Subjects, courses and any arrangements for courses 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 1 November 1996, but may be amended without notice by the University Council.

CREDIT POINTS – IMPORTANT NOTE
From 1996, UNSW introduced a university wide credit point system for all subjects offered to both undergraduate and postgraduate students. The system means that a subject will have the same credit point value irrespective of which faculty's course it is counting towards. Students are able to determine the value of subjects taken from other faculties when planning their programs of study. The student load for a subject is calculated by dividing the credit point value of a subject by the total credit points required for the program for that year of the course. 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 course will pay more HECS.

Old subject measures have been replaced by new university credit points. Every effort has been made to ensure the accuracy of the credit point values shown for all subjects. However, if any inconsistencies between old and new credit point measures cause concern, students are advised to check with their faculty office for clarification before making 1997 subject selections based on the credit points shown in this handbook.
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First Degrees
Higher Degrees
Doctor of Philosophy (PhD)
Master of Applied Science (MAppSc) and Master of Environmental Studies (MEnvStudies)
Master of Engineering (ME) and Master of Science (MSc)
Master of Engineering (ME), Master of Science (MSc) and Master of Surveying (MSurv) without supervision
Master of Engineering Science (MEngSc)
Master of Environmental Studies (MEnvStudies)
Master of Safety Science (MSafetySc)
Master of Science (MSc)
Master of Science (MSc) – without supervision
Graduate Diploma (GradDip)
Master of Technology Management MTM

Scholarships

Undergraduate Scholarships
Scholarships for students entering the first year of an undergraduate course
Scholarships for students in their second or later year of study
Honours Year Scholarships
Travel Scholarships
Graduate Scholarships
General Scholarships
Faculty of Applied Science
General Travel Scholarships

Prizes

Undergraduate Prizes
Graduate Prizes
Engineering and science disciplines that are directly concerned with aspects of Australia's resources have been established in the Faculty of Applied Science. Interdisciplinary and multidisciplinary course options are available to students through the various Schools within the Faculty: Applied Bioscience, Chemical Engineering and Industrial Chemistry, Fibre Science and Technology, Geography, Materials Science and Engineering, Mines, as well as the Department of Safety Science, and the Centre for Petroleum Engineering. The Faculty of Applied Science also has a number of specialised research and teaching centres including Commonwealth Cooperative Research Centres, Key Centres and a UNESCO Centre.

Undergraduate courses available are:

- Applied Geology (including specialisation in Mineral Exploration and Mining Geology, Sedimentary Basin Studies, Geophysics, Engineering Geology, Environmental Geology, Geochemistry and Hydrogeology)
- Biotechnology
- Bioprocess Engineering
- Chemical Engineering (including Fuel and Energy Engineering and Mineral Engineering)
- Food Science and Technology
- Geography (including Applied Physical Geography, Applied Economic Geography, and Human and Physical Resources)
- Industrial Chemistry (including Polymer Science)
- Materials Science and Engineering (including Ceramic Engineering, Materials Engineering, and Metallurgical Engineering)
- Mining Engineering
- Petroleum Engineering
- Textile Management
- Textile Technology (including Textile Chemistry, Textile Engineering and Textile Physics)
- Wool and Pastoral Sciences

In most schools a variety of options are available, including joint degrees in other faculties. Students should discuss their programs with appropriate staff to ensure that their chosen course of study is appropriate to their aims and aspirations.

The importance of applied science to the University of New South Wales, and to the wider community, is fully recognised and is especially referred to in the University Act of Incorporation. The Faculty of Applied Science is dynamic, with changing activities and programs to meet the rapid technological developments in the applied sciences. Many of the staff of the Faculty have achieved international recognition for their work, and there is a continuing and wide range of research programs underway. The staff are enthusiastic, and I hope that you will share their enthusiasm.

Once the academic year begins, it is essential that you participate fully in your study program from the first day of the first year. You are also urged to play an active role in the extramural activities of the University, especially in the student societies in the Schools.

Explanatory pamphlets and brochures are issued at enrolment and these, together with the Calendar, should be consulted for further information. You should not hesitate to contact the appropriate School offices if you have questions or problems.

GJS Govett
Dean
Faculty of Applied Science
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

<table>
<thead>
<tr>
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<tr>
<td><strong>Session 1</strong></td>
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<tr>
<td>(14 weeks)</td>
<td>3 March to 27 March</td>
<td>2 March to 9 April</td>
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<td>7 April to 13 June</td>
<td>20 April to 12 June</td>
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<td><strong>Mid-session recess</strong></td>
<td>28 March to 6 April</td>
<td>10 April to 19 April</td>
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<td><strong>Study period</strong></td>
<td>14 June to 19 June</td>
<td>13 June to 18 June</td>
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<td>20 June to 8 July</td>
<td>19 June to 7 July</td>
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<tr>
<td><strong>Mid-year recess</strong></td>
<td>9 July to 27 July</td>
<td>8 July to 26 July</td>
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<td><strong>Session 2</strong></td>
<td>28 July to 26 September</td>
<td>27 July to 25 September</td>
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<td>(14 weeks)</td>
<td>7 October to 7 November</td>
<td>6 October to 6 November</td>
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<tr>
<td><strong>Mid-session recess</strong></td>
<td>27 September to 6 October</td>
<td>26 September to 5 October</td>
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<tr>
<td><strong>Study period</strong></td>
<td>8 November to 13 November</td>
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### Important dates for 1997

**January 1997**

- W 1 New Year's Day – Public Holiday
- M 13 Medicine IV – Term 1 begins
- Th 16 Medicine V – Term 1 begins
- M 27 Australia Day – Public Holiday
- T 28 Enrolment period begins for new undergraduate students and undergraduate students repeating first year
- W 29 AGSM EMBA Executive Year – Session 1 begins

**February 1997**

- M 10 AGSM EMBA GMQ and GDM programs – Session 1 begins
- M 24 AGSM MBA program – Year 1 classes – Term 1 begins
- Medicine VI – Term 2 begins

**March 1997**

- M 3 Session 1 begins – for Faculties other than Medicine and AGSM
- University College, ADFA – Session 1 begins
- AGSM MBA program – Year 2 classes – Term 1 begins
- F 14 Last day applications are accepted from students to enrol in Session 1 or whole year subjects
- Su 16 Medicine IV – Term 1 ends
- M 17 Medicine IV – Term 2 begins
- Su 23 Medicine V – Term 1 ends
- F 28 Good Friday – Public Holiday
- Mid-session recess begins – for Faculties other than Medicine, AGSM and University College, ADFA
- S 29 Easter Saturday
- Su 30 Easter Sunday
- M 31 Last day for students to discontinue without failure subjects which extend over Session 1 only.
HECS Census Date for Session 1
Easter Monday - Public Holiday

April 1997
T
1 Medicine V - Term 2 begins
Su 6 Mid-year recess ends - for Faculties other than Medicine, AGSM and University College, ADFA
Su 13 Medicine VI - Term 2 ends
M 14 Medicine VI - Recess begins
Su 20 Medicine VI - Recess ends
M 21 Medicine VI - Term 3 begins
F 25 Anzac Day - Public Holiday
Su 27 Medicine IV - Term 2 ends
M 28 Medicine IV - Recess begins

May 1997
S 3 University College, ADFA - May recess begins
Su 4 Medicine IV - Recess ends
M 5 Medicine IV - Term 3 begins
F 9 AGSM MBA program - all classes - Term 1 ends
M 12 AGSM MBA program - all classes - Examinations begin
T 13 Publication of provisional timetable for June examinations
F 16 AGSM MBA program - all classes - Examinations end
Su 18 University College, ADFA - May recess ends
W 21 Last day for students to advise of examination clashes
S 24 AGSM EMBA GMQ and GDM programs - Session 1 ends
AGSM EMBA GMQ and GDM programs - Examination
T 27 AGSM EMBA Executive Year - Session 1 ends

June 1997
Su 1 Medicine V - Term 2 ends
Su 2 Medical VI - Term 3 ends
M 2 AGSM MBA program - all classes - Term 2 begins
M 3 Publication of timetable for June examinations
M 9 Queen's Birthday - Public Holiday
T 10 Medicine V - Term 3 begins
F 13 Session 1 ends - for Faculties other than Medicine, AGSM and University College, ADFA
S 14 Study period begins - for Faculties other than Medicine, AGSM and University College, ADFA
Su 15 Medicine IV - Term 3 ends
M 16 Medicine IV - Term 4 begins
Th 19 Study period ends - for Faculties other than Medicine, AGSM and University College, ADFA
F 20 Examinations begin - for Faculties other than Medicine, AGSM and University College, ADFA
University College, ADFA - Session 1 ends
M 23 University College, ADFA - Examinations begin AGSM EMBA Executive Year - Session 2 begins

July 1997
S 5 University College, ADFA - Examinations end
Su 6 University College, ADFA - Mid-year recess begins
T 8 Examinations end - for Faculties other than Medicine, AGSM and University College, ADFA
W 9 Mid-year recess begins - for Faculties other than Medicine, AGSM and University College, ADFA
M 14 AGSM EMBA GMQ and GDM programs - Session 2 begins
Su 20 University College, ADFA - Mid-year recess ends
M 21 University College, ADFA - Session 2 begins
F 25 Medicine VI - Term 4 ends
S 26 Medicine VI - Recess begins
Su 27 Mid-year recess ends - for Faculties other than Medicine, AGSM and University College, ADFA
M 28 Session 2 begins - for Faculties other than Medicine, AGSM and University College, ADFA

August 1997
Su 3 Medicine VI - Recess ends
M 4 Medicine VI - Term 5 begins
F 8 Last day applications are accepted from students to enrol in Session 2 subjects
Last day for students to discontinue without failure subjects which extend over the whole academic year
AGSM MBA program - all classes - Term 2 ends
Su 10 Medicine IV - Term 4 ends
Medicine V - Term 3 ends
M 11 AGSM MBA program - all classes - Examinations begin
Medicine IV - Recess begins
F 15 AGSM MBA program - all classes - Examinations end
Su 17 Medicine IV - Recess ends
M 18 Medicine IV - Term 5 begins
Medicine V - Term 4 begins
Su 31 Last day for students to discontinue without failure subjects which extend over Session 2 only
HECS Census Date for Session 2

September 1997
M 1 AGSM MBA program - all classes - Term 3 begins
S 6 Open Day
Su 14 Medicine VI - Term 5 ends
M 15 Medicine VI - Term 6 begins
F 26 Closing date for applications to the Universities Admission Centre
S 27 Mid-session recess begins - for Faculties other than Medicine and AGSM
University College, ADFA - September recess begins
Su 28 Medicine IV - Term 5 ends
M 29 Medicine IV - Term 6 begins

October 1997
M 6 Labour Day - Public Holiday
Mid-session recess ends - for Faculties other than Medicine and AGSM
University College, ADFA - September recess ends
T 7 Publication of provisional timetable for the November examinations
W 15 Last day for students to advise of examination clashes
F 17 AGSM EMBA Executive Year Session 2 ends
Su 19 Medicine V - Term 4 ends
F 24 University College, ADFA - Session 2 ends
Su 26 Medicine VI - Term 6 ends
M 27 University College, ADFA - Examinations begin
T 28 Publication of timetable for November examinations

November 1997
S 1 AGSM EMBA GDM program - Session 2 ends
AGSM EMBA GDM program - Examination
F 7 Session 2 ends - for Faculties other than Medicine, AGSM and University College, ADFA
AGSM MBA program - all classes - Term 3 ends
S 8 Study period begins - for Faculties other than Medicine, AGSM and University College, ADFA
AGSM EMBA GDM program - Session 2 ends
AGSM EMBA GMQ program - Examination
Su 9 Medicine IV - Term 6 ends
M 10 AGSM MBA program - all classes - Examinations begin
Th 13 Study period ends - for Faculties other than Medicine, AGSM and University College
F 14 Examinations begin - for Faculties other than Medicine, AGSM and University College
AGSM MBA program - all classes - Examinations end
University College, ADFA - Examinations end

December 1997
T 2 Examinations end - for Faculties other than Medicine, AGSM and University College, ADFA
Th 25 Christmas Day - Public Holiday
F 26 Boxing Day - Public Holiday
Comprises Schools of Applied Bioscience, Chemical Engineering and Industrial Chemistry, Fibre Science and Technology, Geography, Materials Science and Engineering, Mines, Department of Safety Science, and the Centre for Petroleum Engineering; as well as Centres located within Schools- Applied Polymer Science, Bioengineering, Minerals Engineering, Particle and Catalyst Technologies, Key Centre for Mines and the UNESCO Centre for Membrane Science and Technology. The Faculty is also associated with the Energy Research, Development and Information Centre (ERDIC), the UNSW Groundwater Centre and the Centre for Remote Sensing and Geographic Information Systems. It houses the Cooperative Research Centres for Biopharmaceutical Research and Food Industry Innovation.

Dean
Professor Gerald James Spurgeon Govett, DSc Wales, PhD DIC Lond., CEng, FIIMM, FIEAust, CFEng

Presiding Member
Associate Professor Rodney Phillip Chaplin, BSc PhD Salford, CChem, MACS, FRACI

Associate Dean
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Position vacant

Senior Administrative Officer
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Workshop Manager
Graham Lesley Millett

Faculty Information Technology Manager
Andrew William Cox, BAppSc UTS

Officer-in-charge, Drawing Office
Narendra Mohan Saha Chaudhury, BME Jadavpur, MIEAust

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Wendy Margaret Wartho

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Physical Sciences Electron Microscopist
Paul Richard Munroe, BSc PhD Birm.

Scientific Illustration Unit
Stephen George Preece, AAIMBI
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Department of Biotechnology

Head of Department of Biotechnology
Professor PP Gray

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Deputy Director
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Head of Department of Food Science and Technology
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Van Bong Dang, BSc MApplSc Gunma, MSc UNSW, AIE
Barry William Edenborough, BE PhD UNSW
Katie Simeonova Nasev, ME Higher Inst.Chem.Tech., Sofia, Grad IEAust
John McEwan Starling, BE UNSW

Computer Systems Officer
Frank Fan, BSc ME UNSW

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Head
Associate Professor JA Raper

Department of Industrial Chemistry
Head
Associate Professor MP Brungs

Centre for Applied Polymer Science
Director
Associate Professor RP Burford

Centre for Particle and Catalyst Technologies
Director
Associate Professor JA Raper

UNESCO Centre for Membrane Science and Technology
(in association with the Faculty of Science)
Director, Chemical Engineering
Professor AG Fane

Director, Biophysics
Professor HG Coster

School of Fibre Science and Technology

Professor of Wool Technology and Head of School
Ross Ernest Griffith, BSc UNSW, PhD Leeds, CText, FTI

Administrative Officer
Frances Colville

Department of Textile Technology
Professor and Head of Department
Michael Thomas Palthorpe, BSc PhD UNSW, CText, FTI, MSDC(ANZ), JP

Professor of Textile Physics
Ronald Postle, BSc UNSW, PhD Leeds, CText, FTI, FAIP, Hon. Docteur, Haute Alsace

Senior Lecturers
John Ilmar Curiskis, BSc PhD UNSW
Department of Wool and Animal Science

Senior Lecturer and Head of Department
Geoffrey Edward Robards, BSc UNSW, PhD Melb.MASAP

Associate Professors
David John Cottle, BSc UNSW, PhD N.E.
John William James, BA Qld., DSc UNSW

Senior Lecturers
Douglas McPherson Murray, BAgrSc PhD Melb., MRurSc N.E.

Lecturer
Peter Douglas Auer, BSc PhD UNSW

Professional Officers
David John Petrie, BSc UNSW

Project Officer
Jeffrey Eppleston, MScAg Syd, PhD UNSW

School of Geography

Associate Professor and Head of School
Marilyn Dale Fox, BSc Windsor, PhD Macq.

Professor of Geography
Barry Jardine Garner, BA Nott., MA PhD Northwestern

Associate Professors
Ian Harry Burnley, MA Cant., PhD Well.
Michael Dick Melville, BScAgr PhD Syd.
Anthony Kinnaird Milne, BA N.E., MA Syd.; PhD Colorado

Senior Lecturers
Wayne David Erskine, BA PhD UNSW
Stephen James Filan, BAgEc N.E., MSc UNSW
Bruno Peter John Parolin, BA Monash, MS Oklahoma State, PhD Ohio State
Morgan Eugene Cyril Sant, BA Keele, MSc PhD Lond.
Qiming Zhou, BSc Beijing Normal, PhD UNSW

School of Materials Science and Engineering

Professor of Materials Science and Engineering and Head of School
David John Young, BSc PhD Melb., FRACI, FIEAust, CPEng, MAmerlChE, FTS

Associate Professor
Oleg Ostrovski, Dipling(Met) PhD DSc MISiS, Moscow, MIEAust
Charles Christopher Sorrell, BS Missouri, MS Penn., PhD UNSW, FIEAust, DipDT, FGAA, NICE

Senior Lecturers
Sri Bandyopadhyay, BTech MTech I.I.T. PhD Monash, FIEAust, CPEng MRACI, MAAS
Alan Crosby, BSc PhD UNSW.
Brian Gleeson, MSc W.Ontario, PhD UCLA
Peter Krauklis, BSc PhD UNSW, MIEAust, MIM, CEng, CPEng
Sviatoslav Antonovich Prokopovich, MSc UNSW, ASTC, CEng, MIEAust
Veena Sahajwalla, MSc, PhD Mich., MIBF, MAIE
Aibing Yu, MSc(Eng) N.E.U.T., China, PhD W'gong.

Lecturer
Patrick Wong, BE PhD UNSW, MAutoIMM

Honorary Visiting Professor
Max Hatherly, MSc PhD UNSW, ASTC, CPEng, FTS, FIM

Professional Officers
James Howells, BSc UNSW
John Walton Sharp, BScTech UNSW

Administrative Assistant
Ole Staer Andersen, MAg Copenhagen, MGenStud UNSW
School of Mines

Associate Professor and Head of School
Geoffrey Robert Taylor, MSc Birm., PhD N.E., FGS, MIMM, MAusIMM

Visiting Professors
Miklos Dezso Gyorgy Salamon, Diplng(MIN) Sopron., PhD Durh., Hon.DSc Miskolc, CEng, MAusIMM, FIMM, MAIME, FSAIMM

Administrative Officer
Rosi Benninghaus

Administrative Assistant
Kim Russell

Department of Applied Geology

Associate Professor and Head of Department
Colin Rex Ward, BSc PhD UNSW, FAusIMM, FAIG

Professors of Geology
GJS Govett
John Roberts, BSc N.E., PhD W.A.

Associate Professors
Alberto Domenico Albani, DrGeoISc Florence, MSc PhD UNSW
Bastiaan Jan Hensen, MSc Ley., PhD A.N.U.

Senior Lecturers
Alistair Chisholm Dunlop, BSc N.E., PhD Lond., DIC, MIMM
Michael Barry Katz, BSc Mich.T.U., MSc McG., PhD Tor.
Paul Gordon Lennox, BSc Tas., PhD Monash
Jerzy Jankowski, MSc PhD Wroclaw
Gregory Hugh McNally, BSc Syd., BA N.E., MAppSc UNSW, DIC, MIE Aust
Derecke Palmer, MSc Syd.
Peter Cyril Rickwood, BSc Lond., PhD Cape T., CChem, MRCS, MMSA

Lecturers
Malcolm David Buck, MSc Waik., PhD Macq.
David Ronald Cohen, BSc Syd., MSc Queens., PhD UNSW, FAEG, CEA

Adjunct Lecturer
Anton Crouch, BA BSc Syd., PhD MAIG

Administrative Assistant
Jaala Clifford

Honorary Visiting Fellow
Ervin Slansky, BSc PhD RnDr Charles

Honorary Associates
Frederick Charles Loughnan, BSc Syd., PhD DSc UNSW
Edward Tyne, BSc GradDip(Geophysics) PhD UNSW

Research Associate
Andreas Moeller, PhD Kiel, MDMG, MEUG, MGSA

Vice-Chancellor's Post-Doctoral Fellow
Leo Marcel Kriegersman, MSc PhD Utrecht

Professional Officers
Zaynab Fidahusayn Muhammad Aly, MSc Lond.

Department of Mining Engineering

Professor of Mining Engineering and Head of Department
James Maurice Galvin, BSc BE Syd., PhD Wits, FAusIMM, FIEA, FIEAust, MISRM

Kenneth Finlay Chair of Rock Mechanics Professor
Bruce Kenneth Hebblewhite, PhD N'cle.(U.K.), DipAICD N.E., MAusIMM, MAIME, MAusIMM

Senior Lecturers
Anthony Charles Partridge, BSc Leeds, MSc PhD McG., CEng, MIMM
Venkata Satyanarayana Vutukuri, BScEng Ban., MS Wisconsin., PhD Tech.Sc Poland, MAusIMM
John Ormiston Watson, BScEng Nott., PhD S'ton.

Lecturers
Christopher Raymond Daly, BE MSc(Acoustics) PhD UNSW, GradDip(MinEcs), GradDip(Higher Ed.)Macq. MAIME, MAusIMM
Drago Panich, BE UNSW, MSc N'cle.(U.K.)

Visiting Professor of Mining Engineering
Frank Ferdinand Roxborough, BSc PhD Durh., CPEng, CEng, FIEAust, FIMM, FAUSIMM, FIMINE

Visiting Fellow
Amal Krishna Bhattacharyya, BSc Glas., MSc Durrh., PhD N'cle.(U.K.), CEng, MAusIMM, FIMINE, FAUSIMM, MCIMM, PEng

Professional Officer
Bin Lin, ME P.R.China

Administrative Assistant
Carol Vallance

Centre for Minerals Engineering

Co- Directors
Anthony Charles Partridge
Tam Tran

Key Centre for Mines

Director
Michael Barry Katz

Associate Directors
Christopher Raymond Daly
David Ronald Cohen

Visiting Fellows
Susan Nicola Border, BSc Lond, GradDip NSWIT
Stephen Geoffrey Gemell, BE Syd., FAusIMM, AIMEPE
Edmund James Malone, MSc Syd., MBA Macq., FAusIMM, FAusIMM, FAIM, MGSA

Administrative Assistant
Kim Russell
Centre for Petroleum Engineering Studies

Director
Wolf Val Pinczewski, BE N'cle(N.S.W.), PhD UNSW, CEng, MIChemE

Visiting Professors
Ferda Akgun, BSc Ankara, MSc U.S.L., PhD C.S.M.
Ashok Kumar Khurana, BSc Jabalpur, BE B'lore, GradDip Birm., PhD DIC Lond.

Senior Lecturers
Henry Alfred Salisch, BSc Quito Poly. Inst., MSc Oklahoma, MS Venezuela Central
Sheikh Rahman, BSc Chitt., MSc Strath., PhD Clausthal

Visiting Lecturers
Richard Christian Curnow, BE Syd., BCom UNSW
Barry Walsh, BE PhD Syd.

Professional Officer
Juan Carlos Zajaczkowski, BE Buenos Aires

Administrative Assistant
Jennifer Ruth Lippiatt

Energy Research Development and Information Centre (ERDIC)

Director
Position vacant

Centre for Remote Sensing and Geographic Information Systems

(in association with the Faculty of Engineering)

Director and Professor
Bruce Crosby Forster, MSurv Melb., MSc R'dg., PhD UNSW, MISAust, LSVic, MIEEE

UNSW Groundwater Centre

(in association with the Faculty of Engineering)

Director
Dr J Jankowski

Senior Lecturer
Richard Ian Acworth, BSc Leeds, MSc PhD Birm., FGS
This handbook is divided into separate sections for each School/Unit, identified by a four-letter code (e.g. GEOG, School of Geography). 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 course outlines and subject descriptions.

Read the opening sections of the handbook first, and then read the information contained under Summary of Courses (Undergraduate or Graduate as appropriate) within the School/Unit you are interested in. These sections cover all degrees and diplomas offered by the Faculty. Detailed information on each subject then appears under Subject Descriptions, which includes session/s offered, pre/corequisite details, class hours, credit point value, etc.

Any subject which is not an Applied Science subject (i.e. a subject offered by another Faculty, but included in a course), appears under the Servicing Subject Descriptions section.

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

Undergraduate Study

It is most important that you read the opening sections of the Handbook for general information on the Faculty of Applied Science, Faculty Information, and Undergraduate Study Summary of Courses. Both of these contain specific information relating to undergraduate degrees, including Enrolment Procedures, Conditions for the Award of Degrees, Honours, Course Transfers and a number of other details that you should be familiar with.

Once you have determined which course you want to do, you must read the course outlines and then the subject descriptions for all subjects to find out what each one entails.

Graduate Study

No matter which graduate degree course you plan to undertake you must read the general summary of graduate courses in the section Graduate Study Summary of Courses. This covers both research degrees and course work programs. Information relating to the various Masters degrees by course work and Graduate Diplomas is detailed in the appropriate School or Centre 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 Applied Science are only too happy 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. 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>Abbreviation</th>
<th>Abbreviation</th>
<th>Abbreviation</th>
</tr>
</thead>
<tbody>
<tr>
<td>CP</td>
<td>credit points</td>
<td>F</td>
<td>full year (Session 1 plus Session 2)</td>
</tr>
<tr>
<td>HPW</td>
<td>hours per week</td>
<td>L</td>
<td>lecture</td>
</tr>
<tr>
<td>P/T</td>
<td>Part-time</td>
<td>S1</td>
<td>Session 1</td>
</tr>
<tr>
<td>S2</td>
<td>Session 2</td>
<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>
<td>U</td>
<td>unit value</td>
</tr>
<tr>
<td>WKS</td>
<td>weeks of duration</td>
<td>X</td>
<td>external</td>
</tr>
</tbody>
</table>

Prefixes

The identifying alphabetical prefixes for each organisational unit offering subjects to students in the Faculty of Applied Science follow.

