroscopy. Statistical treatment of data. Titrimetric and potentiometric analysis. Separation techniques.

CHEM2839
Inorganic Chemistry
Staff Contact: Associate Professor Roger Read
UOC6 HPW6 S2
Prerequisite/s: CHEM1101, CHEM1201 or CHEM1011 and CHEM1021 or CHEM1031 and CHEM1041
Excluded: CHEM2839
Electronic structure of atoms and molecules structure, energetics and banding in the solid state. Principles of co-ordination chemistry. Occurrence, preparation, properties and reactions of selected compounds of transition and main group elements.

CHEM3829
Organic Chemistry
Staff Contact: Professor David Black
UOC6 HPW6 S1
The spectroscopic identification of organic compounds, free radical chemistry and electroorganic processes, various aspects of the organic industrial processes such as industrial synthesis based on petrochemicals, and organometallic reactions of industrial interest. Selected topics from the dyestuff, pharmaceutical and agricultural industries.

ECONS103
Business Economics
Staff Contact: School Office
UOC6 HPW3 S1 S2
An introduction to economic analysis and policy. Using a case study approach, students will examine government and business reports, magazine and newspaper articles, and monographs/journals dealing with contemporary economic issues. Reports or articles will be analysed using simple micro and macroeconomic tools and reasoning. The aim of the course is to improve the economic literacy of students.

ECONS116
Environmental Economics
Staff Contact: School Office
UOC6 HPW3 S2
Prerequisite/s or Corequisite/s: ECONS5103
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.

ECONS248
Business Forecasting
Staff Contact: School Office
UOC6 HPW3 S1
Prerequisite/s: ECONS5203
This course looks at the use of econometric and statistical techniques relevant to forecasting in a business environment and computer implementation of the methods. Short-term forecasting using time series analysis, long-term forecasting with S-shaped growth curves and trend analysis. The study of applied work is emphasised in this non-specialist course.

FINS5511
Corporate Finance
Staff Contact: School Office
UOC6 HPW3 X1 S1 S2
Prerequisite/s: ACCCT5901, ECONS5103, ECONS5203 or ECONS5105, ECONS5203, ACCCT5933.
Essential aspects of financial decision-making in business. Designed to enable the student to usefully employ the following concepts in a business environment: investment decisions under uncertainty; cost of capital structure; mergers and takeovers; and working capital management.

FINS5512
Financial Markets and Institutions
Staff Contact: School Office
UOC6 HPW3 X1 S1 S2
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.

FINS5513
Security Valuation and Portfolio Selection
Staff Contact: School Office
UOC6 HPW3 X1 S1 S2
Prerequisite/s: ECONS5103, ECONS5203
The aim of this course 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, theoretical building blocks in the theory of finance; and (ii) to illustrate The aim of this course is twofold: (i) to introduce students to financial mathematics, security valuation, techniques for capital investment decisions, financial decision making under uncertainty (portfolio theory and capital market theory), corporate capital structure, cost of capital, and dividend decision and policy.

**GEOG2721**

Soils and Landforms  
*Staff Contact: Mr Sammut*  
UOC6 HPW4 S1  
*Prerequisite/s: GEOG1701 or GEOG1721 or GEOG1031 or GEOG1073*  
*Excluded: GEOG2051, GEOG3011, 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: Professor Anthony Milne*  
UOC6 HPW4 S1  
*Excluded: GEOG2025*  

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 course 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.

**GEOG3711**

Biogeography  
*Staff Contact: Dr Scott Mooney*  
UOC6 HPW4 S2  
*Prerequisite/s: GEOG2711 or BIOS1101 and BIOS1201*  
*Excluded: GEOG2025*  


**GEOG3721**

Pedology  
*Staff Contact: School Office*  
UOC6 HPW4 S2  
*Prerequisite/s: GEOG2711 or BIOS1101 and BIOS1201 or GEOOL1111 and GEOOL1211*  
*Excluded: GEOG3011*  

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, swelling, dispersibility, erosion and aggregate stability. Laboratory analysis with emphasis on properties associated with land capability assessment.

**GEOG3751**

Environmental Change  
*Staff Contact: Dr Scott Mooney*  
UOC6 HPW4 S1  
*Prerequisite/s: 96 Units of Credit*  
*Excluded: GEOG3062*  

SERVICING COURSES

GEOG3911
Environmental Impact Assessment
Staff Contact: Mr. Sammut
UOC6 HPW4 S1
Prerequisite/s: 12 UOC Level II Geography
Excluded: GEOG3042


GEOG3921
Coastal Resource Management
Staff Contact: Mr. Sammut
UOC6 HPW4 S2
Prerequisite/s: GEOG3901, GEOG2721

GEOG9011
Environmental Impact Assessment
Staff Contact: Mr. Sammut
UOC6 HPW4 S1
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 HPW4 S1
Using a diverse range of case studies, this course 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 students 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 HPW4 S1 S2
Note/s: This course requires prior approval of the Supervisor.
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: School Office
UOC6 HPW4 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 S1
Study of selected geographic information systems; problems of data capture and display, data storage 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 Geographic Information Systems
Staff Contact: School Office
UOC6 HPW3 S1 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 ARCINFO; INFO is used for data base management.

GEOG9018
Transportation Applications of Geographical Information Systems
Staff Contact: Dr Bruno Parolin
UOC6 HPW3 S2
Prerequisite/s: GEOG9240 or GEOG9016
This course provides an overview and hands-on experience in the design, use, and interpretation of Transport Information Systems (GIS-T s). Topics covered include transportation layers, transportation related referencing systems, data structures, network structures, urban transportation planning models, logit and other spatial models. At the end of the course, 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
The process and issues involved in an organisation acquiring, implementing and managing a GIS will be considered using real examples. Applications using GIS in the management of natural resources (forest, park, soil etc), human activities at the local, national and global scale will be critically reviewed. The course will involve field visits.

GEOG9021
Image Analysis In Remote Sensing
Staff Contact: School Office
UOC6 HPW3 S2
This course, 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 modeling. The course also demonstrates the theory of hyperspectral and radar remote sensing through lectures and practical computer-based processing. The course provides training in both remote sensing and GIS software, including ERDAS, ENVI, ArcView and ArcInfo.
GEOG9022  
Vegetation Management  
Staff Contact: School Office  
UOC6  HPW3  S1  
Notes: Field work forms a compulsory part of this course and students will incur personal costs.  
The course 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 course is devoted to management strategies of selected vegetation types.  

GEOL0360  
Remote Sensing Applications in Geoscience  
Staff Contact: Associate Professor Geoffrey Taylor  
UOC6  HPW0 S1 S2  
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. Geological 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 Paul Lennox  
UOC4  HPW3 S2  
Notes: Field work of up to one day is a compulsory part of this course. Students will incur personal costs.  

GEOL5301  
Introduction to Petroleum Geology  
Staff Contact: Dr Paul Lennox  
UOC3  HPW3 S1  
Notes: Field work of up to 2 days is a compulsory part of this course. Students will incur personal costs.  
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 strctures; 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 Paul Lennox  
UOC3  HPW3 S1  
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: Associate Professor Colin Ward  
UOC3  HPW3 S2  
Prerequisite(s): GEOL5301  

GEOL5321  
Petroleum Geology & Geophysics  
Staff Contact: Associate Professor Colin Ward  
UOC6  HPW6 S2  
Excluded: GEOL5301, GEOL5302, GEOL5312  
Notes: Field work of up to 1 day is a compulsory part of this course. Students will incur personal costs.  
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.  

GEOL5412  
Special Topics in Petroleum Geoscience  
Staff Contact: Associate Professor Colin Ward  
UOC6  HPW6 S2  
Prerequisite(s): GEOL5301  
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.  

GEOL9053  
Hydrogeochemistry  
Staff Contact: Mr Jankowski  
UOC3  HPW0 S1  

GEOL9054  
Analysis and Interpretation of Hydrogeochemical Data  
Staff Contact: Mr Jankowski  
UOC3  HPW0 S1  

GEOL9055  
Hydrogeochemical Modelling  
Staff Contact: Mr Jankowski  
UOC3  HPW0 S2  

GEOL9060  
Environmental Geology  
Staff Contact: Dr David Cohen  
UOC6  HPW0 S1 S2  
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.
INFS2603
Business Intelligence Systems
Staff Contact: School Office
UOC6 HPW3 S1
Prerequisite/s: INFS1602, INFS1603

This course 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 S2
Prerequisite/s: INFS2603

This course 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 S1
Prerequisite/s: INFS1602, INFS1603

This course 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.

INFS4891
Knowledge Based Information Systems
Staff Contact: School Office
UOC6 HPW3 S2
Prerequisite/s: Admission to BCom degree at Honours level majoring in Information Systems.

As for INFS5927. See Graduate Study: Course Descriptions.

INFS4891
Decision Support Systems
Staff Contact: School Office
UOC6 HPW3 S1
Prerequisite/s: Admission to BCom degree at Honours level majoring in Information Systems.

As for INFS5991. See Graduate Study: Course Descriptions.

INFS5848
Information Systems Project Management
Staff Contact: School Office
UOC6 HPW3 S2
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.
INFS5928 Software Engineering Management
Staff Contact: School Office
UOC6 HPW3 S1
Prerequisite/s: INFS5989
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.

INFS5953 Information Systems Management
Staff Contact: School Office
UOC6 HPW3 S2
Prerequisite/s: INFS5988, INFS5992
This course 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 course.

INFS5957 Information and Decision Technology
Staff Contact: School Office
UOC6 HPW3 S1
In a knowledge-based economy, organisational prosperity will largely depend on how successful knowledge workers are at creating and applying new ideas productively and efficiently. This course examines the role of information and models of 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.

INFS5983 Business Data Communications
Staff Contact: School Office
UOC6 HPW3 X1 S1 S2
Prerequisite/s: INFS5988
Excluded: INFS5972
Data communication networks, interfaces between networks and computers, data communications software, standard communication protocols, network architectures, distributed databases, design of information systems which include data communications.

INFS5988 Business Information Systems
Staff Contact: School Office
UOC6 HPW3 X1 S1 S2
This course 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 course also encourages students to consider ethical practices related to the development and use of information systems.

INFS5989 Information Systems Design
Staff Contact: School Office
UOC6 HPW3 S2
Prerequisite/s or Corequisite/s: INFS5988
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 courses and student experiences.

INFS5991 Decision Support Systems
Staff Contact: School Office
UOC6 HPW3 S1
Prerequisite/s: INFS5988
This course covers issues in the design, development and implementation of systems designed to support decision-making tasks in organisations. The course reviews models of individual and organisational decision-making and provides an overview of a number of existing and emerging techniques that support decision-making, such as, management science, statistics, expert systems, artificial intelligence, group decision-support systems, data warehousing and data mining. Methodologies for the development and implementation of DSS applications are discussed. Case studies describing organisational experiences with DSS applications will be discussed.

INFS5992 Data Management
Staff Contact: School Office
UOC6 HPW3 S1 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.

IROB5701 Employment and Industrial Relations
Staff Contact: School Office
UOC6 HPW3 S1
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.

IROB5711 Employment and Industrial Law
Staff Contact: School Office
UOC6 HPW3 S1
Prerequisite/s or Corequisite/s: IROB5701 or IROB5906
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: School Office
UOC6 HPW3 S2
Prerequisite/s or 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 course 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 course provides appropriate theoretical perspectives on these and related employment issues.
This subject seeks to explain human behaviour within organisations. It adopts a critical perspective and uses a multi-disciplinary framework with material from Organisation 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; development and change; and the role of ceremony and formality. The course also examines the need for, awareness, nature and processes of organisational change. It focuses on administrative innovation and decision-making, power and control. It 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 course matter to actual work places. Students participate in this course 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).

This course deals with the ways in which strategic thinking can underpin Human Resource Management in organisations. It aims to provide students with opportunities to synthesise managerial strategy issues with HRM processes, in a considered and reflective manner. The course focuses on the way strategies can be formed and enacted in organisations, and on the internal and external environmental contexts within which human resource strategies are formed. It also deals with a range of contemporary issues in human resource management, and aims to introduce strategic human resource management as a new way of thinking about organisations and their stakeholders. Students are given the opportunity to enhance their skills in organisational analysis and strategic thinking, through fieldwork, case studies and seminars.

Examination of post-modernist theory for understanding the operation of human resource management and organisational culture.

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, negotiating 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 negotiation processes. 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 developed 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.
LEGT5531

Competition and Consumer Law

Staff Contact: School Office

UOC6 HPW3 S2

Prerequisite/s: LEGT5511

Trade practices and fair trading laws have assumed fundamental importance in the Australian marketplace. This subject 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 subject 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.

LEGT5541

Company Law

Staff Contact: School Office

UOC6 HPW3 S1 S2

Prerequisite/s: LEGT5511

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.

LEGT5551

Revenue Law

Staff Contact: School Office

UOC6 HPW3 S1 S2

Prerequisite/s: LEGT5511

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 subject 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.

LEGT5561

Legal Aspects of Finance

Staff Contact: School Office

UOC6 HPW3 S2

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.

LEGT5562

Business Law in a Global Economy

Staff Contact: School Office

UOC6 HPW3 S2

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 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.
LECT5563
Technology, Information and the Law
Staff Contact: School Office
UOC6 HPW3 S1
The rapidly evolving developments in computers and information technology pose particular challenges for society and the law. This subject 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.

LECT5571
Franchising
Staff Contact: School Office
UOC6 HPW3 S1
Franchising is becoming the dominant force in the distribution of goods and services. This subject 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 S2
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.

MARK5903
International Marketing
Staff Contact: School Office
UOC6 HPW4 S2
Prerequisite/s: MARK5902, MARK5911, MARK5928
This course 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.

MATH1081
Discrete Mathematics
Staff Contact: School Office
UOC6 HPW6 S1 S2
Corequisite/s: MATH1131 or MATH1141
Excluded: MATH1090
Assumed Knowledge: HSC 3 unit Mathematics. Students will be expected to have achieved a combined mark of at least 100 in 2 unit and 3 unit Mathematics.

MATH1090
Discrete Mathematics for Electrical Engineers
Staff Contact: School Office
UOC3 HPW3 S1
Corequisite/s: MATH1131 or MATH1141
Excluded: MATH1081
Assumed Knowledge: HSC 3 unit Mathematics. Students will be expected to have achieved a combined mark of at least 100 in 2 unit and 3 unit Mathematics.
Notes: 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 Office
UOC6 HPW6 S1 S2
Excluded: MATH1011, MATH1031, MATH1141, MATH1151, ECON1202, ECON2291
Assumed Knowledge: HSC 3 unit Mathematics. Students will be expected to have achieved a combined mark of at least 100 in 2 unit and 3 unit Mathematics.
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 Office
UOC6 HPW6 S1
Excluded: MATH1011, MATH1031, MATH1131, MATH1151, ECON1202, ECON2291
Assumed Knowledge: HSC 4 unit Mathematics. Students will be expected to have achieved a combined mark of at least 186 in 3 unit and 4 unit Mathematics.
As for MATH1131 but in greater depth.

MATH1231
Mathematics 1B
Staff Contact: School Office
UOC6 HPW6 X1 S2
Prerequisite/s: MATH1131 or MATH1141
Excluded: MATH1021, MATH1031, MATH1241, MATH1251, ECON1202, ECON2291
Several Variable Calculus
Staff Contact: School Office
UOC6  HPW4 S1
Prerequisite/s: MATH1231 or MATH1241 or MATH1251
Excluded: MATH2100, MATH2110, MATH2510, MATH2610
Functions of several variables, limits and continuity, differentiability, gradients, surfaces, maxima and minima, Taylor series, Lagrange multipliers, chain rules, inverse function theorem, Jacobian derivatives, double and triple integrals, iterated integrals, Riemann sums, cylindrical and spherical coordinates, change of variables, centre of mass, curves in space, line integrals, parametrised surfaces, surface integrals, del, divergence and curl, Stokes' theorem, Green's theorem in the plane, applications to fluid dynamics and electrodynamics, orthogonal curvilinear coordinates, arc length and volume elements, gradient, divergence and curl in curvilinear coordinates.

MATH2019
Engineering Mathematics 2CE
Staff Contact: School Office
UOC6  HPWS S2
Prerequisite/s: MATH1021 (CR) or MATH1231 or MATH1241 or MATH1251
Excluded: MATH2009, MATH2029, MATH2039
Notes: Not available in the Science program unless specified as part of a combined degree program.

Partial differentiation and applications, vector algebra, double integrals, ordinary differential equations, introduction to vector field theory, extrema of functions of 2 variables, matrices and their applications, Laplace transforms, Fourier series, partial differential equations and their solution for selected physical problems.

MATH2020
Mathematics 2A
Staff Contact: School Office
UOC3  HPW2.5 S1
Prerequisite/s: MATH1021 (CR) or MATH1231 or MATH1241 or MATH1251
Notes: 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 Keller self-paced learning method.


MATH2029
Engineering Mathematics 2A
Staff Contact: School Office
UOC6  HPW6 S1
Prerequisite/s: MATH1021 (CR) or MATH1231 or MATH1241 or MATH1251
Notes: Not available in the Science program unless specified as part of a combined degree program.


MATH2030
Mathematics 2B
Staff Contact: School Office
UOC3  HPW2 S2
Prerequisite/s: MATH1021 (CR) or MATH1231 or MATH1241 or MATH1251
Notes: 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 Keller self-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
UOC3  HPW3 S2
Prerequisite/s: MATH1231 or MATH1241
Notes: 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.

Higher Mathematics 1B
Staff Contact: School Office
UOC6  HPW6 S2
Prerequisite/s: MATH1131 (CR) or MATH1141 (CR)
Excluded: MATH1201, MATH1301, MATH1231, MATH1251, ECON1202, ECON2291
As for MATH1231 but in greater depth.

Higher Mathematics 1A
Staff Contact: School Office
UOC3  HPW2 S1
Prerequisite/s: MATH1021 (CR) or MATH1031
Excluded: MATH2100, MATH2110, MATH2510, MATH2601

Several Variable Calculus
Staff Contact: School Office
UOC6  HPW4 S1
Prerequisite/s: MATH1231 or MATH1241 or MATH1251
Excluded: MATH2100, MATH2110, MATH2510, MATH2610
Functions of several variables, limits and continuity, differentiability, gradients, surfaces, maxima and minima, Taylor series, Lagrange multipliers, chain rules, inverse function theorem, Jacobian derivatives, double and triple integrals, iterated integrals, Riemann sums, cylindrical and spherical coordinates, change of variables, centre of mass, curves in space, line integrals, parametrised surfaces, surface integrals, del, divergence and curl, Stokes' theorem, Green's theorem in the plane, applications to fluid dynamics and electrodynamics, orthogonal curvilinear coordinates, arc length and volume elements, gradient, divergence and curl in curvilinear coordinates.

MATH2019
Engineering Mathematics 2CE
Staff Contact: School Office
UOC6  HPWS S2
Prerequisite/s: MATH1021 (CR) or MATH1231 or MATH1241 or MATH1251
Excluded: MATH2009, MATH2029, MATH2039
Notes: Not available in the Science program unless specified as part of a combined degree program.

Partial differentiation and applications, vector algebra, double integrals, ordinary differential equations, introduction to vector field theory, extrema of functions of 2 variables, matrices and their applications, Laplace transforms, Fourier series, partial differential equations and their solution for selected physical problems.

MATH2020
Mathematics 2A
Staff Contact: School Office
UOC3  HPW2.5 S1
Prerequisite/s: MATH1021 (CR) or MATH1231 or MATH1241 or MATH1251
Notes: 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 Keller self-paced learning method.


MATH2029
Engineering Mathematics 2A
Staff Contact: School Office
UOC6  HPW6 S1
Prerequisite/s: MATH1021 (CR) or MATH1231 or MATH1241 or MATH1251
Notes: Not available in the Science program unless specified as part of a combined degree program.


MATH2030
Mathematics 2B
Staff Contact: School Office
UOC3  HPW2 S2
Prerequisite/s: MATH1021 (CR) or MATH1231 or MATH1241 or MATH1251
Notes: 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 Keller self-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
UOC3  HPW3 S2
Prerequisite/s: MATH1231 or MATH1241
Notes: 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 2A
Staff Contact: School Office
UOC6  HPW6 S1
Prerequisite/s: MATH1231 or MATH1241
Notes: Not available in the Science program unless specified as part of a combined degree 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.

MATH2059
Mathematics for Materials Science A
Staff Contact: School Office
UOC3  HPW3 S1
Prerequisite/s: MATH1231 or MATH1241
Notes: Not available in the Science program unless specified as part of a combined degree program.


MATH2110
Higher Vector Analysis
Staff Contact: School Office
UOC3  HPW2.5 S1
Prerequisite/s: MATH1231 or MATH1241
Excluded: MATH2100, MATH2110
Properties of vectors and tensors; divergence, gradient, curl of a vector; line, surface and volume integrals. Gauss and Stokes theorems. Curvilinear coordinates.