<table>
<thead>
<tr>
<th>Prefix</th>
<th>Organisational Unit</th>
<th>Faculty/Board</th>
</tr>
</thead>
<tbody>
<tr>
<td>ABIO</td>
<td>School of Applied Bioscience</td>
<td>Applied Science</td>
</tr>
<tr>
<td>ACCT</td>
<td>School of Accounting</td>
<td>Commerce and Economics</td>
</tr>
<tr>
<td>ANAT</td>
<td>School of Anatomy</td>
<td>Medicine</td>
</tr>
<tr>
<td>APSE</td>
<td>Faculty of Applied Science</td>
<td>Biological and Behavioural Sciences</td>
</tr>
<tr>
<td>BIOC</td>
<td>School of Biochemistry</td>
<td>Engineering</td>
</tr>
<tr>
<td>BIOM</td>
<td>Centre for Biomedical Engineering</td>
<td>Biological and Behavioural Sciences</td>
</tr>
<tr>
<td>BIOS</td>
<td>School of Biological Science</td>
<td>Biological and Behavioural Sciences</td>
</tr>
<tr>
<td>BIOT</td>
<td>Department of Biotechnology</td>
<td>Applied Science</td>
</tr>
<tr>
<td>CEIC</td>
<td>School of Chemical Engineering and Industrial Chemistry</td>
<td>Applied Science</td>
</tr>
<tr>
<td>CHEM</td>
<td>School of Chemistry</td>
<td>Science</td>
</tr>
<tr>
<td>CHEN</td>
<td>Department of Chemical Engineering</td>
<td>Applied Science</td>
</tr>
<tr>
<td>CIVL</td>
<td>School of Civil Engineering</td>
<td>Engineering</td>
</tr>
<tr>
<td>CMED</td>
<td>School of Community Medicine</td>
<td>Medicine</td>
</tr>
<tr>
<td>COMP</td>
<td>School of Computer Science and Engineering</td>
<td>Engineering</td>
</tr>
<tr>
<td>ECOH</td>
<td>Department of Economic History</td>
<td>Commerce and Economics</td>
</tr>
<tr>
<td>ECON</td>
<td>School of Economics, Departments of Econometrics and Economics</td>
<td>Commerce and Economics</td>
</tr>
<tr>
<td>ELEC</td>
<td>School of Electrical Engineering</td>
<td>Engineering</td>
</tr>
<tr>
<td>ENVS</td>
<td>Environmental Studies</td>
<td>Biological and Behavioural Sciences</td>
</tr>
<tr>
<td>FIBR</td>
<td>School of Fibre Science and Technology</td>
<td>Applied Science</td>
</tr>
<tr>
<td>FINS</td>
<td>School of Banking and Finance</td>
<td>Commerce and Economics</td>
</tr>
<tr>
<td>FOOD</td>
<td>Department of Food Science and Technology</td>
<td>Applied Science</td>
</tr>
<tr>
<td>FUEL</td>
<td>Department of Fuel Technology</td>
<td>Applied Science</td>
</tr>
<tr>
<td>GEOG</td>
<td>School of Geography</td>
<td>Applied Science</td>
</tr>
<tr>
<td>GEOL</td>
<td>Department of Applied Geology</td>
<td>Applied Science</td>
</tr>
<tr>
<td>GMAT</td>
<td>School of Geomatic Engineering</td>
<td>Engineering</td>
</tr>
<tr>
<td>GSBE</td>
<td>Graduate School of the Built Environment</td>
<td>Built Environment</td>
</tr>
<tr>
<td>HEAL</td>
<td>School of Health Services Management</td>
<td>Professional Studies</td>
</tr>
<tr>
<td>INDC</td>
<td>Department of Industrial Chemistry</td>
<td>Applied Science</td>
</tr>
<tr>
<td>INF S</td>
<td>School of Information Systems</td>
<td>Commerce and Economics</td>
</tr>
<tr>
<td>IROB</td>
<td>School of Industrial Relations and Organisational Behaviour</td>
<td>Commerce and Economics</td>
</tr>
<tr>
<td>Prefix</td>
<td>Organisational Unit</td>
<td>Faculty/Board</td>
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<tr>
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</tr>
<tr>
<td>KCME</td>
<td>Key Centre for Mines</td>
<td>Applied Science</td>
</tr>
<tr>
<td>LAND</td>
<td>School of Landscape Architecture</td>
<td>Built Environment</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 and Archive Studies</td>
<td>Professional Studies</td>
</tr>
<tr>
<td>MANF</td>
<td>School of Mechanical and Manufacturing Engineering</td>
<td>Engineering</td>
</tr>
<tr>
<td>MARK</td>
<td>School of Marketing</td>
<td>Commerce and Economics</td>
</tr>
<tr>
<td>MATH</td>
<td>School of Mathematics</td>
<td>Science</td>
</tr>
<tr>
<td>MATS</td>
<td>School of Materials Science and Engineering</td>
<td>Applied Science</td>
</tr>
<tr>
<td>MECH</td>
<td>School of Mechanical and Manufacturing Engineering</td>
<td>Engineering</td>
</tr>
<tr>
<td>MEED</td>
<td>School of Medical Education</td>
<td>Medicine</td>
</tr>
<tr>
<td>MICR</td>
<td>School of Microbiology and Immunology</td>
<td>Biological and Behavioural Sciences</td>
</tr>
<tr>
<td>MINE</td>
<td>Department of Mining Engineering</td>
<td>Applied Science</td>
</tr>
<tr>
<td>MINP</td>
<td>Centre for Minerals Engineering</td>
<td>Applied Science</td>
</tr>
<tr>
<td>MNGT</td>
<td>Australian Graduate School of Management</td>
<td></td>
</tr>
<tr>
<td>MSCCI</td>
<td>Board of Studies in Science and Mathematics</td>
<td>Science</td>
</tr>
<tr>
<td>PHYS</td>
<td>School of Physics</td>
<td></td>
</tr>
<tr>
<td>PLAN</td>
<td>School of Town Planning</td>
<td>Built Environment</td>
</tr>
<tr>
<td>POLY</td>
<td>Department of Polymer Science</td>
<td>Applied Science</td>
</tr>
<tr>
<td>PROF</td>
<td>Faculty of Professional Studies</td>
<td></td>
</tr>
<tr>
<td>PSYC</td>
<td>School of Psychology</td>
<td>Biological and Behavioural Sciences</td>
</tr>
<tr>
<td>PTRIL</td>
<td>Department of Petroleum Engineering Studies</td>
<td>Applied Science</td>
</tr>
<tr>
<td>SAFE</td>
<td>Department of Safety Science</td>
<td>Applied Science</td>
</tr>
<tr>
<td>SOCI</td>
<td>School of Sociology</td>
<td>Arts and Social Sciences</td>
</tr>
<tr>
<td>SCTS/</td>
<td>School of Science and Technology Studies</td>
<td>Arts and Social Sciences</td>
</tr>
<tr>
<td>HPST</td>
<td>Technology Studies</td>
<td></td>
</tr>
<tr>
<td>TEXT</td>
<td>Department of Textile Technology</td>
<td>Applied Science</td>
</tr>
<tr>
<td>WOOL</td>
<td>Department of Wool and Animal Science</td>
<td>Applied Science</td>
</tr>
</tbody>
</table>
Faculty Information

Some People Who Can Help You

If you require advice and information of a general nature contact: Mr G Baldwin, Senior Administrative Officer, Room 1013, Applied Science Building. Tel. (02) 9385 4469

For information and advice of a specific nature, contact the appropriate school representative below:

**Biotechnology**
Ms R Lee, Administrative Officer, Room 110A, Biological Sciences Building. Tel. (02) 9385 2050

**Chemical Engineering and Industrial Chemistry**
Ms K Mason, Administrative Officer, Room 316, Applied Science Building. Tel. (02) 9385 4318.

**Food Science and Technology**
Mr R Greenwood, Administrative Officer, Room 115, Building B8A. Tel. (02) 9385 4364.

**Geography**
Mr P Dulhunty, Administrative Officer, Room 139, Geography and Surveying Building. Tel. (02) 9385 4390.

**Materials Science and Engineering**
Mr O Andersen, Administrative Assistant, Room 110B, Materials Science and Engineering Building. Tel. (02) 9385 4436.

**Mines (Applied Geology and Mining Engineering)**
Ms R Benninghaus, Administrative Officer, Room 810, Applied Science Building. Tel. (02) 9385 4262

**Petroleum Engineering**
Ms J Lippatt, Room 115, Petroleum Engineering Building. Tel. (02) 9385 5188.

**Safety Science**
Ms B Littlewood, Administrative Assistant, Hut B, 11a, Room111. Tel. (02) 9385 4144.

**Textile Technology and Wool and Animal Science**
Ms F Colville, Administrative Officer, Room 102, Sir Robert Webster Building. Tel. (02) 9385 4477.

Enrolment Procedures

All students re-enrolling in 1997 or enrolling in graduate courses should obtain a copy of the free leaflet ReEnrolling in 1997 available from School Offices and the Student Centre. This leaflet provides detailed information on enrolment procedures and fees, enrolment timetables by Faculty and course, enrolment in miscellaneous subjects, locations, cashier hours and procedures for late enrolments.

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 Adviser to Students with Disabilities, the EEO Unit, the Library and the Students Union.

It is advisable to make contact with the Adviser to Students with Disabilities prior to, or immediately following enrolment, to discuss your support needs.

The Adviser can be contacted on 9385 5418 or at Student Services, Quadrangle Building.

Equal Opportunity in Education Policy Statement

Under the Federal Racial Discrimination Act (1975), Sex Discrimination Act (1984), 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 sex, marital status, pregnancy, race, nationality, national or ethnic origin, colour, homosexuality or disability. 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, the Supportive English 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.

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**Student Clubs and Societies**
Students have the opportunity of joining a wide range of clubs and societies. Many of these are affiliated with the Students' Union. 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 Students' Union or the Sports Association if they wish to be affiliated with either of these bodies, or to the Registrar for approval by the University Council.

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**Applied Sciences Library Facilities**

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

**The Biomedical Library**
The Biomedical Library provides library services for staff and students from the Faculties of Medicine and Biological and Behavioural Sciences, the Schools of Applied Bioscience, Health Services Management, Fibre Science and Technology, Food Science and Technology and the Department of Safety Science. It is closely associated with the teaching hospitals of the University.

The Biomedical Library is located on Levels 2, 3 and 4 of the Mathews Building Annex and is connected to the other Special Libraries via a link through Level 3 of the Library Building.

Biomedical Library staff are available at the Information Desk on Level 2 Mathews Building to provide reference services and to assist in the use of the catalogues. Instructional classes in the use of the library and specific subject material can be arranged through the Information Desk.

Serials in the Biomedical Library are shelved in alphabetical order by title and carry the prefix MB or MBQ. Details about Biomedical Library books, serials and audiovisual material can be found in the Library Catalogue.

In addition the Biomedical Library offers the following services and facilities: literature searches; on-site and remote access to a wide range of bibliographic databases; and a document supply service for external and remote students.

**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, Engineering, the Built Environment and Applied Science.

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, Library hours of opening will vary.

Staff assisted service is available after 10.00 am including help with the 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 years 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.

Computing Requirements

A number of courses in the Faculty of Applied Science have certain computing requirements. To obtain details of these, each student should contact the appropriate School Office in the first weeks of first session.

Computing at UNSW

The Division of Information Services (DIS) encompasses information technology and the University Library at UNSW.

Specific University information which is frequently updated is available on the World Wide Web (WWW) in the UNSW home page at http://www.unsw.edu.au which has an index to its contents which includes URLs http://www.acsu.unsw.edu.au and http://www.misu.unsw.edu.au. You can access this information from your workstation and in any computing laboratory with access to WWW through Mosaic or Netscape.

The information provided on the WWW includes more details about DIS information technology units such as points of contact for particular areas of responsibility and services provided.

Conditions for the Award of the Degree of Bachelor of Science (Technology) or Bachelor of Science (Engineering)

The courses leading to the award of the degree of Bachelor of Science (Technology) or Bachelor of Science (Engineering) in the Faculty of Applied Science are normally programmed over six years of part-time study in the University whilst the student is employed in industry. The normal programs may be varied by the Head of the School in which the student is enrolled. The regulations governing the award of these degrees are as follows:

1. A candidate for the award of the degree of BSc(Tech) or BSc(Eng) shall:
   (1) comply with the requirements for admission;
   (2) follow the prescribed course of study in the appropriate school and pass the necessary examinations;
   (3) complete an approved program of industrial or similar training for such periods as are prescribed.

2. A student may be granted advanced standing by the Professorial Board on the recommendation of Faculty.

3. The degree shall be awarded at Pass or Honours levels. Honours may be awarded in the following categories: Honours Class I; Honours Class II, Division I; Honours Class II, Division II.

4. Students shall be required to conform with the general rules relating to University courses.

General Education Program

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

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

**Objectives of the General Education Program**

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

1. To provide a learning environment in which students acquire, develop, and deploy skills of rational thought and critical analysis.
2. To enable students to evaluate arguments and information.
3. To empower students to systematically challenge received traditions of knowledge, beliefs and values.
4. To enable students to acquire skills and competencies, including written and spoken communication skills.
5. To ensure that students examine the purposes and consequences of their education and experience at University, and to foster acceptance of professional and ethical action and the social responsibility of graduates.
6. To foster among students the competence and the confidence to contribute creatively and responsibly to the development of their society.
7. To provide structured opportunities for students from disparate disciplines to co-operatively interact within a learning situation.
8. To provide opportunities for students to explore discipline and paradigm bases other than those of their professional or major disciplinary specialisation through non-specialist subjects 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 courses:

- Four (4) session length subjects carrying a minimum of 7.5 credit points each or their equivalent, in combinations of session length and year long subjects.
- An additional fifty-six (56) hours of study which foster acceptance of professional and ethical action and social responsibility. This fifty-six hours of study may be distributed throughout the course, or exist as a separate subject, depending on the course.

Because the objectives of General Education require students to explore discipline and paradigm bases other than those of their professional or major disciplinary specialisation. Students cannot choose as a General Education subject one which if offered by a school which offers another subject in their program.

Each Faculty has responsibility for deciding what subjects are not able to be counted towards the General Education requirement for their students. In most cases, this means that subjects offered by the Faculty in which a student is enrolled, or subjects which are a required part of a course even though offered by another Faculty, are not able to be counted toward the General Education requirement.

Students should consult the General Education Handbook for detailed information about what subjects may and may not be taken to fulfill the General Education requirements for each course offered by the Faculty. The General Education Handbook is freely available from all Faculty Offices.

**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 subjects (or their equivalent) in designated categories A and B. The new General Education Program does not categorise subjects in the same way.

As a result, students who enrolled prior to 1996 will be given full credit for any General Education subjects completed up to the end of Session two 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 courses prior to 1996.
The Faculty of Applied Science consists of the Schools of Applied Bioscience, Chemical Engineering and Industrial Chemistry, Fibre Science and Technology, Geography, Materials Science and Engineering, Mines and the Centre for Petroleum Engineering. These Schools offer full-time undergraduate courses leading to the degree of Bachelor of Science or Bachelor of Engineering, and some of the Schools also offer part-time courses leading to the award of the degree of Bachelor of Science (Technology).

Industrial Training

In the scientific and technological courses close association with industry is maintained on the practical aspects of the professions. This is achieved in most of the courses of the Faculty by expecting students to complete an approved industrial training program prior to graduation. This is normally carried out during the Summer Recess. In the case of Wool and Pastoral Sciences, students are required to complete twenty-four weeks' approved practical work. In Mining Engineering students will undertake a program of practical training of at least 100 days.

Honours

In all courses the degree may be awarded with Honours. The award of Honours is determined by performance in subjects and in the final-year project. Honours are awarded in Class 1; Class 2 Division 1; and Class 2 Division 2.

Computing Requirements

A number of courses in the Faculty of Applied Science have certain computing requirements. To obtain details of these, each student should contact the appropriate School Office in the first weeks of first session.

Full-time Courses

These courses are of four years' duration as follows:

Bachelor of Science
BSc

<table>
<thead>
<tr>
<th>Course</th>
<th>Code</th>
</tr>
</thead>
<tbody>
<tr>
<td>Applied Geology</td>
<td>3000</td>
</tr>
<tr>
<td>Applied Physical Geography</td>
<td>3010.1000</td>
</tr>
<tr>
<td>Applied Economic Geography</td>
<td>3010.2000</td>
</tr>
<tr>
<td>Human and Physical Resources (Physical)</td>
<td>3010.3000</td>
</tr>
<tr>
<td>Human and Physical Resources (Economic)</td>
<td>3010.4000</td>
</tr>
<tr>
<td>Biotechnology</td>
<td>3052</td>
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<tr>
<td>Food Science and Technology</td>
<td>3060</td>
</tr>
<tr>
<td>Honours in Food Science</td>
<td>3065</td>
</tr>
<tr>
<td>Industrial Chemistry</td>
<td>3100</td>
</tr>
<tr>
<td>Textile Design and Technology*</td>
<td>3177</td>
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<td>Textile Technology</td>
<td>3170</td>
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<tr>
<td>Wool and Pastoral Sciences</td>
<td>3220</td>
</tr>
</tbody>
</table>

*Subject to UNSW Council approval

Bachelor of Engineering
BE

<table>
<thead>
<tr>
<th>Course</th>
<th>Code</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bioprocess Engineering</td>
<td>3055</td>
</tr>
<tr>
<td>Ceramic Engineering</td>
<td>3025</td>
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<tr>
<td>Chemical Engineering</td>
<td>3040</td>
</tr>
<tr>
<td>Mining Engineering</td>
<td>3140</td>
</tr>
<tr>
<td>Petroleum Engineering</td>
<td>3045</td>
</tr>
</tbody>
</table>

Bachelor of Metallurgical Engineering
BMetE

<table>
<thead>
<tr>
<th>Course</th>
<th>Code</th>
</tr>
</thead>
<tbody>
<tr>
<td>Metallurgical Engineering</td>
<td>3125</td>
</tr>
</tbody>
</table>

Bachelor of Materials Engineering
BMatE

<table>
<thead>
<tr>
<th>Course</th>
<th>Code</th>
</tr>
</thead>
<tbody>
<tr>
<td>Materials Engineering</td>
<td>3615</td>
</tr>
</tbody>
</table>
Part-time Courses

Six-year part-time courses leading to the award of the degree of Bachelor of Science (Technology) 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 course, but with the approval of the Head of School, may be completed after completion of the prescribed course of study.

Students who qualify for the award of the BSc(Tech) degree in the Faculty of Applied Science 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, Master of Engineering or Master of Applied Science, subject to the regulations relating to these degrees.

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

**Bachelor of Science**

BSc

Applied Geology 3000

**Bachelor of Science (Technology)**

BSc(Tech)

Ceramic Engineering 3030
Chemical Engineering 3050
Food Science and Technology 3070
Industrial Chemistry 3110
Metallurgy 3130
Textile Management 3175

Combined Degree Courses

A five-year combined degree course is available in Civil Engineering and Mining Engineering 3146. Students initially enrol in Civil Engineering, and Mining Engineering subjects are taken in Year 4 and Year 5.

Because the first two years of the Petroleum Engineering course are identical to the first two years of the Chemical Engineering course, it is possible, upon completion of the Petroleum Engineering program, to obtain a double BE degree in Petroleum and Chemical Engineering 3046 with one additional year of study.

Engineering Courses in the Faculty of Engineering

The University of New South Wales is unique in that engineering degrees area offered by two faculties, the Faculty of Applied Science and the Faculty of Engineering.

Engineering undergraduate courses (excluding combined degrees) available in the Faculty of Engineering are as follows:

**Bachelor of Engineering**

BE

Aerospace Engineering 3610
Civil Engineering 3620
Computer Engineering 3645
Electrical Engineering 3640
Environmental Engineering 3625
Geomatic Engineering 3741
Manufacturing Management 3663
Mechanical Engineering 3680
Mechatronic Engineering 3685
Naval Architecture 3700
Software Engineering 3648

These full-time courses are designed to be taken over a period of four years. They may also be taken on a part-time basis which usually involves a combination of mainly day-time study together with some evening attendance over a period of six or seven years. It may not be possible to offer evening classes in the later year subjects.

Courses in sandwich form after the first year are also available in Civil Engineering and Environmental Engineering.
The Faculty of Applied Science offers research degrees, coursework masters degrees and graduate diplomas. These courses, as well as research and project areas, are all listed under this section but course information is available under the individual sections for each academic unit. The only exception to this is a unique new degree, the Master of Technology Management, which is offered jointly by three faculties, the Faculty of Applied Science, the Faculty of Commerce and Economics and the Faculty of Engineering. Information on the Master of Technology Management 8007 can be found at the end of this section. The Faculty of Applied Science is also involved in the Master of Business Technology program although students enrol through the Faculty of Engineering.

Research Degrees

The degrees of Doctor of Philosophy, Master of Engineering and Master of Science are all awarded for research and require the preparation and submission of a thesis embodying the results of an original investigation or design. Candidates for the Doctorate of Philosophy are normally involved in at least three years work. The work for the award of a Master's degree may be completed in a minimum of one year, but normally requires two years of study for full-time students, and equivalent time for part-time students. Research degrees may be undertaken in the Faculty of Applied Science as follows:

Doctor of Philosophy
PhD

<table>
<thead>
<tr>
<th>Course</th>
<th>Code</th>
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</thead>
<tbody>
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<td>Biotechnology</td>
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<tr>
<td>Chemical Engineering</td>
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<tr>
<td>Food Science and Technology</td>
<td>1031</td>
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<tr>
<td>Geography</td>
<td>1080</td>
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<tr>
<td>Industrial Chemistry</td>
<td>1016</td>
</tr>
<tr>
<td>Materials Science and Engineering</td>
<td>1045</td>
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<tr>
<td>Mineral Processing and Extractive Metallurgy</td>
<td>1046</td>
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<tr>
<td>Mining Engineering</td>
<td>1050</td>
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<tr>
<td>Petroleum Engineering</td>
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<tr>
<td>Safety Science</td>
<td>1165</td>
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<td>Textile Technology</td>
<td>1060</td>
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<tr>
<td>Wool and Animal Science</td>
<td>1071</td>
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</table>

Master of Engineering
ME

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<tr>
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<tbody>
<tr>
<td>Chemical Engineering</td>
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<tr>
<td>Materials Science and Engineering</td>
<td>2175</td>
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<tr>
<td>Mining Engineering</td>
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<td>Petroleum Engineering</td>
<td>2156</td>
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<tr>
<td>Safety Science</td>
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Master of Science
MSc

<table>
<thead>
<tr>
<th>Course</th>
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<tbody>
<tr>
<td>Applied Geology</td>
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<td>Biotechnology</td>
<td>2036</td>
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<td>Chemical Engineering</td>
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<td>Food Science and Technology</td>
<td>2031</td>
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<tr>
<td>Geography</td>
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<td>Industrial Chemistry</td>
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<tr>
<td>Materials Science and Engineering</td>
<td>2055</td>
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<tr>
<td>Mineral Processing and Extractive Metallurgy</td>
<td>2046</td>
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<tr>
<td>Mining Engineering</td>
<td>2060</td>
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<tr>
<td>Safety Science</td>
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<td>Textile Technology</td>
<td>2070</td>
</tr>
<tr>
<td>Wool and Animal Science</td>
<td>2081</td>
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</tbody>
</table>

Coursework Masters Degrees

The Faculty offers courses leading to the award of the degree of Master of Applied Science. The institution of this degree springs from the recognition of the considerable advance of knowledge in the fields of applied science and engineering which has marked recent years and the consequent increased scope for advanced formal instruction in these fields. Students are usually in attendance at the University for one year on a full-time basis or for two years part-time.

Courses of study leading to the award of a Master of Applied Science degree may be undertaken in the Faculty as follows:
Master of Applied Science
MAppSc

Engineering Materials  8065
Environmental Management  8047.3000
Ergonomics  8075
Food Technology  8032.1000
Food Microbiology  8032.2000
Food Engineering  8032.3000
Fuel Technology  8060
Biotechnology  8042
Biopharmaceuticals  8043.1000
Biopharmaceuticals (by distance education)  8043.2000
Corrosion Engineering  8052
Engineering Geology  8022.1000
Geographic Information Systems  8027.1000
Geological Data Processing  8022.3000
Groundwater Studies  8022.2000
Industrial Safety  8077
Mining and Mineral Engineering  8055
Occupational Health and Safety  8044
Process Engineering  8016
Rangeland Management  8025
Remote Sensing  8047.2000

8045
Master of Environmental Studies
MEnvStud

The Faculty offers a course leading to the award of the degree of Master of Environmental Studies 8045. This is an interdisciplinary course designed to study the nature of environmental problems and the evaluation methodology. Students are usually in attendance at the University for one year on a full-time basis or for two years part-time.

8057
Master of Mining Management
MMinMgt

The Master of Mining Management 8057 is designed to give mining personnel the opportunity to extend their career paths into management levels. Course work modules can be selected from Business Management and Science and Technology streams. Students are usually in attendance for two years on a part-time basis.

8671
Master of Safety Science
MSafetySc

The Master of Safety Science course 8671 is a broad based course which gives a grounding in all the disciplines which are essential to safety, together with electives in specialist areas such as ergonomics, occupational hygiene, safety management or safety engineering. Students are required to study for a minimum of eighteen months full-time or three years part-time.

Graduate Diplomas

Courses are also offered at the graduate level leading to the award of a Graduate Diploma. Students are required to attend courses of study for one year full-time or two years part-time.

Courses of study leading to the award of a graduate diploma may be undertaken in the Faculty of Applied Science as follows:

- Biotechnology  5015
- Ergonomics  5485
- Environmental Studies  5488
- Food Technology  5020
- Mining and Mineral Engineering  5040
- Mining Management  5057
- Petroleum Engineering  5031
- Rangeland Management  5025
- Remote Sensing  5047.2000
- Safety Science  5480
- Textile Technology  5090
- Wool and Pastoral Sciences  5081

Candidates may register for all the research degrees subject to adequate research facilities and satisfactory supervision being available in the candidate's particular field of study. Where special conditions can be met the Faculty may grant permission to a candidate to enrol for the degree of Doctor of Philosophy on a part-time basis.

The conditions governing the award of the various higher degrees and graduate diplomas are set out later in this handbook in Conditions for the Award of Higher Degrees.

Short, intensive graduate and special courses are provided throughout each year designed to keep practising scientists and technologists in touch with the latest developments in their various fields.

Research and Project Areas

School of Applied Bioscience

Department of Biotechnology

Molecular biology of microbial systems
Construction of improved cellulytic and ethanol producing strains
Construction of cloning vectors for use in lactic acid bacteria
Molecular Biology of selected properties of Lactococci including bacteriophage resistance
Cloning and characterisation of bacterial cellulases
Construction of Zymomonas strains able to ferment alternative carbon sources
Construction of improved cloning vectors for use in Zymomonas
Molecular and genetic analysis of Human Immuno-deficiency
Virus isolates

Microbial and Cellular Physiology
Environmental optimisation of production of ethanol,
certain antibiotics and certain amino acids, from various microbial systems
Applied and fundamental aspects of the growth of the lactic streptococci; modelling of metabolic processes, energetics and control in lactic streptococci
Optimization of baker's yeast activity and productivity
Optimization of biotransformation processes using multistage continuous culture
Toxin production by Bacillus sp
Bioengineering of Process Based Prokaryotic and Eukaryotic Cells
Biorabetes of agricultural resources (cellulose, hemicellulose and starch) component sugars
Design and analysis of reactors for large-scale plant cell and organ culture
Experimental, theoretical and control aspects of bioreactors operating under either batch or continuous conditions
Production, purification and characterization of r-DNA derived glycoproteins
Monoclonal antibody production system
High productivity fermentations using cell recycling
Growth and product formation with recombinant mammalian cells
Production of antibodies in plant cell systems
Process control and modelling of biological systems
Environmental Biotechnology
Studies on the mechanisms of mineral biodegradation
Optimization of leaching rates of commercially useful minerals
Uptake of metal ions by plants and plant organs
Studies of the microbial ecology of leaching heaps
Biological removal of heavy metal pollutants
Bioremediation studies
Detoxification of Xenobiotic compounds by plant tissues

Department of Food Science and Technology

Food Chemistry and Biochemistry
Physiology and biochemistry of fruit and vegetables; regulation of fruit ripening and senescence; nature, stability and role of pigments in the visual appearance of foods; natural food toxicants; characterisation, biosynthesis and application of the major volatiles of food; composition and properties of herbs and spices; isolation, characterisation and functional properties of protein from novel food and feed sources; structure, composition, moisture binding capacity, properties and behaviour of starches and their derivatives; chemistry and technology of fats and oils; chemistry and biochemistry of deteriorative reactions in foods; technology and processing of cereals and cereal components.

Food Microbiology
Microbial quality assurance; methods for the microbiological examination of foods. Microorganism of public health significance; foodborne microbial disease. Microbial ecology and biochemistry of food spoilage. Microbial ecology and biochemistry of fermented foods and beverages. Yeast ecology of foods; biochemistry of yeast growth and autolysis. Microorganisms as sources of food ingredients and processing aids; food biotechnology.

Food Acceptability and Sensory Analysis
Basic studies of food acceptability; the development of new techniques for sensory analysis and product development strategies; cross-cultural comparison of food preferences.

Food Processing
Production and stability of intermediate moisture foods; dehydration and quality of fruits, vegetables, nuts, legumes and seafoods; production and stability of traditional south-east Asian foods; utilisation of marine organisms in new food products, high quality seafood product technology; processed meat technology; utilisation of food process waste materials.

Food Engineering
Grain storage and drying; evaporation; baking. Food thermal, physical and rheological properties. Simulation of food process operations. Computer control of food processing

Nutrition
Nutrient composition of foods; effect of processing on nutrients in foods; food and nutrition policy; nutrition through the life cycle; food composition data bases; food habits; factors affecting salt consumption; dietary intervention strategies; assessment of nutritional status; food factors and cancer; community nutrition. Nutrients from unconventional plant food sources.

School of 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 electroylosis; 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 polymerization 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
Hydrosols and Biomaterials
Rigid-rigid polymer blends
Conducting polymer composites
Rheology of polymeric systems

Chemical Engineering

Particle dynamics; fluidisation and spouted bed processes; drying, carbonization, devolatization and gasification; sedimentation and thickening; filtration mechanisms, dewatering of filter cakes, effects of surfactants; characterisation of particulate materials; aggregation kinetic modelling; electrostatic charge determination; Non-Newtonian fluid-particle systems
Mass transfer; packed tower hydraulics and mass transfer performance; hydrodynamics of sieve tray and related mass transfer contractors; mass transfer in bubble columns
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

Membrane Reactor Applications
Aqueous processes, thermodynamics and kinetics in aqueous solutions; dissolution and precipitation kinetics; mineral processes and nuclear materials 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; biofiltration, odour control processes; mass transfer monitoring; hot gas cleaning
Process design and control, computer aided design; systems analysis and process identification; plant simulation; strategies for fault analysis; process optimization 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

Supercritical Fluid Technology
Hydrometallurgy; minerals dissolution and leaching processes; liquor purification processes, metal recovery by precipitation, adsorption, ion-exchange, cementation and electrolytic processes, dewatering of minerals
Refrigeration, heat transfer and food engineering; neural networks; genetic algorithms and other optimization methods; computational fluid dynamics; phase change and inverse heat transfer; food refrigeration

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

School of Fibre Science and Technology

Department of Textile Technology

Fabric Manufacture
Structural mechanics of fibre assemblies, including finite element methods. Properties and performance requirements of industrial/technical fabrics, including composite preforms. Computer aided engineering of textile structures, including aesthetic and functional design. Computer simulation of textile and garment production.

Fibre Processing and Fabric Manufacture
Fibre processing and Yarn Manufacturing
Fibre/fibre and fibre/pin interactions during processing. Mechanical damage of wool fibres in processing

Textile Chemistry

Dyeing and finishing of textiles

Textile Engineering
Econometrics of the textile and clothing industries. Wool scouring, carbonising and drying technology. Effluent
treatment. Waste residue recovery. Dehairing and processing of cashmere.

Textile Physics

Department of Wool and Animal Science

Wool Metrology
Modelling wool production and processing
Developing wool metrology methods
Wool marketing
Wool quality and sheep breeding and nutrition

Animal Genetics
Quantitative genetics
Design and analysis of sire evaluation systems
Design and analysis of crossbreeding experiments
Design of selection programs
Analysis of selection experiments
Estimation of genetic parameters

Animal Production
Factors affecting wool growth
Sheep production and grazing behaviour in arid areas
Sheep reproduction

Agronomy and Range Management
Dynamics of pasture ecosystems
Competition between pasture species
Modelling of chenopod shrublands
Ecology of shrub encroachment
Utilisation of pasture by sheep and goats

Animal Growth and Development
Growth and development
Carcass composition

Animal Nutrition
Ruminant nutrition
Pasture utilisation
Efficiency of wool growth
Grazing management
Carpet wool production

Wool Processing
Fibre breakage mechanisms in early stage processing
The effect of wool properties on wool performance
Wool photochemistry
The effect of technology in distance education

School of Geography

Land Resources and Land Degradation
Landforms and soils in drainage basins
Hill slope processes
Soil studies, including soil survey, soil-plant relations, soil chemistry, soil hydrology
Hazard analysis using remote sensing
Biogeography, particularly plant distributions, environmental controls and disturbances of plant and animal habitats
Development of alluvial landscapes
Forest resource inventory and geographic aspects of conservation
Disturbance ecology
Acid sulphate soil development and management
Gully erosion
Fluvial geomorphology and river channel change
Avulsions and anastomosing streams
River management and flow regulation
Water quality impacts on ecology and fish diseases

Geoprocessing and Information Systems
Remote sensing in environmental studies and land evaluation
Automated cartography
Land cover analysis using remote sensing
Terrain classification, resource inventory systems
Geographic information systems
Information systems for mapping socio-economic and physical resources
Digital elevation modelling
Multi-media geographic information systems
Radar modelling and estimation of biomass
EIS and Expert Systems for regional planning

Social and Economic Processes
Rural transport problems
Transportation and land use analysis
Travel demand forecasting and modelling
Transportation planning and policy analysis
Social aspects of interaction and transportation
Residential choice processes
Migration and ethnic studies
Medical geography and spatial epidemiology
Problems of non-metropolitan regions
Regional policy, planning and locational analysis
Recreational resource management
Tourism development and impacts
Social impact assessment
Cultural geography, spacial construction of communities and place
Location of public and private facilities
Cancer morbidity and mortality
Rural demographic change
Agricultural economics and management
Population studies: migration and settlement studies
Urban and regional development
Locational analysis

Environmental Change
Human impacts on environments of south eastern Australia
Quaternary vegetation change and environments
Residential development patterns and processes
Structure, growth and change in large cities
Population, geography, demographic analysis, social...
indicators, migration and population forecasting
Labour markets and job mobility
Socioeconomic impacts, evaluation and analysis of urban and regional development projects
Socioeconomic impacts and natural hazards
Palynological analysis of vegetation
Role of people and fire in vegetation dynamics

School of Materials Science and Engineering
Structure-property relationship in polymers
Polymer-, metal-, and ceramic-matrix composites
Deformation and failure of polymers and toughened plastics
Failure micromechanisms in composite materials
In-situ experimentation in the SEM
Biomaterials. New composites
Aerospace materials
Metal-and polymer-matrix composites
Aluminium-lithium alloys
Nickel-based superalloys
Adhesive bonding
Fatigue, creep, and failure of metals.
Structure-property relations in materials
Phase equilibria and thermodynamics of metals
Corrosion and oxidation of materials
Diffusion processes
Microstructural evolution in metals
Intermetallic compounds
Advanced coatings for corrosion resistance
Fracture and fatigue of metals and metal-matrix composites
Sustained-load cracking of aluminium alloys
High-temperature fracture toughness of metals
Mixed-mode fracture mechanics
Finite element analysis
Stress analysis of welded joints
Computer modelling of crack growth in metals
Prediction of residual stress in metals
Microstructure-property relations in metals
High-strength low-alloy steels
Weld heat-affected zone toughness of metals
Microstructural control of metals
Abrasive wear of metals and metal-matrix composites
Intermetallic phases in aluminium alloys
Thermodynamics of metallic and slag melts
Thermodynamics and kinetics of pyrometallurgical processes
Processes of reduction of iron, manganese, chromium and other metals
New technologies for iron-making and ferroalloy-making
BOS and EAF steel-making
Sulfur and phosphorus in iron and steel and processes of steel desulfurization and dephosphorization
Structure-property relations of ceramics
Powder processing, forming, and sintering of ceramics
Wear resistance of ceramics
Refractories and refractory coatings
Clay-and porcelain-based bodies
New Direct Ironmaking technology: The HlsmetR Process
Gas based direct reduction of iron ore (DR I)
New developments in blast furnace ironmaking (Pulverised coal injection)
Electric arc furnace (EAF) steelmaking

Ferrous and non-ferrous foundry processes
Kinetics and liquid/solid/gas reactions in metallurgical processes
Phase equilibria of ceramic systems
Non-oxide ceramic processing and properties
Bioceramics
High-temperature superconductors
Powder processing, densification, and crystal growth of ceramics
Glass and glass-ceramics
Ceramic-matrix composites
Microwave processing of ceramics
Electrophoresis of ceramics
Optimisation of metallurgical processes using computer modelling
Selective precipitation and dissolution of minerals
Selective flotation of minerals
Aqueous-bubble-particle interactions
Bubble-metal-slag interactions
Materials degradation at high temperatures
Reaction of metals with liquid and gases at high temperatures
Diffusional processes in high-temperature metals oxidation
Carburisation and sulfidation reactions
Coatings and alloys for high-temperature service
Corrosion of glass and ceramics
Dealloying reactions
Particle packing characteristics
Particle characterisation and data interpretation
Relationship between micro- and macro-structural properties of particle packings
Raw materials processing
Fluid flow, heat and mass transfer in packed beds
Metallurgical process modelling
Blast furnace ironmaking and new ironmaking technology
Fabrication of high-temperature superconducting bulk materials and wires
Fundamental properties of high temperature super-conductors
Electronic and magnetic properties of materials
Functional electronic ceramics
Nonlinear phenomena in materials and dynamic systems

School of Mines

Department of Applied Geology

Environmental Geology: Use of benthic foraminifera (Protozoa) in coastal environmental assessments and in monitoring programs; statistical evaluation of marine sediments as indicators of the behaviour of water masses; geochemistry of recent sediments and its impact on the benthic fauna; management of coastal regions and the estuarine environment.

Volcanology: Silicic volcanism in the Hunter Valley, intraplate volcanism in Bathurst, NSW and Rarotonga, Cook Islands; volcanic hazards in New Zealand; Geoscience education.

Geochemistry: Development of synthetic geochemical standards using organo-silicate coprecipitation methods and assessment of the application of these standards for a
range of sample processing and analytical techniques; exploration geochemical methods (including the use of lags) in the semi-arid to arid environments of eastern Australia; geostatistical analysis of base metal distributions within volcanogenic massive sulphide deposits; methods for conducting baseline contaminant surveys in urban areas and statistical interpretation of results.

Exploration Geochemistry: Metal dispersion from gossans in the Lachlan Fold Belt.

Petrology: Metamorphism and geochronology of granulite terranes in Antarctica and central and western Australia; development of quantitative constraints on models for Proterozoic tectonism and lower crustal evolution; experimental studies of biotite stability and melting behaviour at high temperature.

Hydrogeology: Hydrochemistry of surface water and ground water in the Botany sands aquifer, Botany Basin; dryland salinity processes in the southern Tablelands (Yass area), Liverpool Plains, and Wagga Wagga area; mixing of shallow and deep ground waters as a process of salinisation dryland salinity catchments; water rock interaction, hydrogeological and hydrochemical processes in the Palaeozoic fractured bedrock aquifers of south-east Australia.

Geotectonics: Precambrian assembly and breakup of Gondwanaland, using models based on similar fragments operative in the opening of the Atlantic Ocean, such as the Iberian Massif, as compared to Sri Lanka, together with present day rifting along the Red Sea Dead Sea system.

Structural Geology: Geology of the Hastings Terrane between Taree and Kempsey, including the local geology of this fragment of displaced crust, the nature of faulting/serpentinities around its borders and the nature of the joint systems in the northern Hastings Terrane; structure of the Texas megafold in the border area between NSW and Queensland, to verify the megafolded accretion-subduction tectonic model previously advanced for this region; relationship between granites and regional deformation in the northern Lachlan Fold Belt near Bathurst.

Engineering Geology: Engineering geology of surficial deposits; coal mining geomechanics and environmental geological aspects of coal mining, especially the effects of shallow mining; soil and rock construction materials, including the use of sandstone in thin veneer panels.

Geophysics: High resolution seismic methods for coal and base metal mining; seismic anisotropy; seismic refraction methods.

Igneous Petrology: Form, emplacement and geochemistry of igneous dykes with particular reference to the Sydney Basin and the Falkland Islands; geochemistry of lava flows in the Blue Mountains. Environmental Geochemistry: Marine sediment in the Hawkesbury River estuaries, Lake Macquarie and the Lagoon of Venice, Italy; processing of environmental geochemical data.

Stratigraphy: Use of uranium-lead isotopic ages of zircons determined by the SHRIMP ion microprobe technique to calibrate the relative geological time scale for the Ordovician to Permian Periods of the Palaeozoic Era

Geological Remote Sensing: Use of remotely-sensed imagery for geological exploration and environmental monitoring; stratigraphic mapping with airborne scanners; lineament and tectonic analysis; image processing software development; integration of geological databases, airborne and spaceborne radar data. Geological Education: Development of computer aided learning for training in geological data processing and mining management.

Coal Geology: Nature, origin and significance of mineral matter in coal; processes related to frictional ignition of methane from Australian coal mine rocks; geology of Sydney Basin Coalfields. Sedimentology: Triassic deposition in the Sydney, Gunnedah & Bowen Basins; Sedimentary Petrology: Quantitative mineralogical analysis of sedimentary materials; sandstone provenance and diageneric

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
Basic studies of the physical mechanisms responsible for three-phase flow on the pore-scale.
Network modelling of multi-phase flow and oil recovery in porous media.
The effects of wettability and spreading coefficients in the recovery of waterflood residual oil by gas flooding.

Drilling, Wellbore Engineering and Formation Damage
Studies of the effects of change in permeability due to physico-chemical interactions on mud pressure penetration.
Demonstration of the mud pressure penetration concept with borehole collapse tests.
Development of a mechanistic description of the swelling characteristics and/or generation of hydration stress of shales.
Development of a mathematical model describing the stresses, side forces on the pipe and bit tilt angle involved in the process of drilling a well.
Development of design criteria for selecting and optimising BHA configurations.
Development of a field method of terminating bit walk tendency due to bit-rock interaction.
Effect of fluid composition, salinity and temperature on the porosity of the filter cake.
Effect of mud filtrate composition and fluid flow rate on formation damage.

Gas Recovery from Low Permeability Reservoirs
Reservoir Characterisations
Petrophysical evaluation of lithologically complex reservoirs.
Generation of algorithms to determine porosity, permeability and fluid saturations in lithologically complex reservoirs.
Principal Component Analysis, Pattern Recognition, Electrofacies, Hydraulic Seal Units, Neural Networking, Fuzzy Logic.
Low Resistivity pay sands.
Thin-bed problems.
Identification and quantification of coal bed methane from well logs.
Identification of ore bodies from well logs.

Safety Science

Biomechanics
Analysis of human gait on flat and inclined surfaces. Impact and trauma biomechanics Slips and falls.

Ergonomics
Back injury and whole body vibration.

Human-Computer Interaction
Usability of computer based technology and consumer products. Design and rapid prototyping of interfaces to products & equipment.

Chemical Safety & Applied Toxicology
New approaches to toxicity screening and testing using molecular and cellular biology Management of hazardous chemicals in the workplace. Chemicals and environmental health. New methods for screening the toxicity of natural products.

Risk Assessment and Management
Risk evaluation in industry. Effect of electric and magnetic fields on the body. Behavioural and other aspects of accidents. Accident analysis, reporting and management.

8007
Master of Technology Management
MTM

The Master of Technology Management degree is a new multidisciplinary course approved by the UNSW Council in June 1996. The three faculties who have initiated this unique joint enterprise are the Faculties of Applied Science, Commerce and Economics, and Engineering.

The course is built on the acknowledged strengths of these faculties in applied science, commerce and economics, engineering, technology and technology management.

The major strength of the course is its flexibility. It is designed not only for the recent graduate but also for students who have some years experience in industry and have discovered the areas where their initial education needs strengthening to progress their career. This course provides a mechanism for such people to select from a broad range of subjects and choose those that are most suited to their own industry and their own career path.

Further information the course is available from the MTM Office in the Faculty of Applied Science, contact Mrs Idelies Govett, Tel: (02) 93855563, Fax: (02) 93855456, Email: i.govett@UNSW.EDU.AU
A candidate for the MTM degree should have either a four year bachelor's degree or a three year degree plus either another qualification at an acceptable level, or other academic or professional attainments (including relevant work experience). An applicant who submits evidence of such other academic and professional qualifications as may be approved by the MTM Course Committee may be permitted to enrol in the degree.

Subjects in the MTM course are in four categories and the overall course is structured around the maximum and minimum numbers of subjects that can be drawn from each. The range of choice within the categories is wide and, within the overall structure, students are provided with the opportunity to construct a course best suited to their background and professional needs.

Candidates are required to complete a program of 10 subjects selected from the list of subjects approved for the MTM, consistent with the overall requirements for:

(a) a minimum of 2 and a maximum of 4 subjects from Category A (commercial and business studies) subjects,
(b) a minimum of 2 and a maximum of 4 subjects from Category B (technology management) subjects,
(c) a minimum of 2 and a maximum of 4 subjects from Category C (technical broadening) subjects, and/or Category D (specialist) subjects.

Before enrolment an applicant shall submit an intended program for approval to ensure that the program is suitably focussed, and, the applicant's academic background is adequate for all chosen subjects.

The maximum period of enrolment shall be 2 academic sessions for a full time candidate and 4 academic sessions for a part time candidate.

The Master of Technology Management is a full fee paying course. There are differences in the fee schedules for permanent residents and citizens of Australia and for international students. These fees are set annually.

### Category A: Commercial and Business Studies

The MTM course provides for a minimum of two and a maximum of four subjects from this group. Subjects are available in the following disciplinary streams. Prerequisites and proscriptions may apply to these subjects depending on the prior knowledge of the student. It is the responsibility of the student to satisfy these conditions or to negotiate exemptions.

#### Accounting and Financial Management

- **ACCT5901**: Accounting: A User Perspective
- **ACCT5915**: Individual Judgement and Choice
- **ACCT5931**: Strategic Management Accounting
- **ACCT5932**: Public Sector Accounting and Financial Reporting
- **ACCT5956**: Management Planning and Control
- **ACCT5996**: Management Accounting Control Systems
- **CIVL8701**: Financial Management
- **CIVL8714**: Resource Management
- **COMP9174**: Advanced Decision Theory
- **FINSS511**: Corporate Finance
- **FINSS512**: Australian Capital Markets
- **FINSS513**: Security Valuation and Portfolio Selection

#### Economics

- **ECON5103**: Business Economics
- **ECON5248**: Business Forecasting
- **ECON5124**: Public Enterprise Economics and Cost-Benefit Analysis

#### Industrial Relations

- **IROB5701**: Australian Industrial Relations
- **IROB5711**: Employment and Industrial Law
- **IROB5702**: International and Comparative Industrial Relations
- **IROB5703**: Wage Determination
- **IROB5712**: Industrial Relations Processes
- **IROB5713**: Public Policy and Employment

#### Organisational Management

- **ACCT5917**: Strategic Management: Systems and Processes
- **ACCT5949**: Managerial Dynamics
- **CIVL8703**: Quality and Quality Systems
- **IROB5900**: Social and Organisational Analysis
- **IROB5901**: Organisational Behaviour
- **IROB5904**: Corporate, Managerial and Union Strategy
- **IROB5912**: International Dimensions of Organisational Behaviour
- **IROB5913**: Organisational Power and Politics
- **IROB5914**: Organisational Communications
- **IROB5915**: Human Potentials
- **IROB5920**: Men and Women in Organisations
- **IROB5921**: Management in Cross Cultural Contexts
- **IROB5947**: Performance Management

#### Human Resource Management

- **CIVL8706**: Human Resources Management
- **GEOG9230**: Population, Health and Environment
- **IROB5906**: Human Resource Management in Context
- **IROB5907**: Human Resources Management Processes
- **IROB5948**: Human Resources Development

#### Information Systems

- **INFS5957**: Information and Decision Technology
- **INFS5989**: Information Systems Design
- **INFS5988**: Business Information Systems
- **INFS5991**: Decision Support Systems

#### Legal Studies

- **CIVL8707**: Contracts Management
- **CIVL8726**: Legal Studies and Professional Practice
- **LEGT5511**: Legal Foundations of Business
- **LEGT5531**: Legal Regulations for Business
- **LEGT5541**: Company Law
- **LEGT5551**: Revenue Law
- **LEGT5560**: Legal Aspects of Business Strategy
- **LEGT5561**: Legal Aspects of Finance
- **LEGT5562**: Legal Aspects of International Business
- **LEGT5571**: Franchising and Alternative Distribution Systems
- **SAFE9232**: Introduction to Occupational Health and Safety Law
- **SAFE9273**: Environment and Law

#### Marketing

- **MARK5902**: Elements of Marketing
- **MARK5903**: International Marketing
- **MARK5929**: Corporate and Marketing Planning and Policy
- **MARK5930**: Managerial Elements of Marketing
The MTM course provides for a minimum of two and a maximum of four subjects from this group. The subjects are designed to deal with the application of management concepts in specific technical settings. A list of available subjects is given below.

**Environmental Technologies**
- CIVL9872 Solid Waste Management
- CIVL9881 Hazardous Waste Management
- CIVL8872 Solid Waste Management
- CIVL8881 Hazardous Waste Management
- FUEL5880 Unit Operations in Wastewater Sludge, and Solids Management
- GEOG9042 Environmental Impact Assessment
- GEOG9130 Soil Studies for Arid Lands Management
- GEOG9150 Remote Sensing Applications
- GEOG9240 Principles of Geographic Information Systems
- GEOG9290 Image Analysis of Remote Sensing
- GEOG9300 Vegetation Management
- GEOG9310 River Management
- GEOG9320 Soil Degradation and Conservation
- SAFE9271 Environmental Planning and Assessment
- SAFE9274 Environmental Management Systems

**Information Technologies**
- COMP9008 Software Engineering
- GEOG9210 Computer Mapping and Display
- GEOG9280 Application and Management of Geographical Information Systems
- GEOG9330 Spatial Data Processing and Integration
- GEOG9242 Transportation Applications of Geographical Information Systems
- INFS5848 Information Systems Project Management
- INFS5928 Software Engineering Management
- INFS5953 Information Systems Management
- INFS5992 Data Management

**Project Management**
- BIOM9410 Regulatory Requirements of Biomedical Technology
- CIVL8731 Project Management Framework
- CIVL8702 Project Time Management
- CIVL8710 Management of Risk
- IROBS946 Managing Occupational Health and Safety
- MANF9400 Industrial Management
- MANF9410 Total Quality Management
- MANF9470 Production Management 1
- MANF9601 Economic Decisions in Industrial Management

**Mining and Extractive Technologies**
- KCME4203 Mine Management
- KCME4204 Mineral Exploration Project Management

**Safety Management**
- SAFE9211 Introduction to Safety Engineering
- SAFE9224 Principles of Ergonomics
- SAFE9353 Major Hazards Management
- SAFE9242 Effective Behaviour in Organisations
- SAFE9343 Innovation, Productivity and Safety
- SAFE9350 Risk Management
- SAFE9543 Management of Dangerous Materials

**Biomedical Engineering**
- BIOM9027 Biomedical Imaging
- BIOM9028 Radiation Physics
- BIOM9060 Biomedical Systems Analysis
- BIOM9321 Physiological Fluid Mechanics
- BIOM9331 Mass Transfer in Medicine
- BIOM9332 Biocompatibility
- BIOM9430 Biomedical Standards
- BIOM9510 Introductory Biomechanics
- BIOM9541 Mechanics of the Human Body
- BIOM9621 Biological Systems Analysis
- BIOM9701 Dynamics of the Cardiovascular System

**Biotechnology**
- BIOT7081 Environmental Biotechnology
- BIOT7100 Biological Principles
- BIOT7110 Bioengineering Principles
- BIOT7051 Applied Genetics
- BIOT7061 Peptide and Protein Technology
- BIOT7071 Biochemical Engineering
- BIOT7081 Applied Cellular Physiology

**Chemical Engineering and Industrial Chemistry**
- CEIC5342 Energy Management in the Process Industries
- CEIC5340 Polymer Management: Fundamentals and Techniques
- CEIC5330 Process Engineering and the Petroleum Industry
- CEIC5336 Environmental Chemistry in the Process Industries
- CEIC5337 Particle Characterisation in the Process Industries

**Fibre Science and Technology**
- TEXT5601 Colour Science

**Food Science and Technooogy**
- FOOD1450 Food Processing Wastes

**Geography**
- GEOG9150 Remote Sensing Applications

**Geology**
- GEOL9010 Groundwater Environments
- GEOL9060 Environmental Geology

**Information Systems**
- INFS5983 Business Data Communications
### Materials Science and Engineering
- IDES5051: Plastics, Materials and Processes
- MATS6535: Industrial Coatings for Corrosion Protection
- MATS7480: Polymer Product Design
- MATS7470: Polymer Processing and Fabrication
- MATS9520: Engineering Materials
- MATS9530: Materials Engineering

### Mines
- MINE0130: Principles of Mining

### Safety Science
- SAFE9211: Introduction to Safety Engineering
- SAFE9260: Introduction to Occupational Health
- SAFE9261: Occupational Hygiene
- SAFE9262: Occupational Medicine
- SAFE9265: Occupational Health Practice
- SAFE9272: Environment and Medicine
- SAFE9352: Hazard and Risk Analysis
- SAFE9424: Applied Ergonomics
- SAFE9426: Ergonomics and New Technology

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**Category D: Specialist Subjects**

The MTM course provides for a minimum total of two and a maximum total of four subjects chosen from this group and group C above. These are the specialist technical subjects which make up the postgraduate coursework programs in the Faculties of Applied Science and Engineering. They are advanced treatments of the subject matter that go beyond the content or level of the usual undergraduate course.

Almost all graduate subjects from the Faculty of Applied Science and the Faculty of Engineering are available, many in highly technical and specialised areas.
The School of Applied Bioscience was formed in 1986 and consists of the Departments of Biotechnology and of Food Science and Technology. Previously these disciplines were separate Schools in the Faculties of Biological Sciences and Applied Science, respectively. The Department of Biotechnology retains membership of the Faculty of Biological and Behavioural Sciences. The academic relationship between biotechnology and food science and technology at UNSW is unique in Australia and offers opportunities for joint activities to further develop the food, beverage and pharmaceutical industries in this country.

Specialised centres exist in and are associated with each Department, and include the Bioengineering Centre, the Cooperative Research Centre for Biopharmaceutical Research and the Cooperative Research Centre for Food Industry Innovation.

The School offers four undergraduate degrees and seven formal coursework postgraduate degrees or diplomas, as well as postgraduate MSc and PhD research degrees.

Graduates of the School are keenly sought by industry and government employers. A number of Co-op Program, government and industry scholarships are available on a competitive basis for undergraduate and postgraduate studies.

The food and biotechnology industries have been targeted by government as key sectors for expansion with particular reference to exports and import replacement.
Head of Department
Professor PP Gray

Biotechnology can be defined as the use of various biological processes to make products and perform services. The essential feature of biotechnology therefore is the use of biological processes based on living cells and biochemical macromolecules such as proteins, DNA and RNA in a rapidly expanding range of activities of benefit to mankind. As such, biotechnology makes practical use of the recent scientific advances in areas such as molecular genetics.

The development of recombinant-DNA (r-DNA) technology has resulted in the ability to produce large quantities of any potentially useful product. Based on this technology, a new generation of biopharmaceuticals, including hormones, vaccines, anti-hypertensive and anti-inflammatory agents, are being developed which have the potential to revolutionise medicine.

Microorganisms and viruses are being modified for use in controlling plant and animal diseases and pests. Diagnostic kits are being developed for use in forensic science and in product identification and quality control. In addition, genetic improvements in agriculture, plants and animals are becoming a reality, as is the control of inborn genetic disorders in humans.

Bioprocesses are also used in the extraction of minerals from low grade ores, and modified and novel bioprocesses are being developed for the treatment of waste and degradation of recalcitrant molecules, an area of vital importance in our increasingly polluted planet.

The future for expansion in all the above areas is immense, and an ability to cope with the problems of the 21st century will be heavily dependent on these advances.

Undergraduate Study

Course Outlines

The Department of Biotechnology offers undergraduate training in the BE Degree Course in Bioprocess Engineering, the BSc Degree Course in Biotechnology and in the BSc Degree Course through the Board of Studies in Science and Mathematics.

The BE Course in Bioprocess Engineering is four years full-time and has been designed to meet the requirements for membership of the Institution of Engineers, Australia. The BSc (Biotechnology) Course is four years full-time and awarded with Honours to students who have distinguished themselves in coursework and in the final year project.

The BSc Course through the BSSM is three years for a Pass degree during which the student can study aspects of biotechnology in combination with another major in a relevant discipline, preferably biochemistry, microbiology or chemistry. The fourth Honours Year of this BSc Course includes further formal training in biotechnology as well as an extensive research project. Details on both the Pass and Honours BSc Course majoring in biotechnology are given in the Faculty of Science Handbook.

3052
Biotechnology Full-time Course
Bachelor of Science
BSc

This course in Biotechnology offers a comprehensive education in all aspects of modern applied biology. It leads to the award of a Bachelor of Science Degree over four years full-time study, with Honours for students who perform with merit.

Graduates in Biotechnology will be able to find employment in industries and other organisations involved with biopharmaceutical production and food processing, as well as in agricultural and environmental biotechnology.
### Course Outlines BIOT 35

#### Year 2

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### 3055

**Bioprocess Engineering Full-time Course**

**Bachelor of Engineering BE**

The first two years of the course are similar to the first two years of the Chemical Engineering degree course with the addition of basic training in Biology. The third year of the course contains basic training in Biochemistry, MicroEvolutionary Biology and Functional Biology as well as the Chemical Engineering subjects and an introduction to Bioprocess Engineering which will be further developed in the fourth year. The course has been designed so that graduates can find employment in the fermentation, food processing, pharmaceutical, agro-industrial and waste treatment industries.
Graduate Study

The Department of Biotechnology conducts formal courses leading to the award of Master of Applied Science degrees in Biotechnology and Biopharmaceuticals. A Graduate Diploma in Biotechnology is also available.

In addition, the Department welcomes enquiries from graduates in Chemistry, Biochemistry, Microbiology, Applied Science, Chemical Engineering, Physiology, Nutrition and Agriculture who are interested in pursuing research in biotechnology for the award of the degrees of Master of Science 2036 and Doctor of Philosophy 1036.

The Head of Department provides information on research scholarships, fellowships, grants-in-aid and School research activities. Graduates are advised to consult the Head of School or Departments before making a formal application for registration.

Course Outlines

Master of Applied Science Degree Courses

The MAppSc degree courses provide for a comprehensive study of theoretical and applied aspects of the science, technology and engineering of foods. The courses are elective in nature providing an opportunity for graduates to apply their basic skills in areas relevant to these fields of applied science in which the Department has developed special expertise. Intending candidates are invited to contact the Head of Department for advice and recommendation.

The Department of Biotechnology offers three formal masters courses, the Master of Applied Science (Biotechnology) 8042, the Master of Applied Science (Biopharmaceuticals) 8043.1000, and the Master of Applied Science (Biopharmaceuticals) by distance education 8043.2000.

8042
Master of Applied Science (Biotechnology)

MAppSc(Biotech)

The course includes advanced treatments of all areas of biotechnology. It is open to graduates with a four-year degree in biotechnology or a related discipline, or who have, in the opinion of the Higher Degree Committee, acquired equivalent qualifications or experience. Intending students are referred to Conditions for the Award of Graduate Degrees set out later in this handbook.

The course consists of lectures, tutorials, practical sessions, case history studies and a supervised project.

The minimum period of registration before the award of the degree is two sessions for full-time students and four sessions for part-time students.

An acceptable course would be a program of subjects involving a minimum of 18 hours per week for two sessions
full-time or a minimum of 9 hours per week for four sessions part-time. Course details are as follows:

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Elective components

Elective subjects, including some undergraduate subjects, may be selected from those offered by the School of Applied Bioscience, or from those offered by other schools in the University subject to approval. Each individual course must be approved by the Higher Degree Committee of the Faculty of Applied Science and would comprise:

1. A major strand of related material comprising approximately 75% of the total program, including a project comprising not less than 15% nor more than 50% of the program.
2. A minor strand of broader based material comprising up to 25% of the total program.
3. At least 60% of the non-project component must be taken in the Department of Biotechnology unless otherwise approved by the Head of School. The remainder, subject to approval and availability, may be undertaken elsewhere in the University. Full details of all subjects are listed under Disciplines of the University in the Calendar.

8043.1000
Master of Applied Science (Biopharmaceuticals)

MAAppSc(Biopharmaceuticals)

This is an interdisciplinary program designed for graduates with backgrounds in either pharmacology or biotechnology who wish to obtain advanced training in both areas in order to gain expertise necessary for the development and use of the new generation of biopharmaceuticals which have been developed by, or result from, the application of molecular biology. It is open to graduates with a four year degree in a related discipline or who have, in the opinion of the Higher Degree Committee, acquired equivalent qualifications or experience. Prior study of biochemistry is required for the course. The course consists of lectures, tutorials, practical sessions, case history studies and a supervised project. The minimum period of registration before the award of the degree is two sessions for full-time students and four sessions for part-time students. The course is also offered through distance education. An acceptable course would be a program of subjects involving a minimum of 18 hours per week for two sessions full-time or a minimum of 9 hours per week for four sessions part-time. Choice of subjects is dependent on the background of the student.