MATH2120
Mathematical Methods for Differential Equations
Staff Contact: School Office
UOC3  HPW2.5 S1 S2
Prerequisite/s: MATH1231 or MATH1241 or MATH1251
Excluded: MATH2130
Introduction to qualitative and quantitative methods for ordinary and partial differential equations. The following topics are treated by example. Ordinary differential equations: linear with constant coefficients, first-order systems, singularities, boundary-value problems, eigenfunctions, Fourier series. Bessel's equation and Legendre's equation. Partial differential equations: characteristics, classification, wave equation, heat equation, Laplace's equation, separation of variables methods, applications of Bessel functions and Legendre polynomials.

MATH2130
Higher Mathematical Methods for Differential Equations
Staff Contact: School Office
UOC3  HPW2.5 S2
Prerequisite/s: MATH1231 or MATH1241 or MATH1251 Each with a mark of 70
Excluded: MATH2120
As for MATH2120 but in greater depth.
MATh2400
Finite Mathematics
Staff Contact: School Office
UOC6 HPW4 S1
Prerequisite/s: MATH1081 or MATH1231 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.

MATh2430
Symbolic Computing
Staff Contact: School Office
UOC3 HPW2
Prerequisite/s: MATH1231 or MATH1241 or MATH1251
Principles of, uses of and algorithms underlying symbolic computing systems. Applications in pure and applied mathematics using a variety of symbolic computing systems.

MATh2501
Linear Algebra
Staff Contact: School Office
UOC6 HPW5 S1 S2
Prerequisite/s: MATH1231 or MATH1241 or MATH1251
Excluded: MATH2509, MATH2601

MATh2509
Linear Algebra for Engineers
Staff Contact: School Office
UOC3 HPW3 S2
Prerequisite/s: MATH1231 or MATH1241
Excluded: MATH2501, MATH2601
Note/s: 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
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 S2
Prerequisite/s: MATH1231 or MATH1241 or MATH1251
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 S2
Prerequisite/s: 70% in any of MATH1231 or MATH1241 or MATH1251
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 S2
Prerequisite/s: MATH1231 or MATH1241 or MATH1251 Each with a mark of 70
Excluded: MATH2011, MATH2510
As for MATH2510 but in greater depth.

MATh2620
Higher Complex Analysis
Staff Contact: School Office
UOC3 HPW2.5 S2
Prerequisite/s: MATH1231 or MATH1241 or MATH1251 Each with a mark of 70
Excluded: MATH2520
As for MATH2520 but in greater depth.

MATh2801
Theory of Statistics
Staff Contact: School Office
UOC6 HPW4 S1
Prerequisite/s: MATH1021 CR or MATH1231 or MATH1241 or MATH1251
Excluded: MATH2819, MATH2841, MATH2870, MATH2901, BIOS2041
Probability, random variables, standard distributions, bivariate distributions, transformations, central limit theorem, sampling distributions, point estimation, interval estimation, hypothesis testing.

MATh2810
Statistical Computing for Categorical Data
Staff Contact: School Office
UOC6 HPW4 S2
Prerequisite/s: MATH2801 or MATH2901
Excluded: MATH2910
This course will focus on the statistical computing tools appropriate for discrete-valued data. Exploratory and graphical analysis of data using modern statistical packages. Data visualisation. Analysis of cross-tabulated data. Logistic and Poisson regression for analysis of binary and count data. Log-linear models for contingency tables.

MATh2829
Statistics SU
Staff Contact: School Office
UOC3 HPW3 S1
Prerequisite/s: MATH1231 or MATH1241
Note/s: Not available to Science students except where specified as part of a combined degree program.
Introduction to probability theory, random variables and distribution functions, sampling distributions, including those of chi-square, t and F. Estimation procedures, including confidence interval estimation with an emphasis on least squares and surveying problems, and computer based exercises.

MATh2831
Linear Models
Staff Contact: School Office
UOC6 HPW4 S2
Prerequisite/s: MATH2801 or MATH2901
Excluded: MATH2931, BIOS2041
MATH2839
Statistics SM
Staff Contact: School Office
UOC3 HPW3 S2
Prerequisite/s: MATH1021 or MATH1231 or MATH1241
Excluded: MATH1041, MATH2841, MATH2870, MATH2801, MATH2901
Note/s: Not available in the Science program unless specified as part of a combined degree program.

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 mechanical and mining engineering and industrial design.

MATH2841
Statistics SS
Staff Contact: School Office
UOC6 HPW4 S2
Prerequisite/s: MATH1021 or MATH1231 or MATH1241
Excluded: MATH2801, MATH2870, MATH2901, MATH2819, BIOS2041
Note/s: 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 (including sampling variance formulae, and regression); confidence 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 and Statistics for Information
Staff Contact: School Office
UOC3 HPW3 S1 S2
Prerequisite/s: MATH1231 or MATH1241
Excluded: MATH1041, MATH2841, MATH2870, MATH2801, MATH2901
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 program.

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 or MATH1251
Excluded: MATH2819, MATH2841, MATH2870, MATH2801, BIOS2041
Note/s: Not available in the Science program unless specified as part of a combined degree program.

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.
inspired the founders of computing such as Turing and von Neumann. Topics include Propositional calculus: formal proofs and the Deduction theorem; consistency, completeness, compactness, independence of axioms. Predicate calculus: interpretations; axiomatisations; soundness, completeness and compactness theorems; nonstandard analysis; Peano arithmetic and Godel's incompleteness theorems. Automata: deterministic and non-deterministic finite automata, regular languages, Kleene's theorem, Pumping Lemma, Myhill-Nerode theorem. Computability: algorithms; Turing machines, computable and uncomputable functions; Church's thesis, different formalisations of computation; Godel numbering, universal machines, unsolvable problems; recursive functions:

**MATS1002**

**Microstructure Analysis**  
*Staff Contact: Dr Krauklis*  
UOC3 HPW3 S1 S2  
*Note*: Restricted to Combined degree course 3681.


**MATS1072**

**Physics of Materials**  
*Staff Contact: Dr Bandypadhyay*  
UOC4 HPW3 S1 S2  
*Prerequisite/s*: PHYS1002 or PHYS1221 or PHYS1231

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.

**MATS1112**

**Phase Equilibrium**  
*Staff Contact: School Office*  
UOC3 HPW2 S2  

**MATS1142**

**Crystallography and X-Ray Diffraction**  
*Staff Contact: Dr Veena Sahajwalla*  
UOC3 HPW3 S2  

**MATS1183**

**Non-Ferrous Physical Metallurgy**  
*Staff Contact: Dr Krauklis*  
UOC3 HPW2 S2  
Constitution, microstructure, processing and properties of non-ferrous alloys. Cast and wrought alloys based on aluminium, copper, magnesium, lead, tin and zinc.

**MATS2213**

**Diffusion**  
*Staff Contact: Professor David Young*  
UOC3 HPW2 S1  
MATS9650
Pyrometallurgical Processes
Staff Contact: Associate Professor Ostrovski Professor Charles Sorrell
UOC6 HPW2 S1 S2

Principles and development of pyrometallurgical processes and a review of the unit operations, roasting, sintering, smelting and refining for the treatment of ferrous and non-ferrous minerals.

MICR2201
Fundamentals of Microbiology and Immunology
Staff Contact: Dr Cooperwhite
UOC6 HPW6 S1

This course is designed to give undergraduate and post graduate students a solid background in fundamentals of microbiology and immunology. The course 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 course will consider bacteria, fungi, yeasts and viruses in our every day 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 course. This introduction will encourage the student to question controversial areas of microbiology and immunology such as AIDS. Immunization, environmental pollution, food hygiene, food spoilage causes and prevention etc.

PHPH2101
Physiology 1A
Staff Contact: Dr Simonetta
UOC6 HPW6 S1
Prerequisite/s: BIOS1101, BIOS1201, CHEM1021
Corequisite/s: BI0C2201 or BI0C2181; or Prerequisite: BI0M1080 (BE/BiomedE: students)

Introduces fundamental physiological principles, from basic cellular function in terms of chemical and physical principles to the operation and interaction of body systems. The areas of physiology covered in this unit are excitable tissues, the cardiovascular system, blood and neuroscience. The unit includes a substantial series of practical class experiments on these different areas of physiology. This subject is taken by students enrolled in any of the Physiology programs.

PHPH2201
Physiology 1B
Staff Contact: Dr Simonetta
UOC6 HPW6 S2
Prerequisite/s: PHPH2101
Corequisite/s: BI0C2201 or BI0C2291

Introduces fundamental physiological principles, from basic cellular function in terms of chemical and physical principles to the operation and interaction of body systems. The areas of physiology covered in this unit are excitable tissues, the cardiovascular system, blood and neuroscience. The unit includes a substantial series of practical class experiments on these different areas of physiology. This subject is taken by students enrolled in any of the Physiology programs.

PHYS1111
Fundamentals of Physics
Staff Contact: School Office
UOC6 HPW6 S1 S2

Note/s: Introductory level course 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
Physics 1A
Staff Contact: School Office
UOC6 HPW6 S1 S2
Corequisite/s: MATH1131 or MATH1141


PHYS1131
Higher Physics 1A
Staff Contact: School Office
UOC6 HPW6 S1 S2
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.

PHYS1189
Physics 1 (Chem, Mech, Min Eng)
Staff Contact: School Office
UOC6 HPW6 S1


PHYS1189
Physics 1 (Geomatic Engineering)
Staff Contact: School Office
UOC6 HPW6 S1


PHYS1221
Physics 1B
Staff Contact: School Office
UOC6 HPW6 S2
Corequisite/s: MATH1231 or MATH1241

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: School Office
UOC6 HPW6 S2
Corequisite/s: PHYS1022 or PHYS1111

Corequisite/s: MATH1021 or MATH1031 or MATH1131 or MATH1141

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
Corequisite/s: PHYS1131

ELECTIVE SYLLABUS: Those students enrolled in a physics plan in the Science program, and who have achieved a satisfactory performance in Session 1, may elect to take the following option for Session 2. (This option is not repeated in Summer Session.)

PHYS1231
Higher Physics 1B (SPECIAL)
Staff Contact: School Office
UOC6 HPW6 S2
Prerequisite/s: PHYS1131

ELECTIVE SYLLABUS: Those students enrolled in a physics plan in the Science program, and who have achieved a satisfactory performance in Session 1, may elect to take the following option for Session 2. (This option is not repeated in Summer Session.)