Principles of Pharmacology (PHPH5461) must be taken by students who have not completed an approved Pharmacology course, while Principles of Biotechnology (BIOT7040) must be taken by students who have not completed an approved Biotechnology course program.

All students must pass Advanced Pharmacology (PHPH5471) and Advanced Biotechnology (BIOT7030). Course details are as follows:

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A recommended program for full-time students with a Biotechnology background would then be:

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A recommended program for full-time students with a Pharmacology background would then be:

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Elective Components

If a minor project is selected, additional elective subject(s) may be selected from those offered by the Department of Biotechnology or the School of Physiology and Pharmacology, or from those offered by other Schools in the University subject to approval.

Each individual course must be approved by the Higher Degree Committee of the Faculty of Applied Science and would comprise: (i) a major strand of related material comprising approximately 75% of the total program including a project comprising not less than 15% of the program (ii) a minor strand of broader based material comprising up to 25% of the total program.
The CRC for Biopharmaceutical Research has developed this strongly interdisciplinary Masters of Applied Science in Biopharmaceuticals course. The course teaches the scientific basis underscoring the development of recombinant biopharmaceuticals, combined with aspects of clinical trials, regulatory considerations, patent issues, and licencing. The course content is incorporated in 8 distance education modules comprised of written text and video/audio tapes containing course material, demonstrations and self-testing exercises. Access to the Subject Co-ordinators will be phone, fax, electronic mail and teleconferencing facilities.

The Master's Program can be completed in a minimum of 2 years. The maximum time for completion has been set at 8 years.

Modules consist of printed notes containing subject material, readings, assessment questions and exercises. Some modules also include audio and video taped material so access to audio equipment is essential.

The Master's Program calls for the completion of 8 modules coursework (exemptions may be allowed in exceptional circumstances) plus completion of a major project or two mini projects. Depending upon circumstances, projects may be industry or laboratory related or may be literature based. Completion of a minimum of 4 modules is required before projects may be commenced.

There will be two tutorials per session per module. These will be conducted via a multiple telephone link and will be structured and interactive.

Each module will be assessed separately at module completion and a certificate awarded. The assessment of modules will be flexible and will be based on two pieces of submitted work. This may be in the form of written assignments or as a timed, faxed examination.

Students module choices are from the following:

Module 1
Basic Principles of Drug Actions
PHPH5501 Basic Principles of Drug Actions

This module covers general principles of pharmacodynamics and pharmacokinetics. Pharmacodynamics (what the drug does to the body) considers drug-receptor interactions, the basis of dose-response curves, reversible and irreversible antagonists, partial agonists and related topics. Events following the drug-receptor interaction, which include stimulation of second messenger systems and the pharmacology of ion channels, are described. The principles governing pharmacokinetics (what the body does to the drug) and their clinical importance are discussed in some detail. There are several simple graphical and problem solving exercises to be completed to aid in your understanding of this material.

Module 2
PHPH5511 Selected Topics in Pharmacology

For this module the topics were chosen to enable students to gain knowledge of the receptors in the human body with which drugs commonly interact to produce their main clinical effects, or their side-effects/toxicological actions. The module begins with an introduction to the autonomic nervous system, then works through autonomic receptors, receptors for histamine and serotonin, then to the newer areas of peptide receptors and cytokines, the latter areas being those for which drugs are now being developed. With this background, plus some reading material on receptors for drugs affecting the central nervous system, it is felt that students will be able to read and understand the pharmacology of most drugs in clinical use. A video which covers many autonomic drug effects on the cardiovascular system, plus questions based around this film, are included.

Module 3
PHPH5521 Techniques for Drug Development

This module extends the concepts raised and discussed in the Basic Pharmacokinetics section of Module 1. More advanced pharmacokinetic problems, such as compartmentation, kinetics of effects and problem solving are included. The technique of measuring receptor binding is shown in some detail on video, with explanation of how the technique is set up, and how and why it is much used in new drug development. Also included in this module is a section on techniques used in the assay of drugs. The determination of molecular structure, and quantitation of drugs in the body are vital areas of drug development, and indeed pharmacokinetics depends upon such quantitation.

Module 4
PHPH5531 Discovery and Development of New Medicines

This module gives an overview of most aspects of the development of new drugs. There is a very short historical introduction and examples of the discovery and development of drugs from natural products (plants) plus some examples of drugs developed using synthetic programs (chemical modifications). There is an example of a Natural Products program with examples of broad based screens and follow up testing in animals (Phase 0) followed by a section on the necessary toxicological testing in animals (also Phase 0) before a drug can be tested in humans. Phase 1-4 of clinical trials are then discussed, followed by the Pharmaceutical Company's and the Clinical Investigator's viewpoints of drug development. Regulatory issues and some ethical problems are briefly considered.

Module 5
BIOT7070 Production of Recombinant Products

In this module, the topics deal with some basic recombinant DNA techniques and then heterologous protein expression in prokaryotes and eukaryotes are discussed in greater details. For prokaryotes, *Escherichia coli* is the model species chosen and for eukaryotes, the cell systems of yeast and mammalian cells are described. The advantages and disadvantages of the various expression cell systems are outlined. The vectors used for cloning of the protein genes are also described and illustrated. Cloning of genes into the vectors, production and subsequent characterisation of the recombinant protein are also described. These examples are actual biopharmaceutical products currently produced by the biotechnology industry.
and students are referred to published journal papers throughout the modules.

**Module 6**
**BIOT7080 Principles of Fermentation and Downstream Processing**
The units in this module were selected to give the students a good understanding of the fundamental principles associated with biopharmaceuticals manufacture. The module begins by discussing basic fermentation principles for the large-scale culture of bacterial and mammalian cells to produce recombinant protein biopharmaceuticals. This is followed by a thorough study of the main unit operations associated with product recovery, commonly referred to as downstream processes. The principles of Good Manufacturing Practice are discussed in this third unit, which is relevant to all aspects of drug manufacturing, including fermentation and product recovery operations. This unit is thus designed to put regulatory principles into the context of biopharmaceutical manufacture. The last unit covers modern methods of product characterisation, which forms a critical component of the regulatory procedure.

**Module 7**
**BIOT7090 Monoclonal Antibody Technology**
This module is made up of 4 units covering techniques for the production of monoclonal antibodies and discussing their therapeutic applications. Unit 1 is designed as an introduction to immunology, emphasising the areas of immunology relevant to antibody production. In addition, the structure of antibody molecules is studied in detail. Unit 2 describes the processes in the production of hybridomas, the specialised cells which produce monoclonal antibodies. This unit includes information on immunisation protocols, methods of cell fusion and selection, and the production of human monoclonal antibodies by EBV-transformed B cells. Unit 3 is associated with the more recent developments in antibody engineering techniques. The phage display system, and genetic manipulations for the production of humanised antibodies and antibody fragments are described in detail. Unit 4 covers the applications of monoclonal antibodies both for in vivo diagnostics and for therapy. Also, some of the more recent innovations such as the production of recombinant immunotoxins are described.

**Module 8**
**BIOT7120 Regulatory Considerations, Patent Issues and Licensing**
The first unit of this module looks at the code of Good Manufacturing Practice (GMP) for the production of recombinant biopharmaceuticals and the establishment of Standard Operating Procedures (SOPs) for a production process. This is especially relevant as many of the M.App.Sc. (Biopharmaceuticals) graduates will take up positions in industry. The international biopharmaceutical industry is a vigorous, rapidly growing industry. Compared to the pharmaceutical industry it is still at a fairly early stage of development and undergoing some interesting changes. The second unit provides an understanding of the nature of the biopharmaceutical industry at this stage of its evolution. It includes the concept of licensing as an important factor in its development as well as an appreciation of the basics of licensing activity. The final unit introduces the student to the concept of intellectual property as it relates to biopharmaceuticals and provides some guidelines on its management. Intellectual property is the collection of statute and common law principles giving ownership of inventions, trade secrets, trade marks, designs and copyright in literary and artistic works to their creators. The creation and protection of intellectual property is the basis on which development and commercialisation of biopharmaceuticals is built and as such is of vital concern to the industry. This unit will provide a detailed consideration of patents and trade secrets and touch briefly on the subject of trade mark registrations, industrial design registrations and copyright. Special issues relating to patents and trade secrets in biopharmaceuticals will also be examined.

**Module 9**
**BIOT7130 Biotechnology Mini Project 1**
A small experimental or design project, or an extensive literature review and analysis of a selected topic in biotechnology.

**Module 10**
**BIOT7140 Biotechnology Mini Project 2**
A small experimental or design project, or an extensive literature review and analysis of a selected topic in biotechnology.

**Modules 9 and 10**
**BIOT7150 Biotechnology Major Project**
An experimental or technical investigation or design project in the general field of biotechnology.

**Module 9**
**PHPH5541 Pharmacology Mini Project 1**
A small laboratory or industry based project or an extensive literature review or extensive data analysis in the area of drug development.

**Module 10**
**PHPH5551 Pharmacology Mini Project 2**
A small laboratory or industry based project or an extensive literature review or extensive data analysis in the area of drug development.

**Modules 9 & 10**
**PHPH5561 Pharmacology Major Project**
A laboratory or industry based project in the area of drug development.

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**5015 Biotechnology Graduate Diploma Course**

**Graduate Diploma GradDip**
The graduate diploma course provides the opportunity for graduates with no previous tuition in biotechnology to undertake training in this discipline.

A degree in a science-based course is required for admission. If the degree course has not included a biology component, the candidate is required to undertake some basic biology training as a prerequisite or corequisite.

Under normal circumstances, students whose previous training has included a substantial component of biotechnology will not be admitted to the course.
The course comprises study of undergraduate and graduate formal subjects, plus extensive laboratory training in biotechnology.

The diploma is awarded after one year’s full-time study, consisting of an average of 18 hours per week, or two years part-time study, consisting of an average of 9 hours per week. The program includes the listed obligatory subjects plus sufficient of the listed elective subjects to meet the hours of study required. The electives include subjects necessary for students without previous tuition in biochemistry and/or microbiology, as well as alternatives for those with previous tuition in these disciplines. The choice of electives in each individual case is subject to approval by the Head of School.

Other suitable electives from the Department of Food Science and Technology and/or other Schools

### Compulsory subjects

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### Elective subjects

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Head of Department
Professor KA Buckle

Food science and technology involves the understanding of basic sciences and the application of this knowledge to foods from the point of production, through handling, processing, preservation, distribution and marketing, up to consumption and utilisation by consumers. It is concerned with food processes, food commodities, food composition and food quality (including sensory properties, safety and nutritional value).

The study of food science and technology integrates many scientific disciplines. Its bases are in chemistry, physics, biochemistry and microbiology. Its borders merge with those of agriculture, engineering, human nutrition, public health, commerce, psychology and law. Biotechnology has a role of increasing importance in food science and technology.

The food scientist and food technologist are concerned with population food supplies and requirements, community wants and needs, and equitable distribution of foods to ensure human nutritional needs are met.

New knowledge is acquired in the laboratory, the pilot plant, and the community, and then applied to the development of safe, nutritious and palatable foods, beverages and food ingredients by optimisation of processes and equipment. Foods are studied in terms of their basic constituents and structures, and the changes they undergo when subjected to handling, processing and distribution.

The food scientist and food technologist are equally concerned with the development and selection of raw materials from agricultural, horticultural, animal and marine sources.

A safe, adequate, palatable and nutritious food supply is essential to human health. The food and beverage industry is of major economic importance and in Australia is the largest sector of manufacturing industry. Internationally, food production, processing and service are among the largest and most stable industries. The challenges are to increase the availability, variety, quality and quantity of foods economically and in line with the needs of the world population. The Australian industry has a major role to play in supplying high quality foods to emerging overseas markets and there is a national and international demand for professionally trained people prepared to accept responsibility for the quality and safety of food.

The Department offers a four-year full-time course leading to the award of Bachelor of Science and a six-year part-time course leading to the award of the degree of Bachelor of Science (Technology). Graduates of both courses qualify for membership of the Australian Institute of Food Science and Technology, the US Institute of Food Technologists, and may qualify for membership of the Royal Australian Chemical Institute.

Graduate Diploma and Master of Applied Science courses in Food Science and Technology are offered for graduates in science or agriculture wishing to familiarise themselves with the principles of food science and technology.

The courses provide basic preparation for food science and technology careers in the food industry, the public sector, education, research, the food service industry, public health, management and marketing. Graduates may also find careers in health and environmental sciences, management of food resources and food wastes, and communication, and in areas such as dietetics after further training.
Undergraduate Study

Course Outlines

3060
Food Science and Technology
Full-time Course

Bachelor of Science
BSc

This course is designed to provide depth and breadth in the relevant physical and biological sciences on which food science and technology is based. Students completing the Year 1 requirements are eligible for selection for admission to Year 2 of the course. It is strongly recommended that students obtain, before the completion of the course and during recess periods, as much professionally oriented or industrial experience as possible.

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Year 2

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Year 3

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<td>CHEM3926</td>
<td>Instrumental Methods of Food Analysis</td>
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<td>CHEM3929</td>
<td>Food Chemistry</td>
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<td>FOOD1310</td>
<td>Food Preservation</td>
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<td>FOOD1320</td>
<td>Plant Food Science</td>
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<td>FOOD1330</td>
<td>Animal Food Science</td>
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<td>FOOD1340</td>
<td>Quality Evaluation &amp; Control</td>
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<td>Food Technology Laboratory</td>
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<td>FOOD2310</td>
<td>Food Microbiology</td>
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Year 4

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<td>APSE0002</td>
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<td>FOOD1400</td>
<td>Project</td>
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<td>FOOD1410</td>
<td>Field Excursions</td>
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<tr>
<td>FOOD1420</td>
<td>Food Legislation</td>
<td>2</td>
<td>0</td>
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<tr>
<td>FOOD1430</td>
<td>Food Industry Management</td>
<td>2</td>
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<td></td>
<td>General Education subject/s</td>
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<td>Plus three or more of the following electives to a total of not less than 42.5 credit points.</td>
<td></td>
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</tr>
<tr>
<td>FOOD1440</td>
<td>Food Quality and Product Development</td>
<td>0</td>
<td>6</td>
</tr>
<tr>
<td>FOOD1450</td>
<td>Food Processing Wastes</td>
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<td>3</td>
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<tr>
<td>FOOD1460</td>
<td>Cereal Technology</td>
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<td>6</td>
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<tr>
<td>FOOD1470</td>
<td>Postharvest Technology of Foods</td>
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<td>0</td>
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<tr>
<td>FOOD2410</td>
<td>Advanced Food Microbiology</td>
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<td>6</td>
</tr>
<tr>
<td>FOOD2430</td>
<td>Quality Assurance and Food Microbiology</td>
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<td>Microbial Food Spoilage</td>
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<tr>
<td>FOOD2450</td>
<td>Foodborne Microorganisms of Public Health Significance</td>
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<td>2</td>
</tr>
<tr>
<td>FOOD2460</td>
<td>Food and Beverage Fermentations</td>
<td>0</td>
<td>2</td>
</tr>
<tr>
<td>FOOD2470</td>
<td>Microorganisms as Food Processing Aids and Ingredients</td>
<td>0</td>
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<tr>
<td>FOOD3410</td>
<td>Nutrient Analysis of Foods</td>
<td>6</td>
<td>0</td>
</tr>
<tr>
<td>FOOD3420</td>
<td>Population &amp; Applied Nutrition</td>
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<td>2</td>
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<tr>
<td>FOOD3430</td>
<td>Special Dietary Foods and Ingredients</td>
<td>1</td>
<td>0</td>
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<td>FOOD4420</td>
<td>Food Packaging</td>
<td>3</td>
<td>0</td>
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<tr>
<td>FOOD4430</td>
<td>Advanced Food Engineering A</td>
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<td>FOOD4440</td>
<td>Advanced Food Engineering B</td>
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<td>Total Credit Points</td>
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</tbody>
</table>
or such other electives to a total of not less than 42.5 credit points, as approved by the Head of Department. Year 4 totals at least 120 credit points.

During Years 3 and 4 of the course excursions are made to various food industries. Detailed reports of some of these visits are required. Detailed reports of the students’ activities during their periods in industry are required.

3065
Honours in Food Science
Full-time Course

Bachelor of Science (Honours)
BSc (Hons)

This course is designed to provide extensive research training in some aspects of food science and technology, at undergraduate level. The research orientation of the course, compared to the Graduate Diploma, facilitates entry into a research higher degree (MSc/PhD) upon completion of Honours at a satisfactory level.

Entry to the course requires satisfactory completion of a Bachelor degree, or equivalent, in an area considered relevant to food science and technology. Students who have completed a four-year Bachelor course, in which Honours has already been awarded, are specifically excluded.

The major component of the course is an extensive research project, conducted throughout one year of full time study. Candidates also take 10 credit points of subjects within the Department, or other subjects as approved by the Head of Department, in each session, and complete a program of General Studies, dealing with social and ethical issues relevant to food science and technology. Honours is awarded on the basis of performance in the research project and satisfactory completion of coursework.

Compulsory Subjects

<table>
<thead>
<tr>
<th>HPW</th>
<th>CP</th>
</tr>
</thead>
<tbody>
<tr>
<td>S1</td>
<td>S2</td>
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<tr>
<td>FOOD9410 Honours Research Project</td>
<td>20</td>
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<tr>
<td>FOODXXXX*</td>
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<tr>
<td>General Studies</td>
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</table>

Total HPW Session 1 24
Total HPW Session 2 24
Total Credit Points 125

*Subjects offered by the Department of Food Science and Technology or as approved by the Head of Department and dependent on the background of the candidate. Credit points for coursework subjects may be concentrated in one session.

3070
Food Science and Technology
Part-time Course

Bachelor of Science (Technology)
BScTech

This course is designed for students who are employed in the food processing industries. It extends over six part-time years of study, and leads to the award of the degree of Bachelor of Science (Technology). Students are required to complete an approved program of industrial training of not less than twelve months prior to the award of the degree. Industrial training should normally be completed concurrently with attendance in the course, but with the approval of the Head of Department may be completed after completion of the prescribed course of study.

The course covers the same subject matter as the first three years of the full-time course. For the first two years students follow a common course in which general biology is taken, and thereafter specialise in the biological sciences, which are fundamental to the study of food science and technology. The subjects of Stages 4, 5 and 6 may be available only in day-time classes, and substantial day-time release from industry may be required. Students who have completed the requirements of this course and have qualified for the award of the degree of Bachelor of Science (Technology) may proceed to the award of the degree of Bachelor of Science by attending for one full-time year and completing the subjects listed in Year 4 of the full-time course. Students desiring to proceed to the award of a BSc degree must apply to the Head of the Department not later than 31 December of the year in which the sixth stage is completed.

Stages 1 and 2

<table>
<thead>
<tr>
<th>HPW</th>
<th>CP</th>
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</thead>
<tbody>
<tr>
<td>S1</td>
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<tr>
<td>BIOS1101 Evolutionary and Functional Biology</td>
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<tr>
<td>BIOS1201 Molecules, Cells and Genes</td>
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<tr>
<td>CHEM1101 Chemistry 1A</td>
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<td>CHEM1201 Chemistry 1B</td>
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<td>FOOD1100 Food in Society</td>
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<tr>
<td>MATH1141 Higher Mathematics 1A or Mathematics 1A</td>
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<tr>
<td>MATH1131 Mathematics 1B or Mathematics 1B</td>
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<tr>
<td>MATH1021 General Mathematics 1C</td>
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<tr>
<td>PHYS1002 Physics 1 or Introductory Physics 1</td>
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</table>

Total HPW Session 1 26
Total HPW Session 2 24
Total Credit Points 125

Note: Physics and Mathematics are usually taken as Stage 1, the other subjects as Stage 2
### Graduate Study

The Department of Food Science and Technology conducts formal courses leading to the award of Master of Applied Science degrees in Food Technology, Food Microbiology, Food Engineering and Food Science and Nutrition and a Graduate Diploma in Food Technology. These courses are one year full-time or two years part-time. In addition, the Department welcomes enquiries from graduates in Chemistry, Biochemistry, Microbiology, Applied Science, Chemical Engineering, Physiology, Nutrition and Agriculture who are interested in pursuing research in food science and technology for the award of the degrees of Master of Science 2031 and Doctor of Philosophy 1031.

The Head of Department provides information on research scholarships, fellowships, grants-in-aid and School research activities. Graduates are advised to consult the Head of Department before making a formal application for registration.

### Course Outlines

#### Master of Applied Science Degree

**Courses**

The MAppSc degree courses provide for a comprehensive study of theoretical and applied aspects of the science, technology and engineering of foods. The courses are elective in nature providing an opportunity for graduates to apply their basic skills in areas relevant to these fields of applied science in which the Department has developed special expertise. Intending candidates are invited to contact the Head of Department for advice and recommendation.

<table>
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<td>BIOC2201</td>
<td>Principles of Molecular Biology</td>
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<td>CHEM2021</td>
<td>Physical Chemistry for Food and Fibre Science and Technology</td>
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<tr>
<td>CHEM2041</td>
<td>Chemical and Spectroscopic Analysis</td>
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<td>FOOD3210</td>
<td>Introductory Nutrition</td>
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<tr>
<td>FOOD4210</td>
<td>Introductory Food Engineering</td>
<td>3</td>
</tr>
<tr>
<td>MATH2819</td>
<td>Statistics SA</td>
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<td>MICR2218</td>
<td>Microbiology</td>
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**Stage 5**

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<td>Principles of Biotechnology</td>
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<tr>
<td>CHEM3929</td>
<td>Food Chemistry</td>
<td>6</td>
</tr>
<tr>
<td>FOOD2310</td>
<td>Food Microbiology</td>
<td>4</td>
</tr>
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<td>FOOD3310</td>
<td>Nutrition</td>
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<tr>
<td>FOOD4310</td>
<td>Food Process Engineering</td>
<td>0</td>
</tr>
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<td>FOOD4320</td>
<td>Computer Applications</td>
<td>0</td>
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<td>General Education subject/s</td>
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**Stage 6**

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<td>Food Preservation</td>
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<td>FOOD1320</td>
<td>Plant Food Science</td>
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<td>Animal Food Science</td>
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<td><strong>Total Credit Points</strong></td>
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Graduate courses are available for Master of Applied Science degree programs in the following areas:

- Food Technology Course 8032.1000
- Food Microbiology Course 8032.2000
- Food Engineering Course 8032.3000
- Food Science and Nutrition Course* 8032.4000

*Subject to Academic Board approval.

**Entry qualifications**

A four-year Bachelor degree, honours degree or equivalent (e.g. three-year degree plus relevant employment experience) is the minimum requirement for admission to the courses.
Study programs

Students are required to complete a program of study totalling at least 126 credit points (3.5 credit points equals 1 hour of class contact per week for one session) made up of compulsory subjects, a compulsory project (either 21 or 42 or 63 credit points) and elective subjects. Students who have previously studied compulsory subjects or their equivalent may be granted an exemption by the Head of Department but the equivalent number of credit points must be completed by taking other approved subjects. The degree will comprise one year of full-time study (normally two sessions of at least 63 credit points each) or two years of part-time study (normally four sessions of at least 31.5 credit points each), and would comprise:

1. A major strand of related material comprising approximately 75% of the total program, including a project comprising not less than 15% nor more than 50% of the program.
2. A minor strand of broader based material comprising up to 25% of the total program.
3. Undergraduate material may be included in one or both strands but will not be included in credit points.
4. At least 60% of the non-project component must be taken in the School of Applied Bioscience unless otherwise approved by the Head of Department. The remainder, subject to approval and availability, may be undertaken elsewhere in the University. Full details of all subjects are listed under Disciplines of the University in the Calendar.

8032.1000

Food Technology

Master of Applied Science
MAppSc

The MAppSc course in Food Technology is particularly relevant to graduates in Agriculture, Applied Science and Science with principal interests in chemistry, biochemistry, microbiology, physiology, nutrition and engineering. This is a formal course consisting of core components (including a project), and an elective component that allows reasonable flexibility and a choice of subjects in food science and technology based on the candidate's background, subject to the availability of staff and resources.

The course comprises:

<table>
<thead>
<tr>
<th>Compulsory subjects</th>
<th>CP*</th>
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</thead>
<tbody>
<tr>
<td>FOOD1527 Principles of Food Preservation</td>
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<tr>
<td>FOOD1557 Food Technology Laboratory</td>
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<td>FOOD1707 Seminar</td>
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Compulsory project

Either

<table>
<thead>
<tr>
<th>Subject</th>
<th>CP</th>
</tr>
</thead>
<tbody>
<tr>
<td>FOOD1717 Major Research Project or</td>
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</tr>
<tr>
<td>FOOD1727 Research Project or</td>
<td>42</td>
</tr>
<tr>
<td>FOOD1737 Minor Project</td>
<td>21</td>
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</tbody>
</table>

* Credit points may be concentrated in one session.

Elective subjects

Elective subjects making up the remainder of the credit points may be selected from those offered by the School of Applied Bioscience, or from those offered by other Schools in the University subject to approval by the Head of Department.

The work involved in the project must be embodied in a report and submitted in accordance with the requirements of the Faculty.

Depending on the candidate's background, enrolment in some of the above subjects may be accompanied by enrolment in related undergraduate subjects as prerequisites or corequisites. A particular subject may not necessarily be conducted in any one year.

8032.2000

Food Microbiology

Master of Applied Science
MAppSc

The MAppSc course in Food Microbiology is a program of study designed for graduates in Food Science, Food Technology, Microbiology, Biochemistry, Biotechnology or related disciplines who have an interest in microorganisms associated with foods. The course provides advanced training in all aspects of food microbiology as well as fundamental aspects of food science and technology.

Entry qualifications

A four year Bachelor degree, honours degree or equivalent involving some basic training in microbiology and biochemistry is the minimum requirement for admission to the course.

The course comprises:

Compulsory subjects

<table>
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<tr>
<th>Subject</th>
<th>CP</th>
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</thead>
<tbody>
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<td>FOOD2517 Food Microbiology</td>
<td>14</td>
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<tr>
<td>FOOD2527 Microbiological Examination of Foods</td>
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</tr>
<tr>
<td>FOOD2537 Microbiological Quality Assurance</td>
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Compulsory project

Either

<table>
<thead>
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<th>Subject</th>
<th>CP</th>
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<tbody>
<tr>
<td>FOOD2617 Major Research Project in Food Microbiology</td>
<td>63</td>
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<tr>
<td>FOOD2607 Food Microbiology Research Project or</td>
<td>48</td>
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<tr>
<td>FOOD2547 Food Microbiology Project</td>
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Elective subjects

<table>
<thead>
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<th>Subject</th>
<th>CP</th>
</tr>
</thead>
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<tr>
<td>FOOD1517 Chemistry, Biochemistry and Physics of Foods</td>
<td>10.5</td>
</tr>
<tr>
<td>FOOD1527 Principles of Food Preservation</td>
<td>21</td>
</tr>
<tr>
<td>FOOD2507 Introductory Microbiology</td>
<td>10.5</td>
</tr>
<tr>
<td>FOOD2557 Microbial Spoilage of Foods</td>
<td>3.5</td>
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<td>FOOD2567 Foodborne Microorganisms of Public Health Significance</td>
<td>7</td>
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<tr>
<td>FOOD2577 Food and Beverage Fermentations</td>
<td>7</td>
</tr>
<tr>
<td>FOOD2587 Microorganisms as Food Processing Aids and Ingredients</td>
<td>3.5</td>
</tr>
</tbody>
</table>

or other subjects offered by the Departments of Food Science and Technology and of Biotechnology or other Schools subject to approval by the Head of Department.

* Credit points may be concentrated in one session.
8032.3000
Food Engineering

Master of Applied Science
MAppSc

The MAppSc course in Food Engineering is a formal course designed for graduates in Engineering or related disciplines who have an interest in the processing of biological resources for human consumption. The formal components of the course provide professional training at an advanced level in food engineering and food science. The studies in food engineering are designed to strengthen and broaden the engineering background of candidates and emphasise the use of fundamental principles in solving problems associated with food processing. Problem solving skills in engineering are developed further in a research project devoted to an area of food engineering.

Compulsory subjects

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>CP*</th>
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<tbody>
<tr>
<td>FOOD1707</td>
<td>Seminar</td>
<td>7</td>
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<tr>
<td>FOOD4557</td>
<td>Food Engineering Laboratory</td>
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<tr>
<td>FOOD4567</td>
<td>Food Engineering Field Work</td>
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<tr>
<td>FOOD4587</td>
<td>Advanced Food Engineering A</td>
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<tr>
<td>FOOD4597</td>
<td>Advanced Food Engineering B</td>
<td>14</td>
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<tr>
<td>FOOD4607</td>
<td>Packaging and Production</td>
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</tr>
</tbody>
</table>

Compulsory project

Either

- FOOD1717 Major Research Project (available only to exceptional candidates) or 63 CP
- FOOD1727 Research Project or 42 CP
- FOOD1737 Minor Project 21 CP

*Credit points may be concentrated in one session.

Elective subjects

- FOOD3527 Nutritional Evaluation of Foods 21 CP
- FOOD3537 Public Health Nutrition 7 CP
- FOOD3547 Nutritionally Modified Foods and Ingredients 3.5 CP
- FOOD3557 Advanced Nutritional Science 7 CP
- CMED9610 Community Nutrition and Food Policy Studies 10 CP
- SLST9250 Nutrition for Peak Performance 15 CP

5020
Food Technology Graduate Diploma Course

Graduate Diploma
GradDip

The Graduate Diploma course is designed to provide professional training at an advanced level for graduates in Science, Applied Science or Engineering who have not had previous training in Food Technology.

Requirements are a first degree and, in some cases, the successful completion of assignments or examinations, as directed by the Head of Department.

The course is a blend of formal lectures and laboratory work at the undergraduate and graduate levels. The Graduate Diploma in Food Technology (GradDip) is awarded on the successful completion of one year of full-time study (at least 119 credit points, 3.5 credit points equals 1 hour of class contact per week for one session), or two years of part-time study (at least 59.5 credit points/year). It involves the following program:

Compulsory subjects

<table>
<thead>
<tr>
<th>Course Code</th>
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<tbody>
<tr>
<td>FOOD1527</td>
<td>Principles of Food Preservation</td>
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<tr>
<td>FOOD1537</td>
<td>Plant Food Products</td>
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<tr>
<td>FOOD1547</td>
<td>Animal Food Products</td>
<td>10.5</td>
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<tr>
<td>FOOD1557</td>
<td>Food Technology Laboratory</td>
<td>21</td>
</tr>
<tr>
<td>FOOD2517</td>
<td>Food Microbiology</td>
<td>14</td>
</tr>
</tbody>
</table>

Students who have previously studied compulsory subjects or their equivalent at an acceptable level may be granted an exemption by the Head of Department but the equivalent number of credit points must be completed by taking other approved subjects.

*Credit points may be concentrated in one session.

Elective subjects

The elective subjects making up the remainder of the credit points, may be selected from those offered by the School of Applied Bioscience, or from those offered by other Schools in the University subject to approval by the Head of Department. Only graduate subjects will count towards credit points.
Subject Descriptions

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

Units are offered separately subject to specified prerequisites as well as the restrictions on those units designed as bridging materials.

APSE0002
Social Issues in Applied Science
Staff Contact: Faculty Office
CP7.5 S1 L1 T1

The subject covers social issues arising from future technological developments and the role that a professional applied scientist can play in influencing future directions. It will be taught by a combination of group activity, case studies and projects and seminars from visiting speakers, some of whom will be from disciplines other than the applied sciences.

BIOT3011
Biotechnology A
Staff Contact: Dr D Glenn
CP15 S1 L3 T3
Prerequisite: BIOC2101 and BIOC2201

The basic principles involved in the operation of microbial processes on an industrial scale. Includes: the selection, maintenance and improvement of microorganisms; the influence of physical and chemical factors on the microbial environment; the control of environmental factors; the effects of operational patterns on batch and continuous flow cultivation; aeration and agitation; scale-up of microbial processes; air and media sterilisation; the harvesting, purification and standardization of products; the principles involved in microbial processes for chemical, pharmaceutical and food production, microbial waste treatment and environmental control. The laboratory component includes manipulation of microorganisms, laboratory-scale fermentor operation, microbial enzyme isolation, visits to industrial fermentation plants and industrial seminars.

BIOT3021
Biotechnology B
Staff Contact: Prof P Rogers
CP15 S2 L2 T4
Prerequisite: BIOT3011

Application of principles of biotechnology to the analysis and design of microbial processes of industrial relevance (antibiotics, microbial enzymes, single cell protein from carbohydrates and hydrocarbons, fermented foods and beverages, amino acids and vitamins, microbial polysaccharides, activated sludge and photosynthetic processes for waste treatment, microbial leaching of low-grade minerals). Emphasis on quantitative approach: mass and heat balance calculations, kinetic and thermodynamic analysis, detailed equipment design and specification, process design and layout, process simulation, plant location, application of optimisation techniques. The economics of microbial processes are considered and comparison made with alternative modes of production or treatment. The economics of agroindustry in Australia using microbial processes. Marketing of fermentation products, clinical trials required, legal constraints, patent rights. Technical and economic feasibility studies, and a design project.

BIOT3031
Microbial Genetics
Staff Contact: Dr F Foong, Dr D Glenn
CP15 S1 L2 T4
Prerequisites: BIOS2011, BIOS2021, BIOC2101, BIOC2201 and MICR2011
Note/s: Excluded MICR3021.

This unit is suitable for students majoring in Microbiology, Biochemistry, Biotechnology or Genetics. It deals with major aspects of the genetics of bacteriophage, bacteria and yeast. Topics include plasmids and transposable genetic elements, gene transfer, mutagenesis and DNA repair, mutants, bacteriophage genetics, gene cloning (vectors, recombinant-DNA techniques) and genetics of nitrogen fixation.

BIOT3041
Principles of Biotechnology
Staff Contact: Dr D Glenn
CP7.5 S1 L3
Prerequisites: BIOC210, BIOC2201 and MICR218

Lecture component of BIOT3011 Biotechnology A.

BIOT3051
Biotechnology Laboratory
Staff Contact: Dr D Glenn
CP7.5 S1 T3
Prerequisite: BIOT3041

Laboratory component of BIOT3011 Biotechnology A and a project set within the department to complement the laboratory component.

BIOT3061
Monoclonal Antibody and Genetic Techniques in Biotechnology
Staff Contact: Dr S Mahler
CP15 S2 L2 T4
Prerequisite: BIOC2101 and BIOC2201

Recent developments in biotechnology have resulted in techniques which are widely applied in industrial, clinical, veterinary, agricultural and research laboratories. Many of these techniques have resulted from the development of monoclonal antibodies and the development of gene probes. The course includes: antibody structure; production of monoclonal antibodies, cell fusion, hybridoma selection, culture techniques, purification; analytical techniques employing monoclonal antibodies (RIA, ELISA); therapeutic application of antibodies, immunotoxins; gene probes; restriction fragment length polymorphisms (RFLP); gene probes for disease detection, identification of bacteria and viruses; forensic application of DNA fingerprinting. Tutorial and practical work to complement the lectures.
BIOT7010
Reading List in Biotechnology (Microbiology)
Staff Contact: Prof N Dunn
CP12 S1 or S2 T3

BIOT7020
Reading List in Biotechnology (Biochemistry)
Staff Contact: Prof N Dunn
CP12 S1 or S2 T3

BIOT7030
Advanced Biotechnology
Staff Contact: Dr F Foong
CP24 F HPW3
Co-requisite: PHPH5471

This course will cover the production and characterisation of biopharmaceuticals. Production involving chemical and enzymatic peptide synthesis, recombinant production in E.coli, yeast, baculovirus and mammalian cells and associated purification processes will be covered. Regulatory considerations important in the validation of fermentation and recovery processes, the purity of final product, and the design of facilities will also be covered. Patent issues relevant to such products and other aspects of licensing business considerations will be addressed, as will case studies of current production processes.

BIOT7040
Biotechnology Principles
Staff Contact: Dr S Mahler
CP32 S1 6 S2 2

This course is designed to provide students who have not previously studied biotechnology with sufficient training in the field to complete the MAppSc (Biopharmaceuticals). Aspects of the application of gene cloning techniques for the production of recombinant proteins from a range of host cells, growth, product formation and recovery of microbial products, bioreactor design and operation, monoclonal antibody and gene probe technology will be covered.

BIOT7050
Biopharmaceuticals Project (Major)
Staff Contact: Dr S Mahler
CP64 F HPW 8

An experimental or technical investigation or design project in the general field of biotechnology.

BIOT7051
Applied Genetics
Staff Contact: Dr D Glenn
CP20 S2 L2 T3

Isolation of commercially useful microorganisms. Mutagenesis and the isolation of mutants of the following types: auxotrophs; catabolic mutants; feedback inhibition and repression resistance; constitutive; catabolite repression resistance; resistance to antimicrobial agents and to viruses; extended enzyme substrate specificity; altered enzyme properties; changes in promoter and attenuator activity.

Techniques of genetic exchange: transformation; conjugation; transduction; cell fusion; sexual and parasexual cycles. The use of these techniques in strain construction.

Recombinant-DNA technology: plasmid and virus technology; cloning vectors for use in microorganisms, plant and animal cells. Strain construction using recDNA

BIOT7060
Biopharmaceuticals Project (Minor)
Staff Contact: Dr S Mahler
CP32 F HPW 4
A small experimental or design project, or an extensive literature review and analysis of a selected topic in biotechnology.

BIOT7061
Peptide and Protein Technology
Staff Contact: Dr F. Foong
CP20 S1 L2 T3
Industrial scale production of enzymes, peptide hormones, antibodies including monoclonal antibodies, vaccines; regulation of synthesis by environmental control and genetic manipulation; recovery and downstream processing techniques; immobilisation by entrapment and binding.

Applications of proteins in medical therapy and diagnosis and as analytical tools including ELISA and affinity chromatography; applications of enzymes in the food and beverage industries.

BIOT7071
Biochemical Engineering
Staff Contact: Prof P Gray
CP20 S1 L2 T3
Design of bioreactors; range of biocatalysts from free enzymes to immobilised cells; heat and mass transfer, scale-up, economic feasibility studies as applied to bioprocesses; design of equipment and facilities for sterile operation and to meet recDNA guidelines; downstream processing, design and operation; instrumentation and control; use of computer-linked systems; mathematical simulation.


BIOT7081
Environmental Biotechnology
Staff Contact: Department Office
CP20 S2 L2 T3
Environmental Biotechnology examines the way microbes decompose chemically complex materials. Applications include the use of bacteria and fungi to detoxify wastes, converting them to usable substances. Prevention of biodeterioration of valuable materials is also an important area of study. Lectures cover biodegradation of minerals, metals, cellulosics, aromatics, hydrocarbons and wastewater treatment. Students present research reviews and conduct experimental projects.

BIOT7091
Applied Cellular Physiology
Staff Contact: Dr F Foong
CP20 S2 L2 T3
Elemental and molecular composition of cells; formulation of growth media; stoichiometry of growth processes and product formation; metabolic regulation; stringent response; mechanisms of metabolite uptake and product release; maintenance energy; thermodynamics of cellular growth and activities. Effect of mutation on cellular physiology; recombinant-DNA products. Fermentation processes: inoculum preparation, physiology of selected processes.

BIOT7100
Biological Principles
Staff Contact: Dr F Foong
CP12 S1 L3

BIOT7110
Bioengineering Principles
Staff Contact: Prof P Rogers
CP12 S1 L3
A subject designed to provide an introductory course for students in the MAppSc Biotech program who have not previously undertaken any bioengineering studies.

Steady state and differential balances as a basis for quantification of complex real systems. Concepts in rate processes and kinetic analysis with application to biological systems. Experimental determination of rate data. Correlation of simple lumped rate processes and simultaneous distributed processes and the concepts involved in dimensionless numbers.

Laminar and turbulent flow. The structure of homogeneous and boundary layer turbulence flow in pipes and channels. Mixing theory. Process vessel reactor models.

Fluid viscosity, Newtonian and non-Newtonian fluids, convective and molecular transport processes. Heat and mass transport, film coefficients. Film, boundary layer, penetration and surface renewal theories.

Quantification of complex systems. Empirical and mechanistic models in biological systems.

BIOT7123
Biotechnology Project (Minor)
Staff Contact: Prof P Rogers
CP32 F T4
A small experimental or design project, or an extensive literature review or analysis of a selected topic in biotechnology. As part of their project students must satisfactorily complete a training program in research techniques. Part-time students and students carrying out an approved project externally may substitute an appropriate, alternative training program.
Food in Society
Staff Contact: Dr JE Paton
CPS S2 L2

Note/s: Excluded GENA6201. Interactive discussion sessions held during lectures.

Introduction to principles of food production and consumption. Food in history, society, economics and politics. Development of the food industry into one of the largest industry sectors in Australia; nutritional, physiological and psychological roles of food; role of microbiology, biotechnology and technology in safe, nutritious, innovative food processing. Topical issues discussed include: food irradiation risk or benefit?; genetic engineering and biotechnology 'new' food sources; food additives necessity or evil?; environmental impact of food processing; food choices and prejudices and food marketing and education who should the consumer believe?

Food Preservation
Staff Contact: Prof KA Buckle
CP15 S1 L3 T3

Prerequisites: BIOC2101, BIOC2201, CHEM2021, CHEM2041, CHEM2819, FOOD3210, FOOD4210, MICR2218

Introduction to food preservation; spoilage control by traditional and modern techniques. Technology of food preservation by heating, chilling and freezing, sun drying and dehydration. Use of salt, sugar, acid, chemical preservatives, ionising radiations, modified atmospheres in food preservation. Chemical and microbial stability of foods. Packaging requirements for preserved foods. Water relations of foods. An integrated program of laboratory and pilot plant exercises designed to illustrate the principles and procedures presented in the lecture course.

Plant Food Science
Staff Contact: Dr JE Paton
CP5 S1 L2

Prerequisites: BIOC2101, BIOC2201, CHEM2021, CHEM2041, CHEM2819, FOOD3210, FOOD4210, MICR2218

Cereals: Structure, composition, properties and uses of cereal grains with emphasis on wheat; processing and technology of wheat and rice. Sugars: Sources, types, properties of sugars in foods; sugar milling and refining. Fruit and vegetables: Nutrient composition; principles of post-harvest physiology, storage and handling. Lipids: Sources and composition of fats and oils, methods of extraction and processing. Non-microbial hazards in foods.
FOOD1400
Project
Staff Contact: Dr RH Driscoll
CP40 F T8
Prerequisite: Completion of Year 3 subjects

The student undertakes an individual project involving a literature survey, an experimental investigation, the preparation of a detailed report on a selected topic in food science and technology, and presentation of seminars on a literature review and experimental results.

FOOD1410
Field Excursions
Staff Contact: Prof KA Buckle
CP7.5 S1 T3
Prerequisite: Completion of Year 3 subjects

Inspection of food processing plants, growing areas and research stations in the Sydney metropolitan area, New South Wales and interstate.

FOOD1420
Food Legislation
Staff Contact: Prof KA Buckle
CPS S1 L2
Prerequisite: Completion of Year 3 subjects


FOOD1430
Food Industry Management
Staff Contact: Dr M Filadelfi-Keszi
CP5 S1 L2
Prerequisite: Completion of Year 3 subjects

An introduction to food industry management, accounting, finance, marketing, industrial relations and communication skills.

FOOD1440
Food Quality and Product Development
Staff Contact: Dr M Filadelfi-Keszi
CP15 S2 L2 T4
Prerequisite: Completion of Year 3 subjects

The steps involved in new product development; role of market research and advertising. Costing procedures, new product failure, case studies. Practical exercises in new food product development.

FOOD1450
Food Processing Wastes
Staff Contact: Prof KA Buckle
CP7.5 S2 L2 T1
Prerequisite: FOOD1350 or equivalent

Effects of waste discharges into the environment. Treatment of water for domestic and industrial applications; water reuse; process modifications for effluent reduction. Origin, composition, treatment, disposal and utilisation of wastes from food processing operations. Legal and economic aspects of waste disposal. Inspections of water and waste treatment plants.

FOOD1460
Cereal Technology
Staff Contact: A/Prof M Wootton
CP15 S2 L2 T4
Prerequisite: FOOD1350


FOOD1470
Postharvest Technology of Foods
Staff Contact: Dr JE Paton
CP15 S1 L2 T4
Prerequisite: FOOD1350


FOOD1507
Introductory Food Science
Staff Contact: Prof KA Buckle
CP7 S1 L1 S2 T1

An introduction to the history of food preservation and human nutrition. Current world food patterns, organisations and trade. Food development programs, regional and international agencies and activities. Parameters of food quality; food choice and social behaviour, food and society. Students present a seminar on aspects of food science in Session 2.

FOOD1517
Chemistry, Biochemistry and Physics of Foods
Staff Contact: Prof KA Buckle
CP10.5 S1 or S2 L2 T1


FOOD1527
Principles of Food Preservation
Staff Contact: Prof KA Buckle
CP21 S1 L3 T3

Spoilage control by traditional and modern techniques. Technology of food preservation by heating, chilling and freezing, sun drying and dehydration, salt, sugar, acid, chemical preservatives, ionising radiations, modified atmospheres. Chemical and microbial stability of foods. Packaging requirements for preserved foods. An integrated program of laboratory and pilot plant exercises designed to illustrate the principles and procedures presented in the lecture course.
FOOD1537
Plant Food Products
Staff Contact: Dr JE Paton
CP7 S1 L2
Cereals: structure, composition, properties and uses of cereal grains with emphasis on wheat; processing and technology of wheat and rice. Sugars: sources, types, properties of sugars in foods; sugar milling and refining. Fruit and vegetables: nutrient composition; principles of post-harvest physiology, storage and handling. Lipids: sources and composition of fats and oils, methods of extraction and processing. Non-microbial hazards in foods: minerals, proteins, acids, goitrogens, cyanogens, carcinogens; spices and flavours. Plant protein: sources, composition, extraction and uses in foods with emphasis on soybean. Tea, cocoa and coffee: production, composition and processing.

FOOD1547
Animal Food Products
Staff Contact: Dr JE Paton
CP10.5 S1 L3
Nature and distribution of world animal food resources. Meat: muscle structure, function, slaughter, conversion of muscle to meat; chemical, biochemical factors in postmortem glycolysis; meat microbiology; chilling, freezing, curing, processing of meat and meat-derived products; processing equipment; meat marketing systems; nutritional and sensory properties of meats. Milk and dairy products: chemical, physical properties, microbiology of milk; technology of milk-derived products including cheese, fermented products, butter, frozen, chilled and dried milk-derived foods. Marine products: nature and distribution of world fishery resources; teleostean and elasmobranch species, spoilage mechanisms, quality assessment; preservation by chilling, freezing, salting, drying, smoking, marinading and fermentation; fish meal and fish protein concentrate. Egg products: structure and composition of the avian egg; changes during storage of whole eggs; egg quality assessment; functional properties of egg components; preservation of the intact egg; pulping, freezing and drying of whole egg pulp, yolk and albumen.

FOOD1557
Food Technology Laboratory
Staff Contact: Dr JE Paton
CP21 S2 T6
Prerequisite: FOOD1527, FOOD1537, FOOD1547 or their equivalent
A program of laboratory and pilot plant exercises integrating elements of the chemical, physical, sensory and microbiological analysis of foods and the impact of processing on these factors. The program is designed to demonstrate the application of laboratory methods to food systems.

FOOD1627
Technology of Cereal Products
Staff Contact: A/Prof M Wootton
CP7 S2 L2
Prerequisite: FOOD1537 or equivalent

FOOD1637
Marine Products
Staff Contact: Prof KA Buckle
CP7 S2 L2
Prerequisite: FOOD1547 or equivalent

FOOD1647
Food Additives and Toxicology
Staff Contact: A/Prof M Wootton
CP7 S1 L2
Functions, modes of action of food additives, consequences of use, ethical and legislative considerations. National, State and international attitudes and standards. Principles of toxicological testing, the evaluation of results.

FOOD1657
Postharvest Physiology and Handling of Fruit and Vegetables
Staff Contact: Dr JE Paton
CP21 S1 L1 T5
Pre or Corequisite: FOOD1537 or equivalent
Biochemistry and physiology of metabolism in fresh fruit and vegetables; respiration measurements as an index of metabolism, maturation and senescence; concept of climacteric and non-climacteric produce; physiological and metabolic changes occurring during ripening. Effect of temperature on metabolism; constraints of high and low temperatures; role of humidity control and water loss in quality maintenance; use of atmosphere control to delay senescence and ripening. Physiological disorders of stored produce; microorganisms of importance to post-harvest tissue; physical and chemical methods of control; post-harvest disinfection and quarantine measures. Examination of current commercial storage and marketing operations.

FOOD1667
Postharvest Storage of Foods
Staff Contact: Dr JE Paton
CP21 S1 L2 T4
Prerequisite: FOOD1557 or equivalent
Pre-harvest considerations, post-harvest physiology and biochemistry, post-harvest factors affecting quality, methods of storage and handling, marketing strategies for selected food commodities.
FOOD1707
Seminar
Staff Contact: A/Prof H Greenfield
CP7 F T1
Students present material arising from literature and/or laboratory assignments and/or plant investigations in the food and related industries. Critical assessments are made of the results of research in food science and technology.

FOOD1717
Major Research Project
Staff Contact: Prof KA Buckle
CP63 F T9
A detailed investigation of a selected topic in food science and technology including submission of a project report.

FOOD1727
Research Project
Staff Contact: Prof KA Buckle
CP42 F T6
An investigation of an aspect of food science and technology and submission of a project report.

FOOD1737
Minor Project
Staff Contact: Prof KA Buckle
CP21 F T3
A study of an aspect of food science and technology and submission of a project report.

FOOD1747
Special Topics in Food Science and Technology
Staff Contact: Prof KA Buckle
CP21 S1 or S2 T6
An individually supervised program of investigation in specialised aspects of food science and technology not otherwise offered. Embraces a literature review, laboratory work and/or industrial liaison as may be appropriate. Available only to appropriately qualified students.

FOOD1757
Special Topics in Food Science and Technology
Staff Contact: Prof KA Buckle
CP10.5 S1 or S2 T3
An investigation similar to but shorter than that outlined in FOOD1747.

FOOD1767
Reading Assignment
Staff Contact: Prof KA Buckle
CP3.5 SS T1
A reading assignment in an area supporting candidates' major disciplines or commodity interests. Presentation of a seminar may be required.

FOOD2310
Food Microbiology
Staff Contact: Prof GH Fleet
CP10 S1 L2 T2
Prerequisite: MICR2218
A lecture and laboratory program on the ecology, biochemistry, isolation, enumeration and identification of bacteria, yeasts, fungi and viruses associated with foods and beverages. Food spoilage: specific food microorganism associations; taxonomy and biochemistry of major spoilage species; chemical and physical changes to food properties; control; spoilage of specific commodities. Foodborne microbial disease: foods as vectors of disease and food poisoning; statistics and epidemiology; ecology and taxonomy of food-borne pathogenic microorganisms; control and prevention by hygiene, microbiological standards and legislation. Food fermentation: microbial ecology and biochemistry of fermentations; fermentations of alcoholic beverages, bakery products, dairy products, meats, vegetables, cocoa beans, soy sauce; production of food ingredients and processing aids by fermentation. Microbiological examination of foods: sample preparation and sampling plans; sub-lethal injury; standard methods for determination of total plate counts, indicator organisms, food-borne pathogenic species, principal spoilage species. Microbiological quality assurance: specifications and standards; decision criteria; hazard analysis and critical control point (HACCP) concept; cleaning and sanitation.

FOOD2410
Advanced Food Microbiology
Staff Contact: Prof GH Fleet
CP15 S2 L2 T4
Prerequisite: FOOD2310
An advanced theoretical and practical treatment of the ecology, taxonomy, biochemistry and analytical technology of bacteria, yeasts, fungi and viruses associated with food spoilage, food-borne disease and food fermentations. Emphasis on: new developments in food microbiology; economic consequences of microorganisms in foods; exploitation of microorganisms in novel processes for the production of food ingredients and processing aids; new technologies for the detection of microorganisms in foods, including enzyme immunoassay, DNA probes, bioluminescence, impedance, epifluorescent filtration methods; practical problems associated with the microbiological analysis of foods and interpretation of data.

FOOD2420
Yeast Technology
Staff Contact: Prof GH Fleet
CP7.5 S1 L2 T1
Prerequisite: FOOD2310
Note/s: Not offered in 1997.

FOOD2430
Quality Assurance in Food Microbiology
Staff Contact: Dr JM Cox
CP5 S1 L1 T1
Prerequisite: FOOD2310
Theoretical concepts in, and application of traditional and modern approaches to microbiological quality assurance. HACCP. Cleaning and sanitation. Microbiological criteria and sampling plans. Local, national and international approaches to obtaining safe food. Management and quality assurance in the microbiology laboratory. Quality assurance of microbiological media.
FOOD2440
Microbial Food Spoilage
Staff Contact: Dr JM Cox
CP2.5 S2 L1
Prerequisite: FOOD2310

Detailed consideration of selected microbial groups responsible for spoilage yeasts, moulds, psychrotrophs. Spoilage of specific commodities - dairy products, fruits and vegetables, meat and fish. Impact of new processing and preservation technologies on prevention or modification of food spoilage. Biochemical basis of spoilage. Microbial taints. Predicting shelf-life and spoilage.

FOOD2450
Foodborne Microorganisms of Public Health Significance
Staff Contact: Dr JM Cox
CP5 S2 L2
Prerequisite: FOOD2310


FOOD2460
Food and Beverage Fermentations
Staff Contact: Prof GH Fleet
CP5 S2 L2
Prerequisite: FOOD2310

A detailed treatment of the microbial ecology, biochemistry, processing technology and quality parameters of fermented foods and beverages; cheese, yoghurt, novel dairy products; meat sausages; bread, biscuit/cracker doughs; soybean products, soy sauce, tempe; traditional fermented products of Asia and Africa; vegetables; cocoa beans; alcoholic beverages, beer, wine champagne, distilled spirit.

FOOD2470
Microorganisms as Food Processing Aids and Ingredients
Staff Contact: Prof GH Fleet
CP2.5 S2 L1
Prerequisite: FOOD2310

This subject interfaces with biotechnology and considers the use of microorganisms as primary sources of processing aids and ingredients for food processing. The microbial production of vitamins, flavouring agents, amino acids, enzymes, pigments, thickening agents, fats and oils, modified proteins, organic acids. Use of microbial species as biocontrol agents to extend shelf-life, as agents to improve the nutritive and therapeutic value of foods, immobilised cell and cell reactor technologies for conducting food beverage biocconversions.

FOOD2507
Introductory Microbiology
Staff Contact: Prof GH Fleet
CP14 S1 L2 T2
Note/s: Not offered in 1997.

This subject is designed as a prerequisite to FOOD2517 for students with very limited or no background in basic microbiology. It covers the fundamentals of microbial taxonomy, ecology, cytology and biochemistry and the basic technologies of microbial culture, isolation, enumeration and identification.

FOOD2517
Food Microbiology
Staff Contact: Prof GH Fleet
CP14 S1 L2 T2
Prerequisite: FOOD2507 or other introductory microbiology subject

A lecture and laboratory program on the ecology, biochemistry, isolation, enumeration and identification of bacteria, yeasts, fungi and viruses associated with foods and beverages. Food spoilage: specific food/microorganism associations; taxonomy and biochemistry of major spoilage species; chemical and physical changes to food properties; control of spoilage of specific commodities. Foodborne microbial disease: foods as vectors of disease and food poisoning; statistics and epidemiology; ecology and taxonomy of foodborne pathogenic microorganisms; control and prevention by hygiene, microbiological standards and legislation. Food fermentation: microbial ecology and biochemistry of fermentations; fermentation of alcoholic beverages, bakery products, dairy products, meats, vegetables, cocoa beans, soy sauce; production of food ingredients and processing aids by fermentation. Microbiological examination of foods: sample preparation and sampling plans; sub-lethal injury; standard methods for determination of total plate counts, indicator organisms, foodborne pathogenic species, principal spoilage species. Microbiological quality assurance: specifications and standards; decision criteria; hazard analysis and critical control point (HACCP) concept; cleaning and sanitation.

FOOD2527
Microbiological Examination of Foods
Staff Contact: Prof GH Fleet
CP21 S2 L2 T4
Prerequisite: FOOD2517 or equivalent


FOOD2537
Microbiological Quality Assurance
Staff Contact: Dr JM Cox
CP7 S1 L1 T1
Prerequisite: FOOD2507 or equivalent
Corequisite: FOOD2527

A theoretical and practical consideration of the management of microbiological quality assurance. HACCP. Cleaning and sanitation. Microbiological specifications and regulations. Local and international approaches to obtaining safe food. Management and quality assurance in the microbiology laboratory.
A study of an aspect of food microbiology and submission of a project report.

**Microbial Spoilage of Foods**

*Staff Contact: Dr JM Cox*

*CP3.5 S2 L1*

*Prerequisite: FOOD2517*

Consideration of major microbial groups responsible for spoilage yeasts, moulds, lactic acid bacteria, acetic acid bacteria, psychrophiles, lipolytics, proteolytics. Specific commodity groups: meat, dairy and fish products, fruits, vegetables. Impact of processing technologies on food spoilage and extension of shelf-life; biochemical basis of spoilage defects, taints; predictive considerations.

**Foodborne Microorganisms of Public Health Significance**

*Staff Contact: Dr JM Cox*

*CP7 S2 L2*

*Prerequisite: FOOD2517*

Corequisite: FOOD2527

An advanced treatment of the ecology, epidemiology, properties, pathogenicity, methods of analysis, economic significance and control of pathogenic microorganisms in foods. Salmonella, Shigella, Escherichia coli, Vibrio spp., Staphylococcus aureus, Bacillus spp., Clostridium perfringens, Clostridium botulinum, Yersinia, Listeria, Campylobacter, Aeromonas, Klebsiella, viruses, fungi.

**Food and Beverage Fermentations**

*Staff Contact: Prof GH Fleet*

*CP7 S2 L2*

*Prerequisite: FOOD2517*

A detailed treatment of the microbial ecology, biochemistry, processing technology and quality parameters of fermented foods and beverages: cheese, yogurt, novel dairy products; meat sausages; bread, biscuit/cracker doughs; soybean products, soy sauce, tempe; traditional fermented products of Asia and Africa; vegetables; cocoa beans; alcoholic beverages, beer, wine, champagne, distilled spirit.