PHYS1002 and PHYS1221 and PHYS1231 or MATH1021 or MATH1131 or MATH1231 or MATH1241 or MATH1141 or MATH1031

Physic 1 (Civil Engineering)
Staff Contact: School Office
UOC4 HPW4 S2

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: School Office
UOC6 HPW6 S1 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: School Office
UOC3 HPW2 S1
Prerequisite/s: PHYS1002 and PHYS1221 or PHYS1231 and MATH1231 or MATH1241
Corequisite/s: MATH2101 or MATH2110 or MATH2100

Simple, damped and forced harmonic oscillations, central force problems, systems of particles, Lagrange’s equations, coupled oscillations, waves.

PHYS2020
Computational Physics
Staff Contact: School Office
UOC3 HPW2 S1
Prerequisite/s: PHYS1002 and PHYS1022 and PHYS1221 or PHYS1231 and MATH1021 or MATH1231 or MATH1241 or MATH1031

Use of computers to solve problems in Physics. Application to mechanics, chaos, quantum and thermal physics, data analysis.

PHYS2030
Laboratory A
Staff Contact: School Office
UOC3 HPW3 S1
Prerequisite/s: PHYS1002 or PHYS1022 or or PHYS1111 or PHYS1221 or PHYS1231 and MATH1021 or MATH1131 or MATH1141 or MATH1031

Experimental investigations in a range of areas: x-ray diffraction, work function, semiconductor bandgap, Hall effect, carrier lifetimes, nuclear magnetic resonance, magnetic properties.

PHYS2040
Quantum Physics
Staff Contact: School Office
UOC3 HPW2 S1
Prerequisite/s: PHYS1002 and PHYS1221 or PHYS1231


PHYS2060
Thermal Physics
Staff Contact: School Office
UOC3 HPW2 S2
Prerequisite/s: PHYS1002 or PHYS1022 or or PHYS1111 or PHYS1221 or PHYS1231 and MATH1021 or MATH1131 or MATH1141 or MATH1031

Laws of thermodynamics, kinetic theory, microscopic processes, entropy, solid-state defects, Helmholz and Gibbs’ functions, Maxwell’s relations, phase diagrams, chemical and electrochemical potentials.

PHYS2310
Nuclear Science and Technology
Staff Contact: School Office
UOC3 HPW2 S2
Prerequisite/s: PHYS1002 or PHYS1221 or or PHYS1111 or PHYS1221 or PHYS1231 and MATH1021 or MATH1131 or MATH1141 or MATH1031

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: School Office
UOC3 HPW3 S2
Prerequisite/s: PHYS1002 and PHYS1221 and PHYS1231 or PHYS1022

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: School Office
UOC3 HPW3 S2
Prerequisite/s: PHYS1022 or PHYS1002 or PHYS1169 or PHYS1221 or PHYS1231

The application of electronics to measurement. Includes principles of circuit theory; amplifiers, their specification and application, transducers; electronic instrumentation; industrial data acquisition.
PHYS2939
Physics 2 (Electrical Engineering)
Staff Contact: School Office
UOC3 HPW0 S1

PHYS2969
Physics of Measurement (Geomatic Engineering)
Staff Contact: School Office
UOC3 HPW3 S1
Prerequisite/s: PHYS1989 or PHYS1189

PHYS3010
Quantum Mechanics (Advanced)
Staff Contact: School Office
UOC3 HPW2 S1
Prerequisite/s: PHYS2021 or PHYS2040
Corequisite/s: MATH2120
Excluded: PHYS3210
Note/s: Not available without a mark of 65 or greater in PHYS2021 or PHYS2040.
Fundamental principles; the hydrogen atom; angular momentum; stationary and time-dependent perturbations; semi-classical radiation theory; variational methods; systems of particles; the Helium atom; matrix formulation.

PHYS3020
Statistical Physics
Staff Contact: School Office
UOC3 HPW2 S1
Prerequisite/s: PHYS2060 or PHYS2011
Corequisite/s: MATH2120
Excluded: PHYS3021

PHYS3030
Electromagnetism (Advanced)
Staff Contact: School Office
UOC3 HPW2 S1
Prerequisite/s: PHYS2011 or PHYS2050 and MATH2011 and MATH2120 and MATH2520
Excluded: PHYS3230
Note/s: Not available without a mark of 65 or greater in PHYS2011 or PHYS2050.

PHYS3040
Experimental Physics A1
Staff Contact: School Office
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, magnetic measurement techniques and resonance imaging, electromagnetic waves and waveguides, nuclear counting techniques and neutron activation, vacuum techniques. Formal scientific report writing.

PLAN1022
The Development Process
Staff Contact: Mr. Harris
UOC3 HPW2 S2
An introduction to real property law, the statutory requirements of the NSW planning system, environmental laws and land taxation. Also covered are small building construction issues, the nature of the housing market, commercial and industrial property markets, the funding of infrastructure and the roles of government agencies involved in the property market. Assignments are prepared in the form of consultant reports.

PLAN1093
Planning Studies
Staff Contact: School Office
UOC4 HPW0 S1

PLAN2012
Economic Development Planning
Staff Contact: Professor Peter Murphy
UOC3 HPW3 S2
Prerequisite/s: PLAN2011, PLAN1012
This course aims to show how, at the levels of both theory and practice, the planning system interlocks with socio-political pressures, the effects of which are to influence the shape and direction of development. Bodies of theory on planning and development are introduced and the relationship between them analysed. Planning is presented as a socio-political process the form of which shifts over space and time. The myth of rational, value free planning is exposed. The role of the state and the local state in managing conflicts intrinsic to a capitalist space economy is emphasised.

PLAN3032
Integrated Planning 3 - New Development
Staff Contact: Mr. Harris
UOC6 HPW4 S2
Prerequisite/s: PLAN3041, PLAN2032, PLAN1022
To demonstrate the process of planning as applied to an area undergoing urban development and give students the experience of carrying out such planning; to ensure that students can work competently as planners in urbanising areas; to show the inter-relationships between the planner and other professionals in release area planning.

REST0005
Real Estate Valuation
Staff Contact: Mr. Cardew
UOC3 HPW3 S2
This course provides a graduate level introduction to valuation theory and practice. Topics include the concept and statutory definition of value, land ownership and tenure, basic principles and methods of valuation, valuation process, valuation mathematics and tables, rental valuation and determination, cash-flow analysis and advanced quantitative methods, and application of computer programs to the valuation process.

SESC2091
Safety, Health and Environmental Hazards
Staff Contact: School Office
UOC3 HPW2 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: School Office
UOC3 HPW2 S1 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.

SESC3200
Hazard and Risk Assessment
Staff Contact: Professor Jean Cross
UOC3 HPW2 X1 S1 S2
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.

SESC3310
Social Issues in Science and Technology
Staff Contact: Dr Markovic
UOC3 HPW2 S1
This course 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.

SESC3601
Occupational Health and Safety
Staff Contact: School Office
UOC3 HPW2 S1 S2
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.

SESC4211
Risk Management
Staff Contact: Professor Jean Cross
UOC6 HPW3 S1 S2
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
Health, Safety and Environmental Management
Staff Contact: Ms Dianne Gardner
UOC3 HPW2 S1 S2
Prerequisite/s: PSYC3526 and PSYC3141
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: School Office
UOC3 HPW3 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.

SESC4850
Management of Dangerous Materials
Staff Contact: School Office
UOC3 HPW3 S1 S2
Chemicals legislation, regulatory assessment of chemicals, the dangerous goods system, the hazardous substances regulation and systems for hazardous waste.

SESC9020
Occupational Health and Safety Law 1
Staff Contact: Professor Adrian Brooks
UOC3 HPW2 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: Professor Adrian Brooks
UOC3 HPW2 S2
Assumed Knowledge: Core courses
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: School Office
UOC3 HPW3 S1 S2
Assumed Knowledge: Core subjects
Note/s: Also offered in off campus mode in either session.

SESC9121
Fire and Explosion
Staff Contact: School Office
UOC6 HPWO X2
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 fire and the third section deals with explosion prevention and control.

SESC9150
Electrical Safety
Staff Contact: Professor Jean Cross
UOC3 HPWO 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 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: School Office
UOC3 HPW0 S1
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: Professor Jean Cross
UOC3 HPW3 X1 S1 S2
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: Professor Jean Cross
UOC6 HPW3 S1 S2
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: School Office
UOC6 HPW3 S1 X2
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: Professor Jean Cross
UOC6 HPW3 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.

SESC9261
Introduction to Environmental Risk Assessment
Staff Contact: School Office
UOC3 HPW3 S1 S2
This course introduces the methods used to quantify human health and ecological risks associated with the presence of hazardous chemicals and pathogens in the environment. Environmental risks can be quantified when the following elements are known: The source of the Chemical/pathogen posing risk(s) to human and/or ecological receptors; The fate and transport mechanisms by which a chemical/pathogen moves from the source of the receptors; Exposure scenarios; The dose to the receptors; These elements will be evaluated during the course. Theoretical concepts used in environmental risk assessment will be illustrated with simple, real life examples. Relevant guideline documents will be used to highlight the practice of environmental risk assessment in Australia and compare it with that of countries in Europe and the United States.

SESC9300
Effective Behaviour in Organisations
Staff Contact: Ms Dianne Gardner
UOC3 HPW3 S1 S2
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.

SESC9320
Effective Management
Staff Contact: Ms Dianne Gardner
UOC3 HPW3 S1 S2
This course examines processes required for effective management. Topics include management systems and standards, planning, change management, measuring organisational performance, best practice and benchmarking and the management of conflict.

SESC9350
Safety, Health and Environmental Management
Staff Contact: School Office
UOC3 HPW3 S2
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, organisational management systems for health, safety and the environment.

SESC9400
Ergonomics 1
Staff Contact: School Office
UOC3 HPW3 S1 S2
Note/s: Also offered in off campus mode in either session.
This course provides an introduction to ergonomics, emphasising the principles of user centered design and human-machine-environment systems. Specific topics include definition of and justification for ergonomics, design and human error, human capabilities and limitations, introduction to anthropometry, and the reduction of musculoskeletal loading of workers.

SESC9411
Principles of Ergonomics
Staff Contact: School Office
UOC6 HPW3 S1 S2
This course will give an introduction to ergonomics, emphasising the principles of designing user-centred, human-machine-environment systems. Specific topics include definition of and justification for ergonomics, design and human error, human capabilities and limitations, introduction to anthropometry and the reduction of musculoskeletal loading of workers, displays & controls, design of human-machine-environment systems, job design and
work organisation, design of workplaces, the physical environment and an introduction to product design.

SESC9421
Applied Ergonomics
Staff Contact: Mr Roger Hall
UOC6 HPW3 X2
Assumed Knowledge: SESC9410 or SESC9411 or equivalent
This course will focus on the application of ergonomics principles to real world problems and the difficulties involved. It requires a knowledge of the principles of ergonomics and will provide in-depth knowledge and skills in ergonomics research methodology - analysing the exact nature and extent of the problem, and evaluating the outcome of solutions to the problem. Topics include ergonomics methodologies, analysis techniques, benefit-cost & practical case studies, mock trial, professional ethics, and participatory ergonomics.