**Microorganisms as Food Processing Aids and Ingredients**

*Staff Contact: Prof GH Fleet*

*CP3.5 S2 L1*

*Prerequisite: FOOD2517*

This subject interfaces with biotechnology and considers the use of microorganisms as primary sources of processing aids and ingredients for food processing. The microbial production of vitamins, flavouring agents, amino acids, enzymes, pigments, thickening agents, fats and oils, modified proteins, organic acids. Use of microbial species as biocontrol agents to extend shelf-life, as agents to improve the nutritive and therapeutic value of foods, immobilised cell and cell reactor technologies for conducting food and beverage bioconversions.

**Food Microbiology Seminar**

*Staff Contact: Dr JM Cox*

*CP7 S1 T1 S2 T1*

Students present material arising from literature and/or laboratory assignments and/or plant investigations in the area of food microbiology. Critical assessments are made of the results of research in food microbiology.

**Major Research Project in Food Microbiology**

*Staff Contact: Prof GH Fleet*

*CP63 F T9*

An investigation of an aspect of food microbiology including a literature survey, experimental work and submission of a project thesis.

**Introductory Nutrition**

*Staff Contact: A/Prof H Greenfield*

*CP7.5 S1 L2 T1*

*Corequisite: BIOC2101, BIOC2201*

Role of nutrients in human structure and function. Effects of diet on growth and body size. Food habits, beliefs and choice; dietary patterns. Assessment of nutritional status; anthropometry, dietary intake studies, use of dietary recommendations, food groups, tables of food composition.

**Nutrition**

*Staff Contact: A/Prof H Greenfield*

*CP7.5 S2 L2 T1*

*Corequisites: BIOC2101, BIOC2201, FOOD3210*

Nutritional needs of vulnerable groups: infants, pregnant and lactating women, the aged. Dietary intolerance, disorders related to the affluent diet including coronary heart disease, dental caries, diabetes, hypertension and cancer. Problems of under-nutrition including protein, energy, mineral and vitamin deficiencies. Physiological and nutritional aspects of dietary fibre, alcohol and food intolerance. Measurement of nutrient intake using computer systems, on individual and group bases.

**Nutrient Analysis of Foods**

*Staff Contact: Dr J Arcot*

*CP15 S1 L2 T4*

*Prerequisite: FOOD3310 or equivalent*

Principles of nutrient analysis of foods by chemical and biospecific procedures. Sampling, quality assurance of analytical results, data scrutiny and compilation. Practical exercises in nutrient analysis of foods using bench, instrumental and biospecific techniques.
FOOD3420
Population and Applied Nutrition
Staff Contact: A/Prof H Greenfield
CP5 S2 L2
Prerequisite: FOOD3310 or equivalent

Structure of the population. Food supplies, food consumption, food and nutrition policy, nutritional epidemiology. Population dietary references such as food balance sheets, nutrition monitoring and surveillance, dietary reference values. Food programs such as food fortification, supplementary feeding schemes, nutritional rehabilitation, nutritionally modified foods, nutritional regulations and standards, nutrition education, dietary and other nutrition interventions (ORT, family planning, infection control, growth monitoring). Principles and practice of applied nutrition programs. Evaluation of applied nutrition programs.

FOOD3430
Special Dietary Foods and Ingredients
Staff Contact: Dr J Arcot
CP2.5 S2 L1


FOOD3507
Introductory Nutrition
Staff Contact: A/Prof H Greenfield
CP10.5 S1 L2 T1

Role of nutrients in human structure and function. Effects of diet on growth and body size. Food habits, beliefs and choice; dietary patterns. Assessment of nutritional status; anthropometry, dietary intake studies, use of dietary recommendations, food groups, tables of food composition.

FOOD3517
Nutrition
Staff Contact: A/Prof H Greenfield
CP10.5 S2 L2 T1
Prerequisite: FOOD3507 or equivalent

Nutritional needs of vulnerable groups: infants, pregnant and lactating women, the aged. Dietary intolerance, disorders related to the affluent diet including coronary heart disease, dental caries, diabetes, hypertension and cancer. Problems of under-nutrition including protein, energy, mineral and vitamin deficiencies. Physiological and nutritional aspects of dietary fibre, alcohol and food intolerance. Measurement of nutrient intake using computer systems, on individual and group basis.

FOOD3527
Nutritional Evaluation of Foods
Staff Contact: Dr J Arcot
CP21 S1 L2 T4
Prerequisite: FOOD3517 or equivalent

Principles of nutrient analysis of foods by chemical and biospecific procedures. Sampling, quality assurance of analytical results, data scrutiny and compilation. Practical exercises in nutrient analysis of foods using bench, instrumental and biospecific techniques. Literature search.

FOOD3537
Public Health Nutrition
Staff Contact: A/Prof H Greenfield
CP7 S2 L2
Prerequisite: FOOD3527 or equivalent

Structure of the population. Food supplies, food consumption, food and nutrition policy, nutritional epidemiology. Population dietary references such as food balance sheets, nutrition monitoring and surveillance, dietary reference values. Food programs such as food fortification, supplementary feeding schemes, nutritional rehabilitation, nutritionally modified foods, nutritional regulations and standards, nutrition education, dietary and other nutrition interventions (ORT, family planning, infection control, growth monitoring). Principles and practice of applied nutrition programs. Evaluation of applied nutrition programs. Project work.

FOOD3547
Nutritionally Modified Foods and Ingredients
Staff Contact: Dr J Arcot
CP3.5 S2 L1
Prerequisite: FOOD3517 or equivalent


FOOD3557
Advanced Nutritional Science
Staff Contact: A/Prof H Greenfield
CP7 S2 T2
Prerequisite: FOOD3527 or equivalent

Selected advanced topics e.g. nutrient bioavailability studies, nitrogen balance tests, vitamin load tests, sodium and potassium excretions, creatinine excretions, physical activity diaries, fitness assessment, biochemical assessment, design and evaluation of nutritional epidemiology studies, food intake studies, duplicate diet analyses.

FOOD4210
Introductory Food Engineering
Staff Contact: Dr JL Paterson
CP7.5 S1 L2 T1
Prerequisites: PHYS1002 or PHYS1022 and MATH1141 and MATH1241 or MATH1131 and MATH1231 or MATH1042 or MATH1011 and MATH1021

Units and dimensions. System conversions. Material, momentum and energy balances. Steady state and transient heat transfer; insulation; heat exchangers. Solid and fluid rheology; viscosity; pumps; mixing.

FOOD4310
Food Process Engineering
Staff Contact: Dr RH Driscoll
CP10 S2 L2 T2
Prerequisite: FOOD4210

FOOD4320
Computer Applications
Staff Contact: Dr RH Driscoll
CPS S2 L1 T1
Prerequisite: MATH2819

Introduction to the DOS operating system and WINDOWS. The use of statistical, graphics and other program packages to solve problems in food science and technology.

FOOD4420
Food Packaging
Staff Contact: Dr JL Paterson
CP7.5 S1 L2 T1
Pre or Corequisite: FOOD1310

Chemical and physical properties of packaging materials. Interaction between package and food, selection and evaluation of packaging materials and systems, design, printing, computers, modified atmosphere, smart films.

FOOD4430
Advanced Food Engineering A
Staff Contact: Dr RH Driscoll
CP7.5 S1 L2 T1
Prerequisites: FOOD4210, FOOD4310

Extrusion of food products, membrane technology, refrigeration, chilling, freezing, thawing, tempering, cold room design, process control.

FOOD4440
Advanced Food Engineering B
Staff Contact: Dr RH Driscoll
CP7.5 S2 L2 T1
Prerequisites: FOOD4210, FOOD4310

Mechanical and chemical separation, evaporation, distillation, psychrometry, drying, dryers, mass/energy balances, calculation of drying time, commercial equipment, current drying research.

FOOD4507
Food Engineering Principles
Staff Contact: Dr JL Paterson
CP10.5 S2 L2 T1
Prerequisite: First year mathematics and physics or equivalents

Units and dimensions; system conversions; material, energy and momentum balances; steady state and transient heat transfer; insulation; heat exchangers; solid and fluid rheology; viscosity; pumps; mixing.

FOOD4517
Unit Operations in Food Engineering
Staff Contact: Dr RH Driscoll
CP14 S2 L2 T2
Prerequisite: FOOD4507 or equivalent

Refrigeration; freezing; chilling and thawing; evaporation; dehydration; extraction; distillation; extrusion; comminution; filtration and separation; process control; packaging.

FOOD4537
Computing in Food Science
Staff Contact: Dr RH Driscoll
CP7 S2 L1 T1
Prerequisite: An introductory statistics subject or equivalent

Introduction to the DOS operating system and WINDOWS. The use of statistical, graphics and other program packages to solve problems in food science and technology.

FOOD4557
Food Engineering Laboratory
Staff Contact: Dr JL Paterson
CP10.5 S2 T3
Prerequisite: FOOD4587

Laboratory and pilot plant exercises illustrating the principles and procedures involved in food processing and food quality assessment.

FOOD4567
Food Engineering Field Work
Staff Contact: Dr JL Paterson
CP10.5 S3 T1.5

Inspection of food processing factories, agricultural and food research establishments and food producing areas.

FOOD4577
Advanced Food Engineering A
Staff Contact: Dr RH Driscoll
CP14 S1 L3 T1
Corequisite: FOOD4517 or equivalent

Extrusion of food products, membrane technology, refrigeration, chilling, freezing, thawing, tempering, cold room design, process control, numerical techniques and modelling.

FOOD4597
Advanced Food Engineering B
Staff Contact: Dr RH Driscoll
CP14 S2 L3 T1
Corequisite: FOOD4517 or equivalent

Mechanical and chemical separation, evaporation, distillation, psychrometry, drying, dryers, mass/energy balances, calculation of drying time, commercial equipment, current drying research.

FOOD4607
Packaging and Production
Staff Contact: Dr JL Paterson
CP14 S1 L3 T1

Chemical and physical properties of package materials; interaction between package and food; selection and evaluation of packaging materials and systems; package design criteria; printing; computers in packaging; modified atmospheres. Corrosion; scale-up; waste engineering; CIP systems; plant design.

FOOD9410
Honours Research Project
Staff Contact: Dr JM Cox
CP100 S3

An extensive research project on some aspects of food science and technology, including preparation of a literature review, conduct of laboratory-based research, presentation of two seminars, and submission of a thesis based on the results of the research project. Candidates will undertake corequisite formal coursework as approved by the Head of Department.
The School contains the Departments of Chemical Engineering and Industrial Chemistry which service undergraduate degree courses, and the Departments of Fuel Technology and Polymer Science and the Centre for Minerals Engineering in conjunction with the School of Mines and School of Materials Science and Engineering which offer professional electives in these degree courses. A professional elective in Biological Process Engineering is also available from the Department of Biotechnology.

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.

Fuel engineering is primarily concerned with the practical and economic applications of scientific knowledge and engineering experience to the production, processing and utilisation of fuels and energy.

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 courses, 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 course, students in Chemical Engineering must obtain a minimum of twelve weeks' professionally oriented or industrial experience.

It is compulsory that, before graduation, students in the full-time courses in Industrial Chemistry obtain a minimum of twelve weeks' professionally oriented or industrial experience. Students in the part-time courses in Industrial Chemistry must complete an approved program of industrial experience of not less than twelve months prior to the award of the degree.
Students are expected to possess a calculator having exponential capabilities (In x and exp x or ‘x to the y’); 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 expected to have a copy of Perry J H ed. Chemical Engineers’ Handbook 6th ed. McGraw-Hill. This book is used extensively for most subjects and units. Certain subjects and units do not have specified textbooks and in these cases reference books are used or printed notes supplied.

**Course Outlines**

**3040 Chemical Engineering Full-time Course**

**Bachelor of Engineering**

BE

This course 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 course 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.

Various course patterns involving full-time or part-time study may be approved by the Head of School.

With one additional year of study, it is possible, upon completion of the Petroleum Engineering program 3045, to obtain a double BE degree in Petroleum and Chemical Engineering 3046 because the first two years of the Petroleum Engineering course are identical to the first two years of the Chemical Engineering course.

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### Main Electives

#### Fuel and Energy Engineering

The Department of Fuel Technology offers a professional elective in Fuel and Energy Engineering designed for those students interested in the application in the fourth year of the course.

Students choosing this professional elective should take the subjects listed in the table below in lieu of CHEN4010, CHEN4020, CHEN4030, CHEN4100, CHEN4120.

This elective may qualify graduates for membership of the Australian Institute of Energy and the Institute of Energy UK.

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#### Minerals Engineering

Jointly run by the School of Chemical Engineering and Industrial Chemistry and the School of Mines, the Minerals electives is offered to students who wish to obtain a basic training in preparation for a career in the mineral industry.

Students choosing this elective should take the required subjects listed in the table below for Year 4 in lieu of the following subjects: CHEN4010 Separations 2, CHEN4020 Advanced Reaction Engineering, CHEN4030 Safety and Environmental, CHEN4100 Professional Electives and CHEN4120 Process Plant Management and Operations.

This elective may qualify graduates for membership of the Australian Institute of Mining and Metallurgy.

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

This course requires an approved program of twelve months of industrial training prior to the award of the degree.

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### Industrial Chemistry Full-time Course

#### Bachelor of Science BSc

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

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

Various course patterns involving full-time and part-time study may be approved by the Head of School.
Year 4

APSE0002 Social Issues in Applied Science  2  0  5
CEIC4020 Process Economics 2  1  0  2.5
INDC4040 Management  2  0  5
INDC4060 Process Design  3  4  17.5
INDC4070 Laboratory Automation Science  4  0  10
INDC4080 Seminars  2  2  10
INDC4090 Project  8  16  60
INDC4130 Environmental Chemistry of Industrial Processes  2  0  5

POLY4010 Advanced Polymer Science  2  0  5
General Education subject/s  0  2  7.5

Total HPW Session 1  26
Total HPW Session 2  24
Total Credit Points  127.5

3110
Industrial Chemistry Part-time Course

Bachelor of Science (Technology)
BSc (Tech)

This course requires an approved program of 12 months of industrial training prior to the award of the degree.

Stages 1 and 2*

CHEM1101 Chemistry 1A  6  0  15
CHEM1201 Chemistry 1B  0  6  15
INDC1020 Engineering 1 IC  6  6  30
MATH1131 Mathematics 1A or  6  0  15
MATH1141 Higher Mathematics 1A  6  0  15
MATH1231 Mathematics 1B or  0  6  15
MATH1241 Higher Mathematics 1B  0  6  15
PHYS1002 Physics 1  6  6  30

Total HPW Session 1  24
Total HPW Session 2  24
Total Credit Points  120

*Physics and Mathematics are usually taken in Stage 1 and the other subjects in Stage 2.
Graduate Study

Course Outlines

Formal courses in the School of Chemical Engineering and Industrial Chemistry lead to the award of the Master of Applied Science in Process Engineering 8016 or Fuel Technology 8060.

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

PhD
Chemical Engineering 1010
Industrial Chemistry 1016

MSc
Chemical Engineering 2010
Industrial Chemistry 2016

ME
Chemical Engineering 2150

Master of Applied Science Degree Courses

The MAppSc degree courses involve a project which must integrate and apply the principles treated in the course. 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 student's approach, and the results must be embodied in a report and submitted in accordance with the University's requirements.

The following Master of Applied Science degree courses are available in the School of Chemical Engineering and Industrial Chemistry.

Process Engineering Course 8016
Fuel Technology Course 8060

Proposed study programs should be submitted to the Head of the School for advice and recommendation. Each individual course must be approved by the Higher Degree Committee of the Faculty of Applied Science. An acceptable course would be a program of formal study aggregating approximately 18 hours weekly for two sessions full-time or 9 hours weekly for four sessions part-time, and which could comprise:

1. A major strand of course material making up 75% of the total program. This includes a project constituting not less than 15% and not more than 30% of the program;

2. A minor strand of broader-based supporting material making up to 25% of the total program; and

3. Undergraduate material, which may be included in one or both strands but may not exceed 25% of the total program.

Approximately 60% of the program (including the project) must be undertaken in the School of Chemical Engineering and Industrial Chemistry. The remainder, subject to approval and availability, may be undertaken in other Schools within the University.

Courses will be run in any year only if sufficient applications are received. A minimum number of 5 registrations is usually required.

8016
Process Engineering

Master of Applied Science
MAppSc

The course 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 course in a series of modules over a somewhat longer period. The degree can be obtained by taking a combination of subjects to a minimum number of 120 credit points.

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

Whilst the program is aimed at maximum flexibility four subjects will be considered as core subjects. These are CEIC5310 Computing Studies in Process Industries, CEIC5311 Instrumental Analysis in Process Industries, CEIC5312 Safety and Communication in the Process Industries, and CEIC5313 Environmental Technologies in Process Industries. These core subjects could be substituted if a student can demonstrate skills in these areas. The core subjects will be offered at periods most convenient to the resource utilisation of the School. 24 credit points can be taken as electives which will be given as one week intensive courses. A 48 credit point project on relevant aspects of process industries, supervised by academic members of staff must be undertaken. Assessment of the project report will be undertaken by at least 2 staff members.

Each student program must be approved by the Head of School or Graduate Studies Coordinator.

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

Core subjects (12 credit points)

CEIC5310 Computing Studies in the Process Industries
CEIC5311 Instrumental Analysis in the Process Industries
CEIC5312 Safety and Communications in the Process Industries
CEIC5313 Environmental Technologies

Project (48 credit points)

CEIC5320 Process Engineering Project
<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
</tr>
</thead>
<tbody>
<tr>
<td>CEIC5330</td>
<td>Process Engineering and the Petroleum Industry</td>
</tr>
<tr>
<td>CEIC5331</td>
<td>Process Engineering: Natural Gas and Light</td>
</tr>
<tr>
<td>CEIC5332</td>
<td>Process Engineering in the Food Industry</td>
</tr>
<tr>
<td>CEIC5335</td>
<td>Advanced Computer Methods in the Process Industries</td>
</tr>
<tr>
<td>CEIC5336</td>
<td>Environmental Chemistry in the Process Industries</td>
</tr>
<tr>
<td>CEIC5337</td>
<td>Particle Characterisation in the Process Industries</td>
</tr>
<tr>
<td>CEIC5340</td>
<td>Polymer Synthesis: Fundamentals and Techniques</td>
</tr>
<tr>
<td>CEIC5341</td>
<td>Membrane Technology in the Process Industries</td>
</tr>
<tr>
<td>CEIC5333</td>
<td>Experimental Design in the Process Industries</td>
</tr>
</tbody>
</table>

**8060 Fuel Technology**

**Master of Applied Science MAppSc**

This course is under review and will not be offered in 1997.
Subject Descriptions

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

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

APSE0002
Social Issues in Applied Science
Staff Contact: School Office
CP5 S1 2HPW

The subject covers social issues arising from future technological developments and the role that a professional applied scientist can play in influencing future directions. It will be taught by a combination of group activity, case studies and projects and seminars from visiting speakers, some of whom will be from disciplines other than the applied sciences.

CEIC0010
Mass Transfer and Material Balances
Staff Contact: A/Prof M Brungs
CP10 F L1 T1
Prerequisites: CHEM1101, CHEM1201, CIVL2505
Note/s: Servicing subject i.e. a subject taught within courses offered by other faculties.

CEIC0020
Fluid/Solid Separation
Staff Contact: A/Prof JA Raper
CP5 SS L1 T1
Note/s: Servicing subject i.e. a subject taught within courses offered by other faculties.

CEIC0030
Environmental Protection in the Process Industries
Staff Contact: Dr P Crisp
CP15 S1 L1 T1 S2 L2 T2
Prerequisites: CEIC0010, INDC4120
Note/s: Servicing subject i.e. a subject taught within courses offered by other faculties.
The course comprises four components:

Process safety

Industrial air pollution control

Industrial waste treatment

Analysis of pollutants

CEIC0040
Unit Operations in the Process Industries
Staff Contact: Dr PT Crisp
CP10 S1 L2 S2 T2
Prerequisites: CHEM1101, CHEM1201, PHYS1989, CEIC0010
Note/s: Servicing subject, i.e. a subject taught within courses offered by other faculties.

CEIC0050
Atmospheric and Process Chemistry
Staff Contact: Dr PT Crisp
CP7.5 S1 L2 T1
Prerequisites: CHEM1101, CHEM1201
Note/s: Servicing subject, i.e. a subject taught within courses offered by other faculties.
Provides essential chemistry for understanding the processes which are responsible for air pollution. Composition and structure of the atmosphere. Natural gas chemistry. Free-radical gas-phase chemistry. Sources,

CEIC2010
Instrumental Analysis
Staff Contact: A/Prof M Brungs
CP15 F L1 T2
Prerequisites: PHYS1002, CHEM1101 and CHEM1201, MATH1032 or MATH1231 or MATH1042 or MATH1241, CHEN1020 or IND1020

Data treatment, error analysis and propagation of errors. Basic principles of volumetric analysis. Solubility and pH calculations. Electronic analysis, potentiometric, volumetric and coulometric. Spectrophotometric - analysis UV/visible, atomic emission, atomic absorption, X ray diffraction and fluorescence. Chromatographic analysis, gas chromatography, high performance liquid chromatography, and ion chromatography.

CEIC2020
Computing
Staff Contact: Dr T Pham
CP7.5 S1 L1 S2 L1 T1
Prerequisites: MATH1032 or MATH1231 or MATH1042 or MATH1241, CHEM1101 and CHEM1201, PHYS1002, CHEN1020 or IND1020

Computing for technical applications. Operating systems: VAX computers, the VMS operating system and the EDT editor. The FORTRAN language. Elementary numerical methods; library subprograms; structures of program modules for technical calculations. The BASIC language.

CEIC2030
Applied Thermodynamics and Rate Processes
Staff Contact: A/Prof R Chaplin
CP6.5 S1 L1.5 T1
Prerequisites: PHYS1002, CHEM1101 and CHEM1201, MATH1032 or MATH1231 or MATH1042 or MATH1241, CHEN1020 or IND1020


CEIC2040
Applied Electrochemical and Surface Processes
Staff Contact: A/Prof R Chaplin
CP4 S1 L1.5
Prerequisites: PHYS1002, CHEM1101 and CHEM1201, MATH1032 or MATH1231 or MATH1042 or MATH1241, CHEN1020 or IND1020


CEIC3010
Reaction Engineering
Staff Contact: Prof N Foster
CP7.5 S2 L2 T1
Prerequisites: CEIC2020, CEIC2030, CEIC2040, CHEN2010 or IND1010, CHEN2020 or IND2020, CHEN2030 or IND2030


CEIC4010
Process Economics 1
Staff Contact: A/Prof T Tran
CP2.5 S1 L1

Consists of the segment Process Economics CHEN3060
Process Plant Engineering 1

CEIC4020
Process Economics 2
Staff Contact: A/Prof T Tran
CP2.5 S2 L1


CEIC4070
Laboratory Automation for Ceramic Engineers
Staff Contact: Dr C Dixon
CP8 S1 L1 T1

Note/s: Servicing subject i.e. a subject taught within courses offered by other faculties.

Application of microprocessors to laboratory automation. Basics of computing hardware and process interface hardware (A/D, D/A conversion, digital I/O, etc.) Elements of real-time computing and software associated with the process interface. Real-time data acquisition, signal processing, discrete and sequential control of selected relevant example processes.

CEIC4200
Industrial Experience
Staff Contact: Dr C Dixon
CP40

Students in the four-year courses must obtain a minimum of twelve weeks professionally oriented or industrial experience prior to the award of the degree.
CEIC4210
Industrial Experience
Staff Contact: Dr C Dixon
CP0

Students in the BSc (Tech) course in Industrial Chemistry must complete an approved program of industrial experience of not less than twelve months prior to the award of the degree.

CEIC5000
Major Project
Staff Contact: A/Prof G Sergeant (Dept of Fuel Technology)
Staff Contact: A/Prof R Burford (Dept of Polymer Science)
CP30

A substantial project on some aspects of chemical engineering, industrial chemistry, polymer science, fuel technology or biological process engineering.

CEIC5010
Minor Project
Staff Contact: A/Prof G Sergeant (Dept of Fuel Technology)
Staff Contact: A/Prof R Burford (Dept of Polymer Science)
CP15

A minor investigation on some aspect of chemical engineering, industrial chemistry, polymer science, fuel technology or biological process engineering.

CEIC5310
Computing Studies in the Process Industries
Staff Contact: Dr T Pham
CP12


CEIC5311
Instrumental Analysis in the Process Industries
Staff Contact: A/Prof M Brungs
CP12

The 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).

CEIC5312
Safety and Communications in the Process Industries
Staff Contact: Prof D Trimm
CP12


CEIC5313
Environmental Technologies
Staff Contact: Prof A Fane
CP12

This subject deals with conventional and advanced separation processes for pollution control, effluent treatment and waste minimisation in the Process Industries. Topic areas covered will be selected from: Gravity Separations, Filtration Processes, Sorption Processes, Extraction Processes, Membrane Technology, Biological Processes, Design, Control and Monitoring, Clean Production Technologies.

CEIC5320
Process Engineering Project
Staff Contact: A/Prof R Chaplin
CP48

An investigation of a problem in any area related to process engineering which involves a significant research or design component. Such an investigation should be related to the research interests and expertise of staff in the School of Chemical Engineering and Industrial Chemistry. If the student chooses a research project, a course on research methods must also be taken.

CEIC5330
Process Engineering In the Petroleum Industry
Staff Contact: Dr A Adesina
CP12


CEIC5331
Process Engineering: Natural Gas and Light Hydrocarbons to Petrochemicals
Staff Contact: Dr A Adesina
CP12

halogenation compounds. Manufacture of vinyl monomers and condensation polymer feedstocks.

CEIC5332
Process Engineering in the Food Industry
Staff Contact: Dr T Pham
CP12
This course covers the application of process engineering techniques in the food industry, with its particular emphasis on product sensory quality and hygiene. The topics considered will include evaporation and drying, separation, refrigeration, thermal processing, prediction of quality and microbiological changes, and computer techniques. The course will include lectures, assignments and one major design project.

CEIC5333
Experimental Design in the Process Industries
Staff Contact: A/Prof R Chaplin
CP12
This course is structured to provide a sound introduction to the fundamentals of experimental design and its impact on productivity and quality in research development and manufacturing processes. Topics covered will include: basic statistical hypothesis testing, quality control, control charts, regression analysis, fractional designs, fractional factorial designs, screening designs, linear and curve-linear models, non-linear models, Taguchi concepts, optimisation, response surface concepts.

CEIC5335
Advanced Computer Methods in the Process Industries
Staff Contact: A/Prof R Chaplin
CP12
Solution of Process Engineering problems, troubleshooting and Process Design utilising advanced computer applications including flowsheeting, numerical methods, statistical design, CAD and process integration.

CEIC5336
Environmental Chemistry in the Process Industries
Staff Contact: Dr P Crisp
CP12
Introduction to the chemical processes underlying major problems. The following topics will be covered: soil chemistry, acid rain, land degradation, urban air pollution, ozone depletion, global climatic change, radioactive contamination, alternative energy sources, chemical 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.

CEIC5337
Particle Characterisation in the Process Industries
Staff Contact: A/Prof J Raper
CP12
This course will cover theoretical principles and practical aspects of methods of characterising fine particulate materials. Characteristics investigated include: particle size and size distribution, density, porosity, surface area, zeta potential and electrostatic charge, morphology and structure. Techniques covered include: sedimentation, optical techniques, electrozone sensing, image analysis, time of flight analysis, inertial impaction, mercury porosimetry, gas adsorption, helium pycnometry, morphological analysis. Practical examples of industrial applications will be given together with laboratory demonstrations using all the techniques.

CEIC5340
Polymer Synthesis: Fundamentals and Techniques
Staff Contact: A/Prof R Chaplin
CP12

CEIC5341
Membrane Technology in the Process Industries
Staff Contact: Prof A Fane
CP12
Classification of membranes and membranes processes. Driving forces and mass transfer mechanisms. Characterisation for membranes. Control of concentration polarisation and fouling. Aspects of the design of membranes, membrane modules and membrane systems. Operating principles of major membrane processes include microfiltration, ultrafiltration, nanofiltration, reverse osmosis, dialysis, electrodialysis, membrane distillation, pervaporation, gas permeation, liquid membranes. Selected applications and economic aspects of membrane technology in the fields of biotechnology, biosensors (including bioreactors), controlled release, chemical and food processing, water and waste treatment.

CEIC5342
Energy Management in the Process Industries
Staff Contact: A/Prof G Sergeant
CP12
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.

CEIC5630
Industrial Water and Wastewater Engineering
Staff Contact: Prof AG Fane
CP12 S2 L3
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.
CEIC5890
Graduate Colloquia
Staff Contact: School Office
CP24

Colloquia on research developments in the School of Chemical Engineering and Industrial Chemistry. Students are required to participate actively in the colloquia and give at least one dissertation based on their own investigations.

CEIC5900
Specialist Lectures
Staff Contact: School Office
CP24

CEIC5930
Safety in Laboratories
Staff Contact: A/Prof R Chaplin
CP4 S1


CHEN1010
Introduction to Chemical Engineering
Staff Contact: Dr D Wiley
CP10 F L1 T1

Introduction to the processing industry and chemical engineering practice. The role and responsibilities of the chemical engineer. Introduction to materials of construction for the processing industries. Application of process calculations in chemical process operations. Conventions in methods of analysis and measurement. The chemical equation and stoichiometry. Introduction to material balancing. Process calculations associated with gases, vapours and liquids.

CHEN1020
Engineering 1 CE
Staff Contact: Dr C Dixon
CP30 S1 L2 T4 S2 L3 T3

This subject comprises CHEN1010 Introduction to Chemical Engineering, MECH0130 Engineering Drawing and Descriptive Geometry and MECH0330 Engineering Mechanics.

Each subject is described elsewhere in this handbook. Prospective students should note the following: It is not necessary to pass each of the three component subjects individually; however, for a student who does not pass all components separately the composite mark for the whole subject is not calculated by a simple averaging process. For a component subject in which a passing mark is not obtained, heavier weighting is applied; the lower the mark the heavier the weighting. The details of the calculation method are explained in the first week of the course. A student who is repeating the subject after failure must repeat all three components. No exemptions will be granted for components that were passed at an earlier attempt.

CHEN2010
Material and Energy Balances
Staff Contact: A/Prof M Brungs
CP10 F L1 T1

Prerequisites: CHEM1020, CHEN1020, MATH1032 or MATH1231 or MATH1042 or MATH1241, PHYS1002


CHEN2020
Flow of Fluids
Staff Contact: Dr R Amal
CP10 F L1 T1

Prerequisites: PHYS1002, CHEN1020, CHEM1101 and CHEM1201, MATH1032 or MATH1231 or MATH1042 or MATH1241


CHEN2030
Heat Transfer
Staff Contact: Dr R Sheikholeslami
CP7.5 S2 L2 T1

Prerequisites: PHYS1002, CHEN1020, CHEM1101 and CHEM1201, MATH1032 or MATH1231 or MATH1042 or MATH1241

CHEN2040
Mass Transfer Fundamentals
Staff Contact: Dr A Adesina
CP5 S2 L1 T1
Prerequisites: PHYS1002, CHEM1101 and CHEM1201, CHEN1020, MATH1032 or MATH1231 or MATH1042 or MATH1241

An introduction to the significance of mass transfer to the chemical engineer. Topics to be covered include: mechanisms of mass transfer, mass transfer driving forces, molecular diffusion, mass transfer models, phase equilibrium. Discussion of application of mass transfer in the chemical process industries.

CHEN2051
Chemical Engineering Laboratory I
Staff Contact: Prof N Foster
CP12.5 S1 T3 S2 T2
Prerequisites: PHYS1002, CHEM1101 and CHEM1201, CHEN1020, MATH1032 or MATH1231 or MATH1042 or MATH1241

An introduction to laboratory work in chemical engineering including information retrieval techniques. Experiments designed to demonstrate physical processes in industrial situations.

CHEN3010
Engineering Thermodynamics
Staff Contact: Dr D Wiley
CP10 S1 HPW4
Prerequisites: CEIC2030, CEIC2040, CHEN2010, CHEN2020


CHEN3020
Quantification of Chemical Processes
Staff Contact: Dr DC Dixon
CP7.5 S1 L1 S2 L1 T1
Prerequisites: CEIC2020, MATH2021, MATH2819

Basic concepts in process quantification. Solutions to chemical engineering applications by use of single and multiple, linear and non-linear, non-derivative equations. Optimisation of chemical processes. Single and multiple dimensional search, linear programming, dynamic programming applications to process industry problems.

CHEN3030
Fluids 2
Staff Contact: Dr T Pham
CP5 S1 HPW2
Prerequisites: CEIC2020, CHEN2020, MATH2021

CHEN3061
Process Plant Engineering 1(Petroleum Engineering)
Staff Contact: Mr A Papagelis
CP17.5 S1 L3 S2 L3 T1
Prerequisites: CHEN2010, CHEN2020, CHEN2030, MATH2021
Subject description as for CHEN3060

CHEN3070
Process Control
Staff Contact: Dr C Dixon
CP5 S2 L2
Prerequisites: CEIC2010, CEIC2020, MATH2021

CHEN3080
Chemical Engineering Laboratory 2
Staff Contact: Prof N Foster
CP7.5 F T1.5
Prerequisites: CHEM2828, CHEM2011, CEIC2010, CEIC2020, CHEN2010, CHEN2020, CHEN2030, CHEN2040, CHEN2050, MATH2021, MATH2819
An integrated chemical engineering laboratory incorporating experiments in fluid flow, heat transfer, mass transfer, thermodynamics and kinetics, instrumentation and process dynamics and control. The objectives of this laboratory are: to demonstrate, reinforce and extend the principles of chemical engineering which are covered elsewhere in the course; to introduce various laboratory techniques which are used in the experimental investigation of chemical engineering problems; to develop an interest in experimentation, and to develop a proficiency in technical report writing.

CHEN3090
Chemical Engineering Applications
Staff Contact: A/Prof Tam Tran
CP20 F L2 T2
Prerequisites: CHEM2011, CEIC2020, CHEN2010, CHEN2020, CHEN2030, MATH2021, MATH2819
Application of chemical engineering principles to biochemical engineering, fuel engineering, and minerals processing. Integrated problems illustrating skills in process analysis.

CHEN4010
Separation Processes 2
Staff Contact: Dr T Pham
CP5 S1 L1 T1
Prerequisite: CHEN3010, CHEN3020, CHEN3040, MATH3021

CHEN4020
Advanced Reaction Engineering
Staff Contact: Dr A Adesina
CP5 S1 L1 T1
Prerequisites: CEIC3010, CHEN3020, CHEN3030, CHEN3040, MATH3021

CHEN4030
Environmental Pollution Control
Staff Contact: Prof A Fane
CP5 S1 L2
Prerequisites: CHEN3030, CHEN3040, CHEN3050, CHEN306
Water pollution design and operation strategies; treatment operations; economic aspects. Air pollution- effluent dispersions: types of gas cleaning units, choice of gas cleaning equipment. Noise pollution and pollution control legislation.

CHEN4070
Process Dynamics and Control
Staff Contact: Dr C Dixon
CP12.5 S1 L2 T1 S2 L1 T1
Prerequisites: CEIC3010, CHEN3020, CHEN3070, MATH3021
Common types of feedback controllers; translating control problems into block diagrams. Closed loop relationships and response; stability analysis for SISO systems; feedback controller tuning. Open and closed loop dynamic behaviour of systems of different order and how best to control these systems. Effect of dead time on control; introduction to dead time compensation. Introduction to cascade, feed forward and ratio control. Application of digital computers to real time control; interfacing computers with processes; distributed control systems; data acquisition and process monitoring; digital implementation of control algorithms. Introduction to multi-variable control.

CHEN4081
Design Project
Staff Contact: Dr D Wiley
CP15 S1 T3 S2 T3
Prerequisite: All Year 3 subjects
Safety: Techniques for assessing safety of existing and proposed plants. Systems reliability, HAZOP and HAZAN. Pressure and explosion relief. Laboratory Safety. This project will cover the engineering of a small 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 institution's accreditation standards.
CHEN4090
Research Project
Staff Contact: Dr D Wiley
CP30 S1 T2 S2 T10
Prerequisites: All Year 3 subjects
The experimental investigation of some aspect of chemical engineering.

FUEL0050
Fuel and Energy Engineering for Process Metallurgy
Staff Contact: Dr JF Stubington
CP7.5 S1 L2 S2 L1
An introduction to combustion technology, fuel plant technology and fuel processing.

FUEL4010
Fuel and Energy Engineering 2
Staff Contact: Dr JF Stubington
CP32.5 S1 L5 T4 S2 L2 T2
Combustion engineering. Furnace and fuel plant design. Energy management. Technologies for the efficient use of fuel. Properties and evaluation of fuels for their application. Laboratory work on burners, furnaces, combustion, efficiency, etc.

FUEL4090
Fuel and Energy Research Project
Staff Contact: Dr JF Stubington
CP30 S1 T2 S2 T10
Investigation of some aspect of fuel engineering.

FUEL5800
Fuel Seminar
Staff Contact: Dr JF Stubington
CP4
Note/s: One Session Unit (SU) is equal to 1 hour per week for session of 14 weeks.
1 (SU) to be given in Session 2, compulsory in MAppSc degree course in Fuel Engineering. Content bias to choice of subjects.

FUEL5820
Fuel Constitution
Staff Contact: Dr JF Stubington
CP16
Note/s: One Session Unit (SU) is equal to 1 hour per week for session of 14 weeks. Select from following units:
Unit 1 1 (SU) Coal constitution and pyrolytic behaviour.
Unit 2 1 (SU) Constitution and classification of oils.
Unit 3 2 (SU) Advanced fuel constitution.

FUEL5840
Fuel Plant Engineering
Staff Contact: Dr JF Stubington
CP24
Note/s: One Session Unit (SU) is equal to 1 hour per week for session of 14 weeks. Select from following units:
Unit 1 1 (SU) Furnace design and heat recovery.
Unit 2 1 (SU) Process heat transfer and efficient use of steam.
Unit 3 2 (SU) Furnaces and boiler control system.
Unit 4 2 (SU) Fuel plant heat transfer.
FUEL5850
Combustion and Energy Systems
Staff Contact: Dr JF Stubington
CP16
Note/s: One Session Unit (SU) is equal to 1 hour per week for session of 14 weeks. Select from following units:
unit 1 1 (su) combustion technology.
unit 2 1 (su) fuel impurities, removal of and deposits from.
unit 3 1 (su) efficiency in energy utilisation.
unit 4 1 (su) combined cycles and integrated systems.

FUEL5870
Fuel Technology Practice
Staff Contact: Dr JF Stubington
CP16
Note/s: One Session Unit (SU) is equal to 1 hour per week for session of 14 weeks.
Compulsory in MAppSc (Fuel) (4 SU).

FUEL5880
Unit Operations in Wastewater, Sludge and Solid Waste Management
Staff Contact: Dr JF Stubington
CP12

FUEL5881
Unit Operations in Wastewater, Sludge and Solid Waste Management
Staff Contact: Dr JF Stubington
CP12
Syllabus as for FUEL5880. FUEL5881 is for external students in waste management courses.

FUEL5910
Atmospheric Pollution and Control (Theory)
Staff Contact: Dr JF Stubington
CP12 S1 or S2 L3
Causes, properties, dispersion, measurement and monitoring control and legislation of air pollution in ambient and industrial environments.

FUEL5911
Atmospheric Pollution and Control (Theory)
Staff Contact: Dr JF Stubington
CP12 S1 or S2 L3
Note/s: For external students.
Causes, properties, dispersion, measurement and monitoring, control and legislation of air pollution in ambient and industrial environments.

INDC1010
Industrial Chemistry 1
Staff Contact: Dr D Wiley
CP10 F L1 T1
Prerequisites: PHYS1002, MATH1032 or MATH1231 or MATH1042 or MATH1241
Introduction to the chemical industry. The role of the industrial chemist in society. The ethical responsibility of the industrial chemist. Introduction to materials for the chemical industry. Information retrieval. Communication skills. Factory visits.

INDC1020
Engineering 1 IC
Staff Contact: Dr C Dixon
CP30 S1 L2 T4 S2 L3 T3
This subject is comprised of INDC1010 Industrial Chemistry 1, MECH0130 Engineering Drawing and Descriptive Geometry and MECH0330 Engineering Mechanics.
Each subject is described elsewhere in this handbook. Prospective students should note the following. It is not necessary to pass each of the three component subjects individually; however, for a student who does not pass all components separately the composite mark for the whole subject is not calculated by a simple averaging process. For a component subject in which a passing mark is not obtained, heavier weighting is applied; the lower the mark the heavier the weighting. The details of the calculation method are explained in the first week of the course. A student who is repeating the subject after failure must repeat all three components. No exemptions will be granted for components that were passed at an earlier attempt.

INDC2010
Mass and Energy Balances
Staff Contact: A/Prof M Brungs
CP5 S1 L1 T1
Prerequisites: CHEM1101 and CHEM1201, INDC1020, MATH1032 or MATH1231 or MATH1042 or MATH1241, PHYS1002
Students not taking INDC1010 will be required to complete a 28 hour bridging course offered by the School early in Session 1.
INDC2020
Introduction to Fluid Flow
Staff Contact: Dr R Amal
CP7.5 S1 T2 S2 L1
Prerequisites: PHYS1002, MATH1032 or MATH1231 or MATH1042 or MATH1241, CHEM1101 and CHEM1201, INDC1020

Fundamental concepts of Fluids. Simplification of the Navier-Stokes Equation, continuity, Bernoulli's equation, momentum and energy equations. Flow in closed conduits, including laminar and turbulent flow, and losses due to friction. Measurement in Fluid Mechanics; viscosity, pressure, velocity, flowrate.

INDC2030
Heat Transfer and Temperature Measurement
Staff Contact: Dr R Chhabra
CP5 S2 L1 T1
Prerequisites: PHYS1002, MATH1032 or MATH1231 or MATH1042 or MATH1241, CHEM1101 and CHEM1201, INDC1020

The course will deal with conduction, convection and radiation. Conduction will cover Fourier's Law and the thermal resistance concept. Convection will deal with passage of fluid over a surface and the importance of the Reynolds number in calculating the convection heat transfer coefficient. Radiation will deal with blackbody radiation and Stefan's Law. Applications to industrial heat transfer equipment will be discussed. Temperature measurement devices and circuits. Pyrometry.

INDC2050
Physical Processes Laboratory
Staff Contact: Dr P Crisp
CP5 S1 T2
Prerequisites: PHYS1002 (or CHEM1101 and CHEM1201), CHEM1102, CHEM1201, MATH1032 or MATH1231 or MATH1042 or MATH1241, INDC1020

An integrated industrial chemistry laboratory incorporating a series of experiments designed to demonstrate the principles of physical processes and instrumentation in industrial situations.

INDC3010
Thermodynamics
Staff Contact: Dr D Wiley
CP7.5 S1 L2 T1
Prerequisites: CHEM2011, INDC2010

Review of first law of thermodynamics; thermochemistry; second law of thermodynamics. Auxiliary functions and conditions of equilibrium. Thermodynamic properties of fluids; thermodynamic properties of homogeneous mixtures. Chemical reaction equilibria; calculation of equilibrium compositions for single reactions. Phase equilibria; the phase rule, equilibrium.

INDC3031
Experimental Design
Staff Contact: A/Prof R Chaplin
CP7.5 S1 L2 S2 T1
Prerequisite: MATH2819


INDC3041
Corrosion in the Chemical Industry
Staff Contact: Prof M Skylas-Kazacos
CP7.5 S2 L2 T1
Prerequisite: CEIC2030, CEIC2040


INDC3050
Chemistry of High Temperature Materials
Staff Contact: A/Prof M Brungs
CP5 S2 L2
Prerequisite: CEIC2030, CEIC2040

Chemical aspects of high temperature materials; thermodynamics and kinetics of reactions in the solid state; phase equilibria in condensed systems; gas-solid and liquid-solid reactions.

INDC3060
Unit Operations
Staff Contact: Mr A Papagelis
CP5 S1 L2
Prerequisites: INDC2010, CEIC2030, CEIC2040

This course will emphasise 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.

INDC3070
Instrumentation and Process Control 1
Staff Contact: Dr C Dixon
CP7.5 S2 L2 T1
Prerequisites: MATH2021, CEIC2010, CEIC2020

Analog Computation: theory and application of basic analog computing elements; magnitude and time scaling; solution of linear differential equations. Instrumentation: theory and application of transducers and transmitters for measurement of process variables. Process Dynamics: behaviour of linear, lumped parameter dynamics systems; first, second and higher order and integrating systems. Process Control closed loop, block diagrams, controllers and controller tuning.

INDC3080
Instrumental Analysis 2
Staff Contact: Dr P Crisp
CP10 S1 L2 T2
Prerequisite: CEIC2010

Theory and application of advanced instrumental techniques including: high performance liquid chromatography, infra-red spectroscopy, particle size analysis, surface area analysis, thermal analysis (TGA, DSC/DTA, DMA), ion chromatography, capillary gas chromatography.
INDC3090
Chemistry of Industrial Processes
Staff Contact: Dr T Davis
CP15 F L1 T2
Prerequisite: CEIC 2030, CEIC 2040
Corequisites CHEM2021, CHEM2031
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. Students are required to attend factory inspections at local and country centres as required. Laboratory: A small research project designed to illustrate practical applications of the principles of Industrial Chemistry.

INDC4040
Management
Staff Contact: Dr T Davis
CP5 S2 L2
A series of lectures designed to introduce the students to appropriate management techniques. Topics will include: business strategies, leadership total quality management, safety management.

INDC4060
Process Design
Staff Contact: A/Prof MP Brungs
CP17.5 S1 L2 T1 S2 T1 L1 T3
Prerequisite: INDC3010, INDC3060, CEICP12010
This course will encompass the complete process design of a given (small) chemical plant. Students will be required to produce a design report which will include an environmental impact statement, plant sizing, process flow sheet, equipment selection and costing and a financial evaluation of the whole process. The report will also discuss the relevant thermodynamic and kinetic aspects of the process.

INDC4070
Laboratory Automation Science
Staff Contact: Dr DC Dixon
CP10 S1 L1.5T2.5
Prerequisite: INDC3070
The application of computers, e.g. microcomputers, to real-time data acquisition and process control in chemical laboratories and selected processes of interest to industrial chemists. Introduction to real-time digital operations and data manipulation, Organisation of a process control computer. Hardware considerations. The process computer interface. Sequential and programmable logic control of batch processes. Data acquisition and process monitoring techniques. Digital process control PID controller tuning. Graphics in process monitoring and control. Direct Digital Control.

INDC4080
Seminar
Staff Contact: A/Prof R Burford
CP10 F T2
Students are required to deliver two lectures on selected topics, one related to some aspect of chemical technology, and the other to their research project. 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 lecturers.

INDC4090
Project (Industrial Chemistry)
Staff Contact: A/Prof R Burford
CP60 S1 T8 S2 T16
An experimental or technical investigation related to some aspect of industrial chemistry. Prerequisites and/or corequisites will be determined depending on the nature of the project.

INDC4120
Chemistry of the Industrial Environment
Staff Contact: Dr PT Crisp
CP7.5 S1 L2 T1
Prerequisites: CHEM1101, CHEM1201

INDC4130
Environmental Chemistry of Industrial Processes
Staff Contact: Dr PT Crisp
CP5 S1 L2
Prerequisites: CHEM1101, CHEM1201

MINP4010
Hydrometallurgical Processes
Staff Contact: A/Prof T Tran
CP5 S1 L2
Application of principles of aqueous thermodynamics, electrochemistry, chemical and electrochemical kinetics to hydrometallurgical processes; leaching of metals, minerals and concentrates, solution purification, precipitation, and other separation processes, ion-exchange and liquid-liquid extraction, electro-winning and electro-refining. Emphasis is on processes currently used in the Australian mineral industry.

MINP4020
Hydrometallurgy Practices
Staff Contact: A/Prof T Tran
CP7.5 S1 L1 T2
A critical analysis of recent industrial and research development in hydrometallurgy, problems and methods available for research and development. Development of hydrometallurgical process flowsheets, elements of pre-feasibility studies. Selected laboratory exercises in mineral engineering to develop investigational skills for process development.
MINP4030
Hydrometallurgical Process Engineering
Staff Contact: Dr T Tran
CP5 S2 L2
Thermodynamic and kinetic principles in extraction, precipitation, adsorption. Thermodynamics and kinetics of electrochemical processes: cementation, hydrogen reduction, electrolysis. Design of reactors for hydrometallurgical and electrometallurgical processes.

POLY0010
Polymer Materials
Staff Contact: A/Prof R Burford
CP15 S1 2 S2 4
Note/s: servicing subject i.e. a subject taught within courses offered by other faculties
The structure and synthesis of commercially important polymers including thermoplastics, fibres, rubbers and composites. The effect of chemical and molecular structure upon properties. Degradation. Mechanical properties including time dependent behaviour. Fabrication processes. Polymer selection for various applications.

POLY3010
Polymer Science
Staff Contact: A/Prof R Burford
CP15 S1 L2 S2 Lab.4
Prerequisites: CHEM2011, CHEM2021, MATH2021, MATH2819
Co or Prerequisites: INDC3090

POLY4010
Advanced Polymer Science
Staff Contact: A/Prof R Burford
CP5 S1 L2
Prerequisite: POLY3010
Selected topics from basic texts and the original literature covering polymer chemistry: anionic cationic and Ziegler-Natta catalysis in polymer chemistry. Particular emphasis is placed on stereoregular polymerization for polyolefin manufacture, stressing mechanisms and reactor configuration. The mechanism and use of metalloocene based catalysts. Free radical polymerization mechanism of homo- and copolymerization.

POLY5000
Polymer Science
Staff Contact: A/Prof R Burford
CP30 F L3 T3
Polymer Processes: Classification of polymers, methods of polymerisation; bulk, solution, emulsion, suspension, high pressure; processes; step growth, chain growth; the chemistry and applications of polymer systems including polyesters, polyamides, phenolic condensation resins, vinyl polymers, synthetic elastomers. Natural polymers. Mechanism and Kinetics: Step growth polymerisation, kinetics, structure effects; chain growth polymerisation. Free radical polymerisation, chemistry and properties of free radicals and initiators; kinetics of propagation and termination reactions; co-polymerisation; monomer radical structure and reactivity. Cationic and anionic polymerisation; stereoregular polymers. Polymer Characterisation: Molecular weight; averages and distributions; thermodynamics of polymer solutions; theta temperature; fractionation methods; measurement of number-average molecular weight and weight-average molecular weight. Polymer Physics: Principles of operation of conventional polymer processing equipment; safety procedures; polymer compound design; stress strain behaviour of polymers in tension, compression, shear and flexure; elementary rheological behaviour of polymers; rubber elasticity; thermal characteristics of polymers.
Head of School  
Professor RE Griffith  

Administrative Officer  
Ms F Colville  

The School of Fibre Science and Technology was established in 1986 to bring together the University's activities in Wool and Pastoral Sciences and Textile Technology. The objectives of the School include the provision of comprehensive education of undergraduate and postgraduate students in the science and technology of (i) production and marketing of wool fibre and other ruminant animal products, with special emphasis on wool fibre; (ii) production and marketing of other textile fibres; (iii) processing of textile fibres and their manufacture into consumer and industrial products; and (iv) performance and properties of textile and related fibre products.

These objectives are achieved by providing an undergraduate course in Wool and Pastoral Sciences which emphasises the plant and animal sciences relevant to production in the sheep industry, as well as preparation of wool for market, specification of wool, marketing of wool and the relationship between wool production and wool processing; and by providing undergraduate courses in Textile Technology (in which there are options in Textile Chemistry, Textile Engineering and Textile Physics), Textile Management, and Textile Design and Technology.

While Wool and Pastoral Sciences mainly deals with wool and similar fibres such as cashmere and mohair produced by goats, as well as more general features of animal production, Textile Technology covers all fibres and all aspects of their utilisation in consumer and industrial products.

Rapidly advancing developments in the primary and secondary fibre industries make close collaboration between workers from the production and processing sides essential. Many of these developments have been stimulated by objective measurement of fibre properties; a special area of expertise of the Department of Wool and Animal Science; and the objective specification of textile products in which the Department of Textile Technology is a world leader. In the sheep industry these developments have major implications for systems of wool production particularly in areas such as nutrition, genetics, breeding and management. The School provides a unique opportunity for integration of educational and research efforts right through from production of fibres to finished textile products. The School provides a stimulating environment for students who wish to make careers in fibre based rural and manufacturing industries, both of which are critically important in the economy of Australia.

The School of Fibre Science and Technology participates in the Co-operative Education Program. The program applies to all three undergraduate courses taught in the School. Students in the program will complete their degree in four years, with several supervised terms of industry employment spread throughout the course. Students participating in the program will receive financial support of $10,400 per annum for each of the four years of the program. Selection into the program is based on high academic achievement and strong personal motivation for a successful career in the wool or textile manufacturing fields.
Head of Department
Professor MT Pailthorpe

Textile Technology is concerned with the conversion of both natural and man-made fibres into an extremely wide variety of finished products. These products range from fabrics for apparel, soft furnishings, floor coverings and industrial use to such specialised textiles as tyre cord, ropes, protective clothing, sailcloth, parachute fabrics, medical dressings, composite materials, and many others.

In Australia, the Textile Industry has developed mainly in the past seventy years and today it is one of our largest manufacturing groups. As in overseas countries, the impact of science and technology is bringing rapid changes to the Industry, and a consequence of this has been a strong demand for personnel skilled in Textile Technology, Management and Design.

The Department of Textile Technology offers courses in Textile Technology 3170 and Textile Management 3175. In 1997 it is expected that a new course Textile Design and Technology 3177 will be available, subject to UNSW Council approval. These courses extend over four years full-time study and lead to the award of the degree of Bachelor of Science. For the award of Honours, students need to have distinguished themselves in formal studies, laboratory exercises, and in their final year project. Graduates qualify for membership of the Textile Institute. Students must complete a minimum of 40 working days approved industrial training, of which at least 30 working days training must be taken at the end of Year 3.

It is important to stress that the specialised nature of the training provided within the Department of Textile Technology does not mean a restricted range of job opportunities after graduation. Career possibilities extend through the textile industry, allied industries (such as the production of textile chemicals), private consultants, government departments and authorities, teaching at secondary and tertiary levels, and pure or applied research in various organisations.

Graduates may be employed in quality control, technical management, research and development, international trade, production or general management. Within the textile industry, graduates may, for example, enter any of the following areas; the manufacture of natural and or man-made fibres, yarns, fabrics, etc; dyeing, printing and finishing of textiles, quality assurance, marketing and retailing.

Undergraduate Study

Course Outlines

3170
Textile Technology  Full-time Course

Bachelor of Science
BSc

Textile Chemistry, Textile Physics, Textile Engineering Options

The conversion of textile raw materials into their finished products is simply a succession of, and an interaction between, a number of chemical, physical and engineering processes. It follows, therefore, that the disciplines involved in the study of textile technology, in addition to the technological aspects, include a study in depth of one of the following: chemistry, engineering or physics.

Graduates will qualify for membership for one of the following professional bodies: the Royal Australian Chemical Institute; the Institution of Engineers, Australia; or the Australian Institute of Physics.

All students take a common first year, and they need not choose the option they desire to follow until the end of that year.

In Year 2 and Year 3 students specialise in one of three options of the course, viz. Textile Chemistry, Textile Physics or Textile Engineering. In Year 4 all students take the same subjects.

<table>
<thead>
<tr>
<th>Year 1 All Options</th>
<th>HPW</th>
<th>CP</th>
</tr>
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<tbody>
<tr>
<td>CHEM1101 Chemistry 1A, and</td>
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<td>CHEM1201 Chemistry 1B</td>
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<td>FIBR1101 Fibre Science 1</td>
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<td></td>
</tr>
<tr>
<td>MATH1131 Mathematics 1A or</td>
<td></td>
<td></td>
</tr>
<tr>
<td>MATH1141 Higher Mathematics 1A</td>
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<td>0</td>
</tr>
<tr>
<td>MATH1231 Mathematics 1B or</td>
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<tr>
<td>PHYS1002 Physics 1 or</td>
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<tr>
<td>PHYS1022 Physics for Health and Life Scientists*</td>
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<tr>
<td>TEXT1201 Introductory Textile Technology</td>
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Total HPW Session 1 22
Total HPW Session 2 22
Total Credit Points 110

*For admission into the Textile Physics or Textile Engineering options, students must complete the subject: PHYS1002.
**Textile Chemistry**

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
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<th>HPW S2</th>
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<td>3</td>
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<td>CHEM2021</td>
<td>Organic Chemistry</td>
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<td>CHEM2819</td>
<td>Physical Chemistry for Food and Fibre Science</td>
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<td>FIBR2201</td>
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<td>TEXT2101</td>
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<td>TEXT2301</td>
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<td>TEXT2401</td>
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<td>15</td>
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<td>General Education subject/s</td>
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**Total HPW Session 1** 21  
**Total HPW Session 2** 23  
**Total Credit Points** 115

**Year 3**

<table>
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<td>CHEM3021</td>
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<td>Plus one of the following Chemistry electives</td>
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<tr>
<td>CHEM3031</td>
<td>Inorganic Chemistry and Structure or</td>
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<tr>
<td>CHEM3121</td>
<td>Synthetic Organic Chemistry or</td>
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<tr>
<td>CHEM3321</td>
<td>Applied Organic Chemistry or</td>
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<td>TEXT3101</td>
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**Total HPW Session 1** 24  
**Total HPW Session 2** 21  
**Total Credit Points** 117.5

**Textile Physics**

<table>
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<td>MATH2100</td>
<td>Vector Calculus</td>
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<tr>
<td>MATH2120</td>
<td>Mathematical Methods for Differential Equations</td>
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<td>2.5</td>
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<tr>
<td>PHYS2001</td>
<td>Mechanics and Computational Physics</td>
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<tr>
<td>PHYS2011</td>
<td>Electromagnetism and Thermal Physics</td>
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<tr>
<td>PHYS2021</td>
<td>Quantum Physics and Relativity*</td>
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<td>TEXT2301</td>
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**Total HPW Session 1** 20.5  
**Total HPW Session 2** 22.5  
**Total Credit Points** 130

*Note: because of prerequisite requirements students wishing to take certain year 3 electives may substitute PHYS2031 Laboratory in Year 2, and take PHYS2021 Quantum Physics and Relativity in Year 3.*
Textile Management Full-time Course

Bachelor of Science
BSc

The production and marketing of textile products involves a number of manufacturing processes, and requires an understanding of basic management principles.