SESC9431
Physical Ergonomics
Staff Contact: Dr Kamal Kothiyal
UOC6 HPWO 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: Mr Roger Hall
UOC6 HPW3 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: School Office
UOC6 HPW3 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.

SESC9530
Personal Protective Equipment
Staff Contact: School Office
UOC3 HPWO S2
Note/s: Short Course Mode.
This course 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.

SESC9541
Assessment of Workplace Environment
Staff Contact: Dr Kamal Kothiyal
UOC6 HPW3 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
Environment Planning and Assessment
Staff Contact: Dr Markovic
UOC6 HPW2.5 S1 S2
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 John Frith
UOC6 HPW2.5 S1 S2
Note/s: Also offered in off campus mode.
Aspects of medicine bearing upon physiological consequences of pollutants. Metabolic mechanisms; chemical interactions, synergism and antagonism; photosynthesis and phytotoxicity. Ozone depletion and greenhouse effects. Morbidity and mortality surveys. Studies of particular pollutants and environmental contaminants.

SESC9741
Environmental Management Systems
Staff Contact: Dr Markovic
UOC6 HPWO X2 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 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.

SESC9810
Introduction to Toxicology
Staff Contact: School Office
UOC3 HPW3 S1 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: School Office
UOC3 HPW3 S1 S2
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: School Office
UOC3 HPW3 S1 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.
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.

(4) 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.

(5) 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.

(6) 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 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 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 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

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 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 oral, practical or written 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.

(5) The Committee shall, after consideration of the examiners’ reports and the results of any further 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.

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) 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 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.

(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.

(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 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) 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 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 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.

(4) 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.
Scholarships

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 9373 9230) 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:
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 (IL, 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. Selection is based on academic merit, aptitude and commitment to the course proposed; evidence of good citizenship; leadership potential; and diversity of interests. Consideration may be given in cases of hardship or disadvantage. 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 3166.

The Australian Development Scholarships (ADS) (I)
- 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 (I, 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 are expected to be active members of a UNSW Sports Club. Each applicant will be assessed on the basis of outstanding ability in a particular sport. Consideration may also be given to an applicant's demonstrated ability, leadership qualities, potential to contribute to the wider life of the University, and any social and economic circumstances which might hinder a successful transition to UNSW. 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 3905.

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 5118. 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.

Department of Education and Training / UNSW Rural Assistance Scheme (L)
- $2000
- 1 year
Up to 50 Scholarships are available to help students from rural NSW in the transition to university study at UNSW. Applicants must be accepted into the first year of an undergraduate degree program and may intend to commence study in any semester of a given academic year. Applicants must have attended a State Government High School in rural NSW prior to commencing study. Selection will be based on academic merit, leadership qualities and potential to contribute to university life. Consideration will also be given to financial need, the impact of rural isolation and other relevant family circumstances. Special consideration will be given to Aboriginal applicants. Applications must include a statement of support from your High School Principal. Applications will normally close 31 January.

The Evan Fraser "Lexcen" Scholarship (I, L)
- $2,000 pa
- 1 year
The scholarship is available to encourage students with a disability who possess outstanding sporting abilities to undertake undergraduate study at UNSW. Where there is not a suitable candidate with a disability the scholarship may be offered to a student without a disability. Applicants must be enrolled, or proposing to enrol in a program of at least two years duration at UNSW. Applicants should possess an outstanding ability in a particular sport and be active members of a UNSW sports club for the duration of the scholarship. Selection will be based on sporting ability. Consideration may also be given to demonstrated ability, leadership qualities, potential to contribute to the wider life of the University, and any circumstances which may hinder a successful transition to UNSW. Applications will normally close 31 January.
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 and financial need. Applications close 25 March.

The Ian Somerville Scholarships (I,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 31 October.

The Kensington Colleges Scholarships
Further information concerning the award below is available from The Kensington Colleges, Tel (02) 9315 0000, Fax (02) 9315 0011, Email kenso-colleges@unsw.edu.au, Web http://www.kensocol.unsw.edu.au.

The Access Scholarship
The scholarship provides up to half of 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 Chalkin 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
- 1 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

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 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 1999, Fax (02) 9381 1919, Email admissions@newcollege.unsw.edu.au.

The NewSouth Scholarships (L)
- $6,000
- 1 year

The scholarships are available to students commencing the first year of undergraduate study at UNSW in any discipline. Applicants must have achieved a UAI of at least 99.95 in the HSC (or equivalent) in the year prior to commencing study. Selection is also based on demonstrated ability, leadership qualities, and potential to contribute to the wider life of the University. Consideration is also given to any social and/or economic circumstances which might otherwise hinder successful transition to UNSW. No application form is required.

The Ngunnagan Club Scholarship (L)
- Up to $2,000
- 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. Applicants should complete an official application form by 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 Simon Poidevin “Lecsen” Scholarship (L,L)
- $2,000 pa
- 1 year

The Scholarships are to be awarded to encourage students with an outstanding ability in a particular sport to undertake undergraduate study at UNSW. Applicants must be enrolled in a program of at least two years duration at UNSW. Applicants should possess an outstanding ability in a particular sport. Scholarship recipients must be active members of the appropriate UNSW sports club for the duration of the scholarship. Selection will be based on sporting ability. Consideration may also be given to demonstrated ability and leadership qualities, potential to contribute to the wider life of the University, and circumstances which might otherwise hinder a successful transition to UNSW. Applications close 31 January.

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 demonstrated ability, 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.

UNSW Foundation Year Scholarships (L,L)
- $5,000 payable towards tuition fees
- one year

The Scholarships are available to outstanding students with the highest GPA in each of the UNSW Foundation Year streams of Commerce/Arts, Design & Communication, and Physical/Life Science. Applicants must have graduated from the UNSW Foundation Year cohort directly prior to entry into a UNSW undergraduate degree. Selection is based on academic merit and enrolment in a UNSW undergraduate program. There is no application form. Selection is based on UNSW Foundation Year results.

The UNSW Golden Jubilee Scholarships (L)
- Program fees for the minimum course duration less any advanced standing, subject to satisfactory progress
- No additional allowances are payable

The Scholarships have been established to encourage outstanding Diplomates from Singapore and Malaysia to complete an undergraduate degree at UNSW. To be eligible, applicant’s must be proposing to undertake an undergraduate qualification at UNSW in one of the Faculties of Arts and Social Sciences, Built Environment, Commerce and Economics, Engineering, Life Sciences, 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. It is expected that the successful applicants will be the most outstanding or the second highest ranked final year diplomate graduating from Engineering, Business, Biotechnology, Mass Communications, Information Technology, Science, Architecture and Built Environment (including Industrial Design). Applicants must be graduands of the following institutions and have achieved the grades or standards indicated:

Singapore
- Nanyang Polytechnic- A or Distinction Average over the duration of the course
- Ngee Ann Polytechnic- A or Distinction Average over the duration of the course or be Merit Award Recipients
- Singapore Polytechnic- A or AD/Distinction Average over the duration of the course
- Temasek Polytechnic- A or Distinction Average over the duration of the course
- Malaysia- students must have a GPA of 3.2 or above (or the equivalent)
- Kolej Damansara Utama (KDU)
- Institution of Technology Mara (ITM)
- INTI College
- PRIME College
- Tunku Abdul Rahman College
- Sepang Institute of Technology (SIT)

Applicants must submit a letter of recommendation from the Principal of the Polytechnic, or a senior member of staff nominated by the Principal, stating that they are the most outstanding final year student and that the requirements for the award of the Polytechnic medal or equivalent have been met. 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.
Faculty Scholarships

Faculty of Engineering

The Alexandria Ada Lam Scholarship (L)
- $1,000 pa
- The duration of the program 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 program and financial need. Applications close at the end of January.

The Faculty of Engineering Rural Scholarships Program (L,C)
- $9,000 pa
- Up to four years, subject to satisfactory progress
The Faculty of Engineering Rural Scholarships Program was established to encourage and assist students from rural and isolated areas of New South Wales to undertake full-time study in the Faculty of Engineering at UNSW. This program is comprised of three scholarships - The Faculty of Engineering Rural Scholarships, The Dean's Engineering Rural Scholarship, and The Stan Hall Scholarship. The Rural Scholarships are available for study in one of the undergraduate programs available at UNSW in the Faculty of Engineering. The Stan Hall Scholarship is available only for study in the Bachelor of Engineering in Civil Engineering. Applicants must be Australian Citizens or have been granted Permanent Resident Status by 31 October of the year preceding commencement of the Engineering qualification. The applicant's family must have lived in a rural or isolated area of NSW for at least four years of the applicant's High School studies and the applicant must have attended secondary school in rural NSW for at least four years. Applicants must be completing the NSW HSC (or equivalent examination) in the year of the application or the previous year. Each applicant will be assessed on the basis of interview performance, academic merit and personal qualities (for example, extra-curricular activities, evidence of leadership skills and potential to contribute to the wider life of the University). Consideration may also be given to any economic circumstances which might otherwise hinder successful transition to UNSW. In 2000 applications will close on 14 September. Applications will normally close on 30 September.

The Jack Beale Scholarship (L,L)
- Up to $3,000
- 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 30 September.

The Telstra Women in Telecommunications Scholarship (L)
- $5,000 (taxable)
- Up to 2 years
Applicants must be females and should be proposing to undertake the first year of the Bachelor of Engineering (Telecommunications) degree. Each applicant will be assessed on the basis of academic merit, personal attributes as evidenced by sporting, cultural, community or other extracurricular achievements and a statement detailing the reasons for undertaking the course and proposing a career in the Information and Technology and Telecommunications (IT&T) industry. Applications close 31 January.

The UNSW Honeywell Women in Engineering Scholarship (L)
- $5,000pa
- Program duration, subject to satisfactory progress
Applicants must be female proposing to undertake the Bachelor of Engineering (Telecommunications)/ Master of Biomedical Engineering program at UNSW. One Scholarship will be offered to students commencing the course in each of the academic years 2000 and 2001. Applicant’s will be assessed on the basis of performance in the Higher School Certificate (or equivalent) in the year prior to commencing the BE/BiomedE 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 UNSW ResMed Scholarship (L,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 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 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 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 Surveyor-General's Scholarship for Women in Surveying (L)
- Up to $2,000
- 1 year

The scholarship is available to a female student entering Year 1 of the full-time degree course in Geomatic Engineering. Applications close at the end of January.

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 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 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 scholarships are available to students who are accepted into a course of at least two years duration. Prospective applicants are expected to be active members of a UNSW Sports Club. Each applicant will be assessed on the basis of outstanding ability in a particular sport. Consideration may also be given to an applicant's demonstrated ability, leadership qualities, potential to contribute to the wider life of the University, and any social and economic circumstances which might hinder a successful transition to UNSW. 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 Evan Fraser "Lexcen" Scholarship (L,L)
- $2,000 pa
- 1 year

The scholarship is available to encourage students with a disability who possess outstanding sporting abilities to undertake undergraduate study at UNSW. Where there is not a suitable candidate with a disability the scholarship may be offered to a student without a disability. Applicants must be enrolled, or proposing to enrol in a program of at least two years duration at UNSW. Applicants should possess an outstanding ability in a particular sport and be active members of a UNSW sports club for the duration of the scholarship. Selection will be based on sporting ability. Consideration may also be given to demonstrated ability, leadership qualities, potential to contribute to the wider life of the University, and any circumstances which may hinder a successful transition to UNSW. Applications will normally close 31 January.
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 30 November.

The Dried Fruits Research and Development Council (DFRDC) Studentships and Student Awards (L,L)
• 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, Box 1142, Mildura VIC 3502, Tel (03) 5022 1515, Fax (03) 5023 3321, Email dfrdc@mildura.net.au.

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 (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/ 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 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. Applications 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,L)
• 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. kensocoll.unsw.edu.au.

The Fell 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.

The Mathews 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.

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 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 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)

- 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 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 Simon Poidevin "Lexcen" Scholarship (L,L)

- $2,000 pa
- 1 year
The Scholarships are to be awarded to encourage students with an outstanding ability in a particular sport to undertake undergraduate study at UNSW. Applicants must be enrolled in a program of at least two years duration at UNSW. Applicants should possess an outstanding ability in a particular sport. Scholarship recipients must be active members of the appropriate UNSW sports club for the duration of the scholarship. Selection will be based on sporting ability. Consideration may also be given to demonstrated ability and leadership qualities, potential to contribute to the wider life of the University, and circumstances which might otherwise hinder a successful transition to UNSW. Applications close 31 January.

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 and be active members of a UNSW sports club for the duration of the scholarship. 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 demonstrated ability, 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 Spruon 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
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 normally close at the end of July.

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
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 second year or later

Faculty of Engineering

ACMEE Scholarship in Engineering (L)
- Up to $1,200 (paid in two installments)
- Final year BE students (any branch of engineering)
The scholarship encourages engineering students to enhance their management focus. The final year project should be undertaken in conjunction with an engineering-based enterprise in Australia and should lead to enhancement of the enterprise’s business performance. The winner will have a sustained high academic record, especially relating to management and business performance, and strong performance in industry training. The Dean’s office has specific information. Applications close 30 April.

The Qenos Chemical Engineering Scholarship (L)
- Up to $1,000 per annum (taxable)
- 1 year plus vacation employment with Qenos
The scholarship is established to encourage students to undertake study in Chemical Engineering. Applicants must be undertaking full-time study in the third year of the Bachelor of Engineering (Chemical Engineering) program or the penultimate year of a Bachelor Engineering (Chemical Engineering) program being undertaken in a combined or fast-track mode (e.g., BE/BSc, BE/BA, BE/MCom) at the UNSW. Each applicant will be assessed on the basis of personal qualities, including initiative and ability to work in a team and the reasons for undertaking the program. Applicants must have made satisfactory progress in their studies. Applicants must be available to undertake paid, vacation employment with Qenos in the summer vacation period (that is, November to February). Applications will normally close 17 March.

Civil and Environmental Engineering

The Shell Coal Undergraduate Scholarship (L)
- $500 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. Applications 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 Dean’s NewSouth Engineering Scholarships (L)
- $6,000 pa
- Up to 4 years, subject to satisfactory performance
The Scholarships are available to high achieving students to pursue study in the Faculty of Engineering. Students who are awarded The NewSouth Scholarship for their first year of study will be awarded The Dean’s NewSouth Engineering Scholarship for the second and later years of their program. No application is required.

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.

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 Mineral 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
- 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 applicant's thesis topic must be in the fields of drill and blast technology. The scholarship will be awarded on the basis of academic merit and financial need. Applications close 31 March.

The Voest Alpine Scholarship (L,L)
- Up to $3,000 payable in two equal instalments
- 1 year
The scholarship is available to the student with the best performance in Year 2 and entering Year 3 of the Mining Engineering course. The student is nominated by the School. There is no application.

Honours Year Scholarships

General

The Alumni Association Scholarships (I,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 late January.

The Apex Foundation for Research into Intellectual Disability Studentships (I,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 (I,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 vvet@accsoft.com.au. Applications close 31 October.

The Ben Lexcen Sports Scholarships (I,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 are expected to be active members of a UNSW Sports Club. Each applicant will be assessed on the basis of outstanding ability in a particular sport. Consideration may also be given to an applicant's demonstrated ability, leadership qualities, potential to contribute to the wider life of the University, and any social and economic circumstances which might hinder a successful transition to UNSW. Applications close 31 January.

The CRC Reef Research Centre Support (I,L)
- $1,000
Applicants must be undertaking a full-time Honours year 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 Administrative Assistant, CRC Reef Research Centre, James Cook University, Townsville QLD 4811, Email crcreef@jcu.edu.au. Applications close mid December.

The Esso Australia Ltd Geosciences Scholarship (I, 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 Evan Fraser “Lexcen” Scholarship (I,L)
- $2,000 pa
- 1 year
The scholarship is available to encourage students with a disability who possess outstanding sporting abilities to undertake undergraduate study at UNSW. Where there is not a suitable candidate with a disability the scholarship may be offered to a student without a disability. Applicants must be enrolled, or proposing to, enrol in a program of at least two years duration at UNSW. Applicants should possess an outstanding ability in a particular sport and be active members of a UNSW sports club for the duration of the scholarship. Selection will be based on sporting ability. Consideration may also be given to demonstrated ability, leadership qualities, potential to contribute to the wider life of the University, and any circumstances which may hinder a successful transition to UNSW. Applications will normally close 31 January.

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 31 January.

**The Grains Research and Development Corporation (GRDC) Undergraduate Honours Scholarship (I,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) 6272 5528. Applications close early November.

**The Ian Somervaille Scholarships (I,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)**
- $17,071 - $25,389 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 (I,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 (I,L)**
- $2,500

Applications should be undertaking original research to improve the understanding and welfare of animals. A letter of application and enquiries should be directed to the Executive Officer, RSPCA Australia, PO Box E369, Queen Victoria Terrace, Canberra ACT 2600, Tel (02) 62311437, Fax (02) 6282 8311, Web http://www.rspca.org.au. 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/rhus. 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/rhus. 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 Simon Poidevin “Lexcen” Scholarship (I,L)**
- $2,000 pa
- 1 year

The Scholarships are to be awarded to encourage students with an outstanding ability in a particular sport to undertake undergraduate study at UNSW. Applicants must be enrolled in a program of at least two years duration at UNSW. Applicants should possess an outstanding ability in a particular sport. Scholarship recipients must be active members of the appropriate UNSW sports club for the duration of the scholarship. Selection will be based on sporting ability. Consideration may also be given to demonstrated ability and leadership qualities, potential to contribute to the wider life of the University, and circumstances which might otherwise hinder a successful transition to UNSW. Applications close 31 January.
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 demonstrated ability, 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 (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 (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.

Travel Scholarships

General

The Arthur Andersen 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 Andersen 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 International Student Centre. 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 (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 International Student Centre at UNSW. The Japanese host university will recommend candidates to AIEJ and students must apply as directed by the host university. Applications in February, May and September 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.

Faculty Scholarships

Faculty of Engineering

Department of Computer Systems (DoCS) Thesis Scholarship (L)
- $2,500
- 1 year

The 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 Gemot Heiser, Tel (02) 9385 5156. Applications close one week after the Session 2 assessment deadline.

International Student Centre at UNSW. The Japanese host university will normally apply directly to a Japanese University through the International Student Centre at 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.
The AT&T Leadership Award (L,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 Greece 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 Turrana St, Yarralumla ACT 2600, Tel (02) 6273 3011. Applications normally close late March.

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 International Student Centre, Tel (02) 9385 5333.

The 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 cross-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 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 Coordinator, 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 Coordinator, 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)

Application 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.

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 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 cross-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.
Learn Arabic in Cairo Scholarship (L,L)
- Course fees, AUD$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 Malcolm Chaikin Overseas Exchange Scholarship (L)
- $4,000
- 1 year
A 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 Mitsui 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 1300 033 625, Email queens@ozemail.com.au, Web www.ozemail.com.au/~queens. Applications close in March.

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,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
The scholarship is open to outstanding young conductors, composers and repetiteurs, 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) 9328 2022, Fax (02) 9327 4868, Email bcsydney@sprint.com. Applications close early November.

The STA Travel Scholarship (L,L)
- Up to $3,000
The Scholarship is available to a student undertaking a full-time degree or diploma of the University. The Scholarship will be awarded on the basis of a significant contribution to the community life of the University, for example, involvement in the University Union, leadership in student affairs, voluntary service to the University, and the relevance and merit of the proposed travel to the students academic program or the community life of the University. Consideration may also be given to the applicants academic achievements. Applications close normally close 31 March.

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 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 (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 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.

The UNSW General Education Travel Scholarship (L)

- $3,000

The Scholarship is available to reward sustained high performance in general Education, promote the standing of General and Liberal Education, and encourage UNSW students to experience overseas study through participation in the University’s International Exchange Program. Applicants must be accepted for the UNSW International Exchange Program. Selection will be based on sustained high performance in at least two General Education courses (excluding courses substituted for General Education courses, or for which an exemption has been granted) and above average performance in other courses. Consideration will also be given to the extent to which the proposed International exchange Program will contribute to the objectives of the General Education Program and the applicants potential to contribute to the wider life of the University and the general community. Applications for the International Exchange Scholarship close in June for the following Session One, and in October for the following Session Two.

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 +81 3 3238 2913, Fax +81 3 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 were unsuccessful in their application for 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.

Mechanical and Manufacturing Engineering

The NSK Silver Jubilee Scholarship for Study in Japan (L)

- Up to $15,000 for study in Japan
- From 3-6 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 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 normally 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** (L.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** (L.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** (L.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** (L.L)
- Up to $450 per week plus travel expenses
- 8 weeks between December and February

Applicants must be full-time 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 Marnion. Applications close early September.

The CSIRO Divison of Marine Research Vacation Scholarships (L.L)
- $420 per week
- 8 to 12 weeks between December and February

The scholarships are open to postgraduate and undergraduate students who have completed no 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 (L.L)
- Up to $3,000 for Studentships, up to $1,000 for Student Awards
- 6 to 9 weeks over the vacation period

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 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
- Two 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 related 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.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

Engineering

Computer Science and Engineering

The Computer Science and Engineering Vacation Scholarships (I,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.

The Australian Development Scholarship (ADS) (I)
- 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 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 1074, Web 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/- Bridgen & 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 arthritis, 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)
- $17,000 pa
- 1 to 3 years
The 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. The 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 Committee, Tel (02) 9552 6688, Fax (02) 9552 1369. Applications close mid-September.

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.

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 9888.

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 ttaylor@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 (I,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) 5303 7325. Applications close in July.

The Australian Pain Relief Association and Australian Pain Society PhD Scholarship (L,R)
- $16,750 pa plus allowances
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 (I,L,R,C)
- $5,000 pa
- 1 year, with a possible 1 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 Marine Research - Supplementary PhD Awards (I,L)
- $8,000pa
- 3 years, subject to satisfactory progress
Supplementary PhD awards are offered to students with outstanding academic backgrounds and who are already in receipt of an APA, or similar scholarship. Applications, including details of research plan, university supervisor(s), previous research area, other professional experience, academic transcript and the names of two academic referees should be submitted to Ms Pam Powell, CSIRO Marine Research, PO Box 1538, Hobart TAS 7001, Email pam.powell@marine.csiro.au, Tel (03) 6232 5222, Fax (03) 6232 5000. Applications close 31 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.

Faculty HECS Awards (L,C)
- Substitution of HECS for tuition fees
- Duration of the course if eligibility criteria continue to be satisfied
UNSW HECS awards enable students to substitute a HECS liability for tuition 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. The Faculty HECS Awards are available for the following coursework programs: all programs in the Faculties of Built Environment, College of Fine Arts and Life Sciences; all programs in the Faculty of Arts & Social Sciences except for Couple and Family Therapy and Professional Ethics, all programs in the Faculty of Engineering except for Business and Technology and Technology Management, all programs in the Faculty of Medicine except for Drug Development and Sports Medicine, and all programs in the • 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, FPWRDC, PO Box 157, Bond University QLD 4229, Fax (07) 5578 7911. Applications close early October.

The Garnett Passe and Rodney Williams Memorial Foundation Research Scholarships in Otolaryngology (I,L,R)
- $15,364 pa for science graduates, $22,850 pa for medical graduates, plus allowances
- 3 years

The 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 normally close in August.

The Gerontology Foundation Grant-in-Aid (I,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

Applicants 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

Applicants 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 (I,L,R)
- $1,000

Applicants 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 1999.

The Harold G. Conde Memorial Fellowship (L,R,C)
- $5,000 pa subject to the availability of funds
- Up to 3 years

Applications should be honour 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.

HECS Scholarships (L,C)
See Faculty HECS Awards and Postgraduate Equity Scholarship for further information.

The Julian Small Foundation Annual Research Grant (I,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 (I,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 (I,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)

Applications 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, Web http://www.Vicnet.net.au/~menzies. 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)

- $17,071 - $25,389 pa (depending on qualifications)
- Up to 3 years

Applications 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)

- $17,071 pa, $22,030 for HIV/AIDS research, $19,151 for special initiative scholars, plus allowances
- Up to 3 years

Applications 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)

- $25,389 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)

- $25,389 pa (medical/dental graduates), $17,071 pa (other graduates), $22,030 pa for HIV/AIDS research, $19,151 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 Tertiary Education Union (NTEU) Scholarship for the Study of Industrial Relations and Unionism in Australian Tertiary Education (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 professionals) enrolled in a postgraduate research degree. Applications close mid-July.

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 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 enable postgraduate students to substitute the appropriate HECS liability for tuition 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 and for Session Two close 15 July.

Financial Need HECS Substitution Scholarships

Applicants may apply for the scholarship on the basis of financial need if the students are in receipt of a full allowance from the Department of Social Security (DSS), Department of Veteran Affairs, or AUSTUDY, or receiving the Family Allowance Supplement from DSS, or holding a Health Care Card issued by DSS. Applications will not be accepted without evidence of eligibility. The Postgraduate Equity Scholarships are available for the following coursework programs: Faculty of Arts and Social Sciences - Couple and Family Therapy and Professional Ethics, Faculty of Engineering - Business and Technology and Technology Management, Faculty of Medicine - Drug Development and Sports Medicine, Faculty of Science and Technology - Aviation and Optometry, and all programs for the Australian Graduate School of Management, Australian Defence Force Academy, Faculty of Commerce and Economics and the Faculty of Law. The Faculty of Law will also consider applications from students who are working in a legal or related area of non-profit or community service organisation (eg a community legal centre, a community justice centre or legal-aid office) and whose current income is below $45,000 pa; and from students working in a rural or isolated locations.

HECS Substitution for 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.

Aboriginal and Torres Strait Islander Students

Aboriginal and Torres Strait Islander students who are self-funded (ie whose fees are not being paid by their employer) can substitute a HECS liability for tuition fees. For further information contact the Aboriginal Education Program, UNSW, Tel (02) 9385 3085 or the Equity and Diversity Unit, Tel (02) 9385 5434.

The Re-Entry Scholarship for Women (L,L,R,C)

- $17,071 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 (L,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. 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 (L,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 toward animal welfare issues. A letter of application including two referees and academic transcripts, should be sent to the Executive Officer, RSPCA Australia, PO Box E368, 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)
- $17,071 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 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 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 January 31.

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 under 40 years of age. Further information and applications are available from ANSTO on telephone (02) 9543 3111.

The University of NSW Federation Scholarships (L,C)
- Tuition fees
- 1 year

The Scholarships are established to encourage students from the United States of America and Canada to complete postgraduate study at UNSW. Applicants must be undertaking full-time research in clinical, biomedical or health related clinical sciences. The grants will not be available again until the 1999 academic year. 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. The grants will not be available again until the 1999 academic year. 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 aerospace 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 5948, Fax +1 312 930 0951. Applications close early November.

Faculty of Engineering

The CRC for Waste Management and Pollution Control Research Scholarships (L,L)
- 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 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 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 6429, Fax (02) 9385 5456.

The Supplementary Engineering Postgraduate Awards (L,R)
- $8,000 pa (taxable) supplement to an APA, APA(I), IPRS or Faculty Award
The awards may be available to full-time students who are in receipt of an APA, APA(I), IPRS, or Faculty Award and who are undertaking internal PhD studies in the Faculty of Engineering at UNSW. Recipients will be required to undertake up to six hours per week (up to a total of 180 hours for the year) of teaching and/or research assistance.

The Women in Engineering Research Scholarship (L,R)
- $16,135 pa (equivalent to an APA) plus allowances
- Up to 3 years
This scholarship is open to female students proposing to enrol in a full-time PhD program in the School of Civil and Environmental Engineering, Chemical Engineering and Industrial Chemistry, Computer Science and Engineering, Electrical Engineering and Telecommunications, Geomatic Engineering, Mechanical and Manufacturing Engineering, Mining Engineering, Petroleum 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 6429, Fax (02) 9385 5456. Applications close 31 October.

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

AAUW Educational Foundation Awards (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 (L,R,C)
- US$16,000
The Association of International Education Japan (AIEJ) Short-Term Student Exchange Promotion Program (Inbound) Peace and Friendship Scholarships (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 International Student Centre at 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 AUUW and intend to return to Australia to pursue their professional career. Information and applications are available only from AUUW Educational Foundation, PO Box 4030, Iowa City Iowa 52243-4030, USA, Tel +1 319 337 1716, Fax +1 319 337 2201. Applications close late November.

The AT&T Leadership Award (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 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, Mill Lane, Cambridge CB2 1RZ, United Kingdom. By submitting one Scholarship Application Form, applicants will be considered for one Scholarship Application Form, applicants will be considered

The Australian Bicentennial Scholarships and Fellowships Scheme (L,R,C)

- £4,000
- 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. Applicants 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, Menzies Centre for Australian Studies, University of London, 28 Russell Square, London WC1B 5DS, UK, Tel +44 171 862 8854, Fax +44 171 580 9627, Email mcintyre@sas.ac.uk. Applications close late October.

The Australian Federation of University Women (AFUW) (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
- 3 months

The 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. Admission 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 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 93, Canberra ACT 2601, Tel (02) 6248 7744, Fax (02) 6248 8287, Web http://www.anu.edu.au/eabs/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 (L,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 +72 73 84 85, Fax +72 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 not 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 students to undertake advanced academic study in other Commonwealth countries. Candidates should be 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 9331, Email rachel@aaef.anu.edu.au. Applications close 30 September.

DAAD- The German Academic Exchange Service Scholarships (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, Yarralumla, 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 (L,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 information is available from The English-Speaking Union (NSW Branch), PO Box A2156, Sydney South NSW 1235, Tel (02) 9231 0667. Applications close early June.
Frank Knox Memorial Fellowships (L,R,C)
- US$15,000 pa plus tuition fees and health insurance
- 1 year with the possibility of renewal for a further year
Applicants must be undertaking, or near completion of, a postgraduate qualification at an Australian University. The scholarships are tenable at one of Harvard University’s graduate schools. Applications close early October.

The Fulbright Postgraduate Student Awards (L,R)
- Up to $32,530, depending on the type of award, with the possibility of other allowances (eg return airfares and tuition fees)
- 1 year
Students planning to undertake an American higher degree or engage in research towards an Australian higher degree in any field can apply for the Fulbright Student Awards. Four other privately sponsored awards are available - The Engineering Award, The Aboriginal and Torres Strait Islander People Award, The Visual and Performing Arts Award, and The Tim Matthews Memorial Award in Statistics and Related Disciplines. Applicants must be Australian Citizens who have completed an Honours degree (or equivalent). Further information and applications are available from the Fulbright Home Page, http://sunsite.anu.edu.au/education/fulbright Tel (02) 6247 9331, Email rachel@aaef.anu.edu.au. Applications close 30 September.

The Golda Meir Scholarship (I,L,R,C)
- Tuition (some allowances may be paid)
- 1 year
The Golda Meir scholarships are available to graduates who are wishing to pursue a course in Jewish studies, religious studies, Israel studies or Middle East studies, who meet the relevant requirements for the Graduate Year Program at the Hebrew University's Rothberg School for Overseas Students. Application forms are available from the Australian Friends of the Hebrew University, 36 Hawthorn Road, South Caulfeld VIC 3162, Tel (03) 9272 5511.

The Gowrie Scholarship Trust Fund (L,R)
- $4,000 pa
- 2 years
Applicants 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. Special consideration may be given to cases of financial hardship. Applications close October.

Greek Government Scholarships (L,R,C)
- 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 Turrana St, Yarralumla ACT 2600, Tel (02) 6273 3011. Applications close early May.

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 students 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 3333, Fax (02) 6273 4223. Applications close early March.

The Japanese Government (Monbusho) Scholarships (L)
- Maintenance allowance of at least £7,000 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 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) 6273 7268, Fax (02) 6273 1848. Applications close 20 July.

The Kobe Steel Postgraduate Scholarship (L,R,C)
- Tuition fees, monthly subsidy plus other allowances
- 2 to 24 months
The Kobe Steel Postgraduate Scholarship is available from Kobe Steel, Ltd, 2-20-9, Uchida, Osumi, Osakadai-ku, Osaka 558, Japan. Further information is available from the Embassy of Japan, 112 Empire Circuit, Yarralumla ACT 2600, Tel (02) 6273 3044, Fax (02) 6283 4839. Applications close early May.

The Lady Davis Fellowship Trust (L,R,C)
- Some allowances and tuition fees for study in the USA
- 12-21 months
The Academic Fellowships cover academic study and research. Applicants should be active in the public, business or voluntary sectors with an outstanding record of achievement. Special consideration may be given to students in health care and related community issues. Applications are available on written request from the Lady Davis Fellowship, PO Box 836, Belconnen ACT 2606. Applications close early September.

The Laporte Centenary Scholarship (L,R)
- Airfare, living allowance, tuition fees
- 3 to 6 months
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 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 (I,L,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 Menzies Foundation, GPO Box 4545, Sydney NSW 2001, 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) 9326 2022. Applications normally close October.

Nanyang Technological University Singapore Research Scholarships (I,L,R)
• Tuition fees plus S$1,400-$1,500 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 gleong@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 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 City ACT 2601, Tel (02) 6247 5777, Fax (02) 6257 4620. Applications close mid-March.

Overseas Research Students Awards Scheme (United Kingdom) (I,L,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.

The Qantas/Wolfson College Travel Scholarship (L,R)
• Return, economy air travel to the United Kingdom with Qantas. The travel must be completed within one year of the issue of the ticket.

The Scholarship is established to encourage students to experience overseas study. Applicants must be undertaking a full-time PhD qualification in any field and proposing to undertake study toward their qualification at Wolfson College in the University of Oxford or applying (or have applied) to undertake a Dphil degree at Wolfson College in the University of Oxford. Authorisation of receipt of the Scholarship will only be made on production of evidence of acceptance by Wolfson College. Each applicant will be assessed on the basis of academic merit (as evidenced by the applicant’s undergraduate results and a written statement from their PhD supervisor) and a statement detailing the reasons for the travel. Consideration may also be given to financial need. Applications close 30 April.
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,R,C)
- 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 spirit. Further information is available on the Rhodes home page http://www/usyd.edu.au/su/rhodes. Applications close 1 September.

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. Fax (02) 6279 8524, Email cabs.admin@anu.edu.au, Web http://www.anu.edu.au/cabs/scholarships. Applications close at the end of December.

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
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 bcsydney@sprint.com. Applications close early November.

The STA Travel Scholarship (L,R,C)
- Up to $3,000
The Scholarship is available to a student undertaking a full-time degree or diploma of the University. The Scholarship will be awarded on the basis of a significant contribution to the community life of the University, for example, involvement in the University Union, leadership in student affairs, voluntary service to the University, and the relevance and merit of the proposed travel to the student’s academic program or the community life of the University. Consideration may also be given to the applicants academic achievements. Applications close 31 March.

The Swedish Institute Guest Scholarships (L)
- SEK 7,100 per month living allowance
- 9 months (1 academic year)
The scholarships are 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.

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 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 +81 3 3238 2913, Fax +81 3 5275 1677.

Faculty Travel Scholarships

Faculty of Engineering

Mechanical and Manufacturing Engineering

The NSK Silver Jubilee Scholarship for Study in Japan (L)

- 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.
Prizes

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

The University Of New South Wales
General Category for Prizes

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 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 Sydney Technical College Union Award
• $400 and a bronze medal
For leadership in student affairs combined with marked academic proficiency by a graduand

The UNSW Human Rights Essay Prize
• $400
For the best research essay on a Human Rights topic by a student enrolled at the University of New South Wales proceeding to a Bachelor degree

School of Chemical Engineering and Industrial Chemistry

The Abbott Laboratories Pty Limited Prize
• $500
For the best performance in Year 4 of the Bachelor of Engineering in Chemical Engineering program

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

Faculty of Engineering

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 Western Mining Corporation Ltd Prize

- $150
  For the best performance in CHEN2050 Chemical Engineering Laboratory 1

The Western Mining Corporation Ltd Prize

- $150
  For the best performance in CHEN3080 Chemical Engineering Laboratory 2

The Dow Corning Prize

- $300
  For the best performance in CHEN4090 Research 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 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 Computing Prize

- $400
  For the best performance in CIVL1015 Computing in the Bachelor of Engineering in Civil Engineering or Environmental 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 Electrical Engineering and Telecommunications
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 SOLA3540 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.

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 Board of Surveyors Medal
- A medal
For an outstanding performance in the final year of the Bachelor of Surveying or the Bachelor of Engineering in Geomatic Engineering program.

The CIVILCAD Prize
- Civilcad software package
For the best performance in GMAT3122 Computer Graphics 1, GMAT6052 Field Projects 2 and GMAT8612 Land Management and Development Project 2 in the 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 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 Year 3 of the Bachelor of Engineering in Mining 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

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

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

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/CIVL9872 Solid Waste Management and CIVL8881/CIVL9881 Hazardous Waste Management in the Master of Engineering Science or Master of Applied Science program
The University of New South Wales • Kensington Campus

Theatres
Applied Science Theatre F11
Athol Lykke Theatre C27
Biomedical Theatres E27
Central Lecture Block (CLB) E19
Clancy Auditorium C24
Classroom Block (Western Grounds) H3
Fig Tree Theatre B14
Helffron Theatres (Dwyer, Mellor, Murphy, Nyholm, Smith) E12
Io Myers Studio D9
Keith Burrows Theatre J14
Macauley Theatre E15
Mathews Theatres D23
Parade Theatre E3
Physics Theatre K14
Rex Vowels Theatre F17
Physics Theatre K14

Buildings
AGSM G27
Applied Science F10
Arcade D24
Barker Apartments N13
Basser College C18
Baxter College D14
Biological Sciences D26
Blockhouse G6
Chancellory C22
Civil Engineering H22
Dalton F12
Electrical Engineering G17
Goldstein College D16
Golf House A27
Heffron E12
International House C6
Geography and Surveying K17
Goodsell F20
Kensington Colleges (Office) C17
Library (University) E21
Library Stage 2 F21
Mechanical Engineering J17
Main K15
Mathews F23
Morven Brown C20
Myers, Sir Rupert M15
New College L6
Newton J12
NIDA D2
Packing Station (Barker Street) N18
Packing Station (Botany Street) H25
Pavilions, The E24
Philip Baxter College D14
Quadangle E15
Red Centre H13
Roundhouse E6
Sam Cracknell Pavilion H8
Samuels F25
Shalom College N9
Squarehouse E4
The Scientia G19
University Regiment J2
Valentine Annex E22
Wallace Wursthorn School of Medicine C27
Warrane College M7
Webster, Sir Robert G14
Willis Annex E18

Faculty Offices
Arts and Social Sciences C20
Australian Graduate School of Management AGSM G27
Biomedical Library E21
Biomedical Theatres E27
Biomedical Library F23
Biomedical Library F23
Biomedical Library F23
Biomedical Library F23
Biomedical Library F23
Biomedical Library F23
Biomedical Library F23
Biomedical Library F23
Biomedical Library F23
Biomedical Library F23
Biomedical Library F23
Biomedical Library F23
Biomedical Library F23
Biomedical Library F23

School Offices
Accounting E15
Anatomy B27
Applied Bioscience D26
Architecture Program H13
Banking and Finance F20
Biotechnology and Molecular Genetics D26
Biological Science D26
Building Construction Management Program H13
Business Law and Taxation E15
Chemical Engineering and Industrial Chemistry F10
Chemistry E12
Civil and Environmental Engineering H20
Community Medicine D26
Computer Science and Engineering K17
Economics F20
Education Studies F23
Electrical Engineering and Telecommunications G17
English C20
Geography F10
Geology F10
Geomatic Engineering K17
Health Services Management F25
History C20
Industrial Design Program H13
Industrial Relations and Organisational Behaviour F20
Information, Archive and Library Studies F23
Information Systems F15
Interior Architecture Program H13
International Business E15
Landmark Architecture Program H13
Law (Library Stage 2) F21
Marketing F20
Materials Science and Engineering E8
Mathematics H13
Mechanical and Manufacturing Engineering J17
Media and Communications G15
Medical Education C27
Microbiology and Immunology D26
Mining Engineering K15
Modern Languages Studies C20
Music and Music Education G15
Optometry M15
Paediatrics C27
Pathology C27
Petroleum Engineering D12
Philosophy C20
Physics K15
Psychology and Pharmacology C27
Planning and Urban Development Program H13
Political Science C20
Psychology F23
Safety Science B11a
Science and Technology Studies C20
Social Science and Policy C20
Social Work F23
Sociology C20
Theatre Film and Dance G14

Services
Aboriginal Student Centre A29
Access Scheme – Equity and Diversity Unit E15
Accommodation – Housing Office E15
Admissions and Enrolment – Student Centre C22
Biomedical Library F23
Campus Conferencing E15
Campus Services B14a
Cashier C22
Careers and Employment Office E15
Chaplains E4
Child Care Centres - House at Pooch Corner N8
Kangaroo House C6
Tiggers/Honey Pot – 34 Botany St.
Co-op program M15
CONTACT E15
Counselling Service E15
Educational Testing Centre E4
Equity and Diversity Unit E15
Facilities Department C22
Health Service E15
Housing Office E15
Human Resources C22
Law Library F21
NewSouthWales Student Centre C22
Public Affairs and Development C22
Publishing and Printing Services C22
Religious Services E4
Research Office M15
Roundtable Conferencing and Catering E4
SECURITY/Lost Property/Parking H13
Sports Association H8
Student Centre C22
Student Guild E15
Student Recruitment Office C22
Unisearch Limited M15
University Gymnasium B5
University Union
Blockhouse G6
Roundhouse E6
Squarehouse E4
UNSW Bookshop E15
UNSW International H13
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 (ATAX)
- 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.