The Textile Management course provides a comprehensive knowledge of all the textile sciences and technologies. In addition the course includes studies in economics, accounting, marketing, management, and other areas of commerce.

The course is designed to meet the need for executives in the textile and allied industries. A wide choice of electives is available in the third year of the course. This allows students to either gain a broad knowledge of the various areas of commerce, or to specialise in one of the following areas: Applied Economics; Accounting and Financial Management; or Strategic Marketing Management.
Graduate Study

Course Outlines

The Department of Textile Technology conducts a course which leads to the award of a Graduate Diploma in Textile Technology.

In addition, the Department welcomes inquiries from graduates in Science, Engineering and Applied Science who are interested in doing research leading to the award of the degrees of Master of Science 2070 or Doctor of Philosophy 1060.

5090
Textile Technology Graduate Diploma Course

Graduate Diploma
GradDip

The Graduate Diploma in Textile Technology course is designed to prepare graduates for careers in the textile and allied industries. It also provides formal studies for graduates who are already employed in the textile industry. The normal requirement for admission to the course is a Bachelor degree or equivalent tertiary qualification. The following program, comprising both formal lectures and laboratory work, may be taken as a one year full-time course or two-year part-time course.

Candidates wishing to specialise in the theory and practice of yarn and fabric technology (engineering/physics orientation) should undertake the optional subjects TEXT5301, TEXT5302, TEXT5401, and TEXT5402. Candidates wishing to specialise in the science and technology of textile dyeing and finishing (chemistry orientation) should undertake the optional subjects TEXT5501, TEXT5502, TEXT5601, and TEXT5602.

The following program, comprising both formal lectures and laboratory work, may be taken as a one year full-time course or two-year part-time course.

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
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<td>TEXT5003</td>
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<td>TEXT5201</td>
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<td>TEXT5602</td>
<td>Dyeing Technology</td>
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or an alternative as approved by the Head of Department

or an alternative as approved by the Head of Department

Total Credit Points 102.5

*Co-Op Program students only
Department of Wool and Animal Science

Head of Department
Dr GE Robards

Agricultural products, particularly wool, still contribute a significant share of Australia’s export income. The pastoral industry has also played a major role in the development of the continent and the largest single form of land use still is grazing by sheep and cattle.

Farming has advanced technologically in recent years. However, innovations are continually being sought to increase productivity, raise quality and improve marketing of rural products within the framework of local and international economics. There is a continual need for the feeding and clothing of humans on a planet with finite mineral and fuel resources. This challenge must be balanced with the need for conservation and careful manipulation of a pool of renewable living resources. Wool and pastoral scientists are required to research, communicate and administer the changes which are occurring.

Undergraduate Study

Course Outlines

The Department offers a full-time course of four years duration leading to the award of a Bachelor of Science degree at either Honours or Pass level. The course is the only one in Australia in which special emphasis is given to wool science. In addition, studies concentrate on the most important animal industries (sheep and cattle).

Students receive a thorough grounding in the appropriate basic scientific disciplines as well as the theory and application of principles which are relevant to all aspects of pastoral production, including production and utilisation of pastures; reproduction, nutrition, health, genetic improvement, ecology and management of grazing animals and the production, preparation for sale and specification of wool and meat. The course also includes study of the design and interpretation of experimental investigations, economics and business management as well as elective options on crop production, rangeland management and rural communications. Relevant subjects offered by other schools may also be included. An important component is the final year project whereby students engage in an area of personal research on a theoretical or experimental topic on which they are required to submit a thesis.

The course provides students with a broad overview of the pastoral industries. It aims to produce generalists rather than specialists and, although there is some scope for studying topics of special interest, the course is designed so that certain core subjects must be undertaken. Because of the broad education received, graduates are equipped for a wide variety of careers in, and associated with, agricultural production; including research, advisory work, education, marketing, management and administration. Graduates are eligible for corporate membership of the Australian Institute of Agricultural Science.

Industrial Training Requirements

1. Students are required to obtain twenty-four weeks practical experience on commercial properties. At least twenty weeks of experience must be obtained concurrently with the course, while up to four weeks may be allowed for practical experience obtained immediately prior to the commencement of the course.

2. Students are encouraged to obtain experience in a diversity of pastoral enterprises, i.e. cattle, sheep and cropping, in different climatic zones.

3. A maximum of eight weeks shall be allowed for practical experience on any one property, including home properties. Up to eight weeks employment at research or teaching institutions is allowed towards the industrial training requirement.

4. In order to obtain recognition for practical work carried out, students shall, within six weeks of the commencement of the session immediately following the period of employment:
   (1) Submit written evidence from the owner or manager of the property or the director of the institution as to the length of employment.
   (2) Submit a written report along the guidelines which are available from the Department.
### Year 1

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>HPW</th>
<th>CP</th>
</tr>
</thead>
<tbody>
<tr>
<td>BIOS1101</td>
<td>Evolutionary and Functional Biology</td>
<td>6</td>
<td>15</td>
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<tr>
<td>BIOS1201</td>
<td>Molecules, Cells and Genes</td>
<td>6</td>
<td>15</td>
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<tr>
<td>CHEM1101</td>
<td>Chemistry 1A</td>
<td>6</td>
<td>15</td>
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<tr>
<td>CHEM1201</td>
<td>Chemistry 1B</td>
<td>6</td>
<td>15</td>
</tr>
<tr>
<td>FIBR1001</td>
<td>Natural Fibre Production</td>
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<td>15</td>
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<tr>
<td>FIBR1101</td>
<td>Fibre Science 1</td>
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### Year 2

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<tr>
<td>CHEM2929</td>
<td>Fundamentals of Agricultural and Biological Chemistry</td>
<td>6</td>
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<tr>
<td>FIBR2201</td>
<td>Computing Applications</td>
<td>4</td>
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<tr>
<td>WOOL2103</td>
<td>Livestock Production 1</td>
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<tr>
<td>WOOL2203</td>
<td>Agronomy</td>
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<tr>
<td>WOOL2303</td>
<td>Agricultural Economics and Management</td>
<td>3</td>
<td>15</td>
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<tr>
<td>WOOL2503</td>
<td>Wool Science 1</td>
<td>3</td>
<td>15</td>
</tr>
<tr>
<td>WOOL2601</td>
<td>Animal Physiology 1</td>
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<tr>
<td>MATH2819</td>
<td>Statistics SA</td>
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### Year 3

<table>
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<tbody>
<tr>
<td>WOOL3203</td>
<td>Pastoral Agronomy</td>
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<tr>
<td>WOOL3401</td>
<td>Animal Nutrition</td>
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<tr>
<td>WOOL3503</td>
<td>Wool Science 2</td>
<td>3</td>
<td>15</td>
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<tr>
<td>WOOL3701</td>
<td>Animal Health and Welfare</td>
<td>3</td>
<td>7.5</td>
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<td>WOOL3803</td>
<td>Genetics 1</td>
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<td>WOOL3901</td>
<td>Biostatistics 1</td>
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<td>BIOC2101</td>
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### Year 4

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<td>Livestock Production 2</td>
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<td>15</td>
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<tr>
<td>WOOL3211</td>
<td>Crop Agronomy*</td>
<td>0</td>
<td>15</td>
</tr>
<tr>
<td>WOOL3221</td>
<td>Range Management*</td>
<td>0</td>
<td>15</td>
</tr>
<tr>
<td>WOOL3511</td>
<td>Wool Marketing</td>
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<td>15</td>
</tr>
<tr>
<td>WOOL3521</td>
<td>Wool Biology</td>
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<td>15</td>
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</table>

### Year 3 (cont)

- Plus one of the five available options
- GEOG2021 Introduction to Remote Sensing
- WOOL3111 Livestock Production 2
- WOOL3211 Crop Agronomy*
- WOOL3221 Range Management*
- WOOL3511 Wool Marketing
- WOOL3521 Wool Biology

### Total HPW Session 1
22

### Total HPW Session 2
24

### Total Credit Points
115

### Year 4

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>HPW</th>
<th>CP</th>
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<tbody>
<tr>
<td>GEOG2021</td>
<td>Introduction to Remote Sensing</td>
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<td>15</td>
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<tr>
<td>WOOL3111</td>
<td>Livestock Production 2</td>
<td>0</td>
<td>15</td>
</tr>
<tr>
<td>WOOL3211</td>
<td>Crop Agronomy*</td>
<td>0</td>
<td>15</td>
</tr>
<tr>
<td>WOOL3221</td>
<td>Range Management*</td>
<td>0</td>
<td>15</td>
</tr>
<tr>
<td>WOOL3511</td>
<td>Wool Marketing</td>
<td>0</td>
<td>15</td>
</tr>
<tr>
<td>WOOL3521</td>
<td>Wool Biology</td>
<td>0</td>
<td>15</td>
</tr>
</tbody>
</table>

### Total HPW Session 1
25

### Total HPW Session 2
25

### Total Credit Points
130

### Optional subjects

#### Group A
- WOOL3111 Livestock Production 2
- WOOL3211 Crop Agronomy*
- WOOL3221 Range Management*
- WOOL3511 Wool Marketing
- WOOL3521 Wool Biology
- GEOG2021 Introduction to Remote Sensing
- GEOG3032 Remote Sensing Applications
- MICR2201 Introductory Microbiology

#### Group B
- BIOS3061 Plant Ecosystem Processes
- BIOG2021 Introduction to Remote Sensing
- GEOG3032 Remote Sensing Applications
- MICR2201 Introductory Microbiology

*Available in alternate years.*

Some subjects may not be offered in all years.
Graduate Study

Course Outlines

The Department conducts a course which leads to the award of a Graduate Diploma in Wool and Pastoral Sciences 5081.

In addition, the Department welcomes inquiries from graduates in Science, Agriculture and Applied Science who are interested in doing research leading to the award of the degrees of Master of Science 2081 or Doctor of Philosophy 1071.

Graduate Program in Wool and Pastoral Sciences

5081 Wool and Pastoral Sciences

Graduate Diploma GradDip

The course leading to the award of the Graduate Diploma in Wool and Pastoral Sciences is specially designed for graduate students preparing themselves for careers in the pastoral industry. One of the principal functions of the course is to provide a bridge from other disciplines such as Agriculture, Veterinary Science and Pure Science for graduates who wish to study and work in the field of Wool and Pastoral Sciences, which is of such overall importance to Australia.

The normal requirement for admission to the course is a degree in Agriculture, Applied Science, Veterinary Science or Science in an appropriate field. In addition, students may be required to take a qualifying examination. Such qualifying examination will be of a standard which will ensure that the student has sufficient knowledge of the subject and the principles involved to profit by the course.

The following program may be completed in one year on a full-time basis. Students are required to carry out full-time study to the extent of eighteen hours lecture and laboratory work per week for two sessions. Both graduate subjects and undergraduate subjects may be chosen to suit the requirements of the student subject to their availability and the approval of the Head of the Department.

Full-time Course

18 hours per week of which at least 10 must be chosen from:

<table>
<thead>
<tr>
<th>Subject Code</th>
<th>Subject Name</th>
<th>Credit Points</th>
</tr>
</thead>
<tbody>
<tr>
<td>WOOL5113</td>
<td>Livestock Production</td>
<td>48</td>
</tr>
<tr>
<td>WOOL5213</td>
<td>Range Management</td>
<td>12</td>
</tr>
<tr>
<td>WOOL5513</td>
<td>Wool Science</td>
<td>48</td>
</tr>
<tr>
<td>WOOL5813</td>
<td>Animal Breeding</td>
<td>32</td>
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<tr>
<td>WOOL5913</td>
<td>Quantitative Methods</td>
<td>32</td>
</tr>
</tbody>
</table>

A maximum of 8 hours per week of study may be selected from approved undergraduate subjects.

Graduate Diploma students are expected to work at the level of honours students in the undergraduate courses and to carry out prescribed study of current research material in the appropriate field.

Graduate Programs in Rangeland Management

The University has considerable experience of research and teaching relating to the management of arid zone rangelands, gained over many years by several of its schools. This experience is now used in the provision of these graduate programs based at the University campus in Kensington, Sydney, but also providing for the use of its field station resources including Fowlers Gap Arid Zone Research Station in western New South Wales.

Programs by coursework are available leading to the award of:

Master of Applied Science in Rangeland Management 8025
Graduate Diploma in Rangeland Management 5025

Entry qualifications. Masters degree course - Four-year degree at an appropriate standard in an appropriate discipline. Graduate Diploma course Three-year degree from an approved university or qualifications deemed appropriate by the Faculty of Applied Science.

Course requirements. Candidates are required to complete a program totalling 120 credit points for the Masters degree or 96 credit points for the Graduate Diploma during one year of full-time study or two years of part-time study.

Students will be expected to devote an additional 15 hours per week outside lectures to independent study, fieldwork and completion of assignments.

Course structure. All students are required to complete the core of compulsory subjects which for the Masters degree includes a 36 credit point Project. Students then complete the requirements for their Course by selecting the appropriate number of credit points from the list of available subjects.

Additional subjects may be selected with the permission of the Course Coordinator. In this way students have the flexibility to tailor the course to suit their individual needs.
**8025**

Rangeland Management

Master of Applied Science
MApSc

<table>
<thead>
<tr>
<th>Compulsory Subjects</th>
<th>CP</th>
</tr>
</thead>
<tbody>
<tr>
<td>WOOL5213</td>
<td>12</td>
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<tr>
<td>GEOG9320</td>
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<tr>
<td>GEOG9509</td>
<td>36</td>
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<tr>
<td>WOOL5223</td>
<td>36</td>
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</table>

**Optional Subjects**
Choose subjects totalling 60 credit points from the following list:

<table>
<thead>
<tr>
<th>Subject Code</th>
<th>Subject Name</th>
<th>Credit Points</th>
</tr>
</thead>
<tbody>
<tr>
<td>BIOS3014</td>
<td>Ecological Studies in Arid Lands Management</td>
<td>15</td>
</tr>
<tr>
<td>CIVL9875</td>
<td>Hydrological Processes</td>
<td>12</td>
</tr>
<tr>
<td>ECON2109</td>
<td>Economics of Natural Resources*</td>
<td>15</td>
</tr>
<tr>
<td>GEOG2021</td>
<td>Introduction to Remote Sensing*</td>
<td>15</td>
</tr>
<tr>
<td>GEOG3021</td>
<td>Biogeography*</td>
<td>15</td>
</tr>
<tr>
<td>GEOG3051</td>
<td>Soils and Landforms*</td>
<td>15</td>
</tr>
<tr>
<td>GEOG3062</td>
<td>Environmental Change*</td>
<td>15</td>
</tr>
<tr>
<td>GEOG9130</td>
<td>Soil Studies for Arid Lands Management</td>
<td>12</td>
</tr>
<tr>
<td>GEOG9150</td>
<td>Remote Sensing Applications</td>
<td>12</td>
</tr>
<tr>
<td>GEOG9240</td>
<td>Principles of Geographic Information Systems</td>
<td>12</td>
</tr>
<tr>
<td>GEOG9300</td>
<td>Vegetation Management</td>
<td>12</td>
</tr>
<tr>
<td>GEOG9310</td>
<td>River Management</td>
<td>12</td>
</tr>
<tr>
<td>WOOL5113</td>
<td>Livestock Production</td>
<td>48</td>
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</table>

Additional subjects may be substituted with the permission of the Head of Department.

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**5025**

Rangeland Management

Graduate Diploma
GradDip

<table>
<thead>
<tr>
<th>Compulsory Subjects</th>
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<tbody>
<tr>
<td>GEOG9320</td>
<td>12</td>
</tr>
<tr>
<td>WOOL5213</td>
<td>12</td>
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</table>

**Optional Subjects**
Choose subjects totalling 72 credit points, to include at least 36 credit points of graduate level subjects.

<table>
<thead>
<tr>
<th>Subject Code</th>
<th>Subject Name</th>
<th>Credit Points</th>
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</thead>
<tbody>
<tr>
<td>CIVL9875</td>
<td>Hydrological Processes</td>
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</tr>
<tr>
<td>ECON2109</td>
<td>Economics of Natural Resources*</td>
<td>15</td>
</tr>
<tr>
<td>GEOG2021</td>
<td>Introduction to Remote Sensing*</td>
<td>15</td>
</tr>
<tr>
<td>GEOG3021</td>
<td>Biogeography*</td>
<td>15</td>
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<tr>
<td>GEOG3051</td>
<td>Soils and Landforms*</td>
<td>15</td>
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<tr>
<td>GEOG3062</td>
<td>Environmental Change*</td>
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<tr>
<td>GEOG9130</td>
<td>Soil Studies for Arid Lands Management</td>
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<tr>
<td>GEOG9240</td>
<td>Principles of Geographic Information Systems</td>
<td>12</td>
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<tr>
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<td>Vegetation Management</td>
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<tr>
<td>GEOG9310</td>
<td>River Management</td>
<td>12</td>
</tr>
<tr>
<td>WOOL2103</td>
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<td>WOOL3111</td>
<td>Livestock Production 2*</td>
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<td>WOOL3203</td>
<td>Pastoral Agronomy*</td>
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<td>WOOL4113</td>
<td>Livestock Production 3*</td>
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<tr>
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<td>Livestock Production</td>
<td>48</td>
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*Undergraduate level subjects. Additional subjects may be substituted with the permission of the Head of Department.
Subject Descriptions

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

Students should note that enrolment in all later year subjects taught by the School is subject to satisfactory course progression and approval of the Head of the Department.

APSE0002
Social Issues in Applied Science
Staff Contact: Prof Jean Cross
CP5 S1 L1 T1

The subject covers social issues arising from future technological developments and the role that a professional applied scientist can play in influencing future directions. It will be taught by a combination of group activity, case studies and projects and seminars from visiting speakers, some of whom will be from disciplines other than the applied sciences.

FIBR1001
Natural Fibre Production
Staff Contact: A/Prof David Cottle
CP15 S2 L3 T3

Introduction to the world and Australian wool and cotton industries; fibre and skin biology; mechanisms of, and factors affecting, fibre growth and morphology; introduction to wool and cotton production, harvesting, preparation for sale; wool types and marketing.

FIBR1101
Fibre Science 1
Staff Contact: Dr Shantha David
CP10 S1 L2 T2


FIBR2201
Computing Applications
Staff Contact: A/Prof John James
CP10 S1 L2 T2

Introduction to hardware and software concepts; operating systems. Introduction to computer programming: simple algorithms and data organisation. Computer applications in fibre science and technology: computer-aided design and manufacture CAD CAM; process monitoring and control, computer-integrated manufacture CIM; data acquisition; modelling and optimisation techniques; databases, spreadsheets, text word processing.

TEXT1101
Science for Textiles
Staff Contact: Dr Shantha David
CP5 S2 L1 T1

The atomic structure of matter; x-rays; optics and optical instruments; wave theory. Properties of elements and compounds; introductory organic chemistry.

TEXT1201
Introductory Textile Technology
Staff Contact: Prof Ross Griffith
CP10 S2 L3 T1

Sampling theory and practice for textile testing. Introductory statistics for data processing. Basic techniques for the measurement of fibre properties, including transverse dimensions and length. The application of engineering principles to textile machines and processes, including mechanics of solids, statics, mechanical transmission of power.

TEXT2101
Fibre Science 2
Staff Contact: Prof Ron Postle
CP10 S2 L2 T2
Prerequisite: FIBRE1101/TEXT1101


TEXT2201
Textile Statistics
Staff Contact: Dr John Curiskis
CP5 S2 L2

Application of mathematical techniques to textile data processing and analysis. Probability theory, distribution functions, tests of significance. Analysis of variance, regression analysis. Introduction to computer statistical packages.

TEXT2301
Yarn Technology 1
Staff Contact: Dr Xungai Wang
CP15 S1 L3 T3
Prerequisite: TEXT1201

The preparation of staple fibres for yarns and non-woven fabrics: processes for tow conversion, opening, cleaning, blending, carding, drawing, and combing. Short-staple, worsted and woolen preparation systems. Computer blend selection; drafting theory; theory and measurement of irregularity; levelling of slivers.
TEXT2401
Fabric Technology 1
Staff Contact: Dr John Curiskis
CP15 S2 L3.5 T2.5
Prerequisite: TEXT1201


TEXT3301
Yarn Technology 2
Staff Contact: Dr Xungai Wang
CP15 S2 L3 T3
Prerequisite: TEXT1201


TEXT3401
Fabric Technology 2
Staff Contact: Dr John Curiskis
CP15 S1 L3.5 T2.5
Prerequisite: TEXT1201


TEXT3501
Finishing Technology A
Staff Contact: Dr Shantha David
CP10 S1 L2 T2
Prerequisite: FIBR1101/TEXT1101

Objects of finishing and typical flow diagrams for wool and cotton. The principles and technology of textile finishing processes for protein and cellulosic fabrics, including the removal of impurities and discolouration, the elimination or minimisation of deficiencies in properties, the development of specific properties. Properties of surfactant solutions, micelle formation, surfactants as emulsifiers and detergents. Practical exercises in fabric bleaching, wool milling and shrinkproofing. Analysis of hard water by titration.

TEXT3601
Colour Science
Staff Contact: Prof Mike Pailthorpe
CP7.5 S1 L2 T1


TEXT3701
Colouration Technology
Staff Contact: Prof Mike Pailthorpe
CP10 S2 L2 T2
Prerequisite: FIBR1101/TEXT1101


TEXT3801
Textile Engineering
Staff Contact: Prof Ross Griffith
CP7.5 S2 L2 T1
Prerequisite: TEXT1201


TEXT4003
Project
Staff Contact: Prof Ron Postle
CP35 F S1 T5 S2 T9

Students are required to carry out a research project and to submit a thesis describing their investigations. It is usual for students to be allocated projects in areas related to the particular course option they are studying.

TEXT4013
Seminar
Staff Contact: Prof Mike Pailthorpe
CP10 F T2

Students prepare and present a seminar before an audience consisting of staff of the Department, final year
students, Graduate Diploma students, and any other interested undergraduate or postgraduate students, on a subject of topical and specific interest in the field of textile science, technology or management, and subsequently submit the seminar in writing.

TEXT4101  
Textile Structures 2  
Staff Contact: Prof Ron Postle  
CP7.5 S2 L1 T2  
Prerequisite: FIBR1101/TEXT1101


TEXT4201  
Processing Laboratory  
Staff Contact: Dr John Curiskis  
CP7.5 S1 T3

Students undertake a project involving the design, production and assessment of textile products. Such as: rib jacquard outer fabric, towelling, printed tea towels, woven furnishing fabric, raschel outer wear fabric, etc.

TEXT4202  
Textile Quality Control  
Staff Contact: Prof Mike Pailthorpe  
CP5 S2 L1 T1  
Prerequisite: TEXT2201


TEXT4501  
Finishing Technology B  
Staff Contact: Dr Shantha David  
CP10 S2 L2 T2  
Prerequisite: FIBR1101/TEXT1101

Wet and dry fabric finishing. The application of special finishes including flame retardant finishes, crease resistant and antistatic finishes, etc. Fabric setting Dimensional stability and its measurement. The drying of textile materials. Recent developments in finishing technology.

TEXT4701  
Textile Industry Studies  
Staff Contact: Prof Ross Griffith  
CP7.5 S1 L T3

Econometrics of the textile and clothing industries. Models of production, import and export and consumption of textiles and clothing in Australia, and comparison with world data. Case studies in textile and clothing manufacture operations. Environmental considerations in relation to pollution from the textile industry. Waste water treatment methods.

TEXT4702  
Textile Management*  
Staff Contact: Dr John Curiskis  
CP15 S1 T6  
*Co-Op Students only

Selected readings in the Management of manufacturing systems with particular reference and examples from specific manufacturing enterprises.

TEXT5001  
Textile Technology Dissertation  
Staff Contact: Prof Mike Pailthorpe  
CP7.5 F T1.5

Students review a particular aspect of textile technology, by conducting a literature survey and conferring with experts. The review is presented orally to the staff and students of the department, and submitted in written form.

TEXT5003  
Textile Technology  
Staff Contact: Prof Ross Griffith  
CP7.5 F T1.5

Students gain an overview of textile technology by reviewing the technology relating to one or more textile products, through a series of tutorials and exercises.

TEXT5101  
Fibre Science A  
Staff Contact: Dr Shantha David  
CP15 S1 L4 T2


TEXT5102  
Fibre Science B  
Staff Contact: Prof Ron Postle  
CP10 S2 L2 T2


TEXT5201  
Textile Quality Control  
Staff Contact: Prof Mike Pailthorpe  
CP5 S2 L1 T1

TEXT5301
Yarn Technology A
Staff Contact: Dr Xungai Wang
CP12.5 S1 L3 T3
The preparation of staple fibres for yarns and non-woven fabrics: processes for tow conversion, opening, cleaning, blending, carding, drawing, and combing. Short-staple, worsted and woolen preparation systems. Computer blend selection; drafting theory; theory and measurement of irregularity; levelling of slivers.

TEXT5302
Yarn Technology B
Staff Contact: Dr Xungai Wang
CP12.5 S2 L3 T2

TEXT5401
Fabric Technology A
Staff Contact: Dr John Curiskis
CP12.5 S2 L3.5 T1.5

TEXT5402
Fabric Technology B
Staff Contact: Dr John Curiskis
CP12.5 S1 L3.5 T1.5

TEXT5501
Finishing Technology A
Staff Contact: Dr Shantha David
CP12.5 S1 L3 T2
Objects of finishing and typical flow diagrams for wool and cotton. The principles and technology of textile finishing processes for protein and cellulosic fabrics, including the removal of impurities and discolouration, the elimination or minimisation of deficiencies in properties, the development of specific properties. Properties of surfactant solutions, micelle formation, surfactants as emulsifiers and detergents. Practical exercises in bleaching, wool milling and shrinkproofing. Analysis of hard water by titration.

TEXT5502
Finishing Technology B
Staff Contact: Dr Shantha David
CP12.5 S2 L2 T3
Wet and dry fabric finishing. The application of special finishes including flame retardant finishes, crease resistant and antistatic finishes, etc. Fabric setting. Dimensional stability and its measurement. The drying of textile materials. Recent developments in finishing technology.

TEXT5601
Colour Science
Staff Contact: Prof Mike Pailthorpe
CP10 S1 L2 T1

TEXT5602
Colouration Technology
Staff Contact: Prof Mike Pailthorpe
CP10 S2 L2 T2

WOOL2103
Livestock Production 1
Staff Contact: A/Prof David Cottle
CP10 F L2
The sheep and beef cattle industries and their place in the economic life of Australia; levels of production and trends. The physical, biological, managerial and economic conditions influencing production. Sheep producing zones. Sheep breeds for wool production. Cross breeding, prime lamb production. Sheep and cattle management; nutrition, reproduction, survival. A field excursion of one week's duration is held in Session 1.

WOOL2203
Agronomy
Staff Contact: Dr Gordon King
CP22.5 S1 L2 T1 S2 L3 T3

WOOL2303
Agricultural Economics and Management 1
Staff Contact: Mr Steve Filan
CP15 F L2 T1
Farm planning methods. Budgeting, gross margins, simplified programming and introduction to linear programming. Use of VAX computers: introduction to operating system, text editor, and linear programming.
software. Introduction to farm management implications of land tenure and title; valuation; depreciation; discounting; taxation. Economic principles. Introduction to production economics theory, cost curves, and price theory.

WOOL2503
Wool Science 1
Staff Contact: A/Prof David Cottle
CP15 F L2 T1
(Preparation and Early Stage Processing) Fleece characteristics and their variation; wool faults; clip preparation past, present and future; evaluation and typing of wool; value and use of wool; felting; fellmongering; marketing. Early stage processing and yarn manufacture.

WOOL2601
Animal Physiology 1
Staff Contact: Dr Geoff Robards
CP15 S2 L3 T3
Prerequisite: BIOS1201
Physiology systems of mammalia are treated with special attention to homeostasis. Cell-membranes; blood and body fluids; the immune reaction. Cardiac control, functions and haemodynamics. Respiration. The endocrine system with particular emphasis upon growth, reproduction, lactation and stress. The nerve impulse, its excitation and transmission. Physiology of digestion, the gastro-intestinal tract and of the kidney. Heat tolerance and climatic adaptation.

WOOL3111
Livestock Production 2
Staff Contact: Dr Doug Murray
CP7.5 S2 L2 T1
Prerequisite: WOOL2103
Feed lot production of cattle as an intensive system and the factors affecting output such as environmental conditions, nutrition and disease. Establishment and management of a feed lot. Use of metabolisable and net energy requirements to calculate dry matter intakes of feeds of varying nutritive value for different productive states.

WOOL3203
Pastoral Agronomy
Staff Contact: Dr Gordon King
CP20 F L3 T1
Prerequisite: WOOL2203

WOOL3211
Crop Agronomy
Staff Contact: Dr Gordon King
CP7.5 S2 L2 T1
Prerequisite: WOOL2203
Note/s: Available in alternate years.

WOOL3221
Wool Marketing
Staff Contact: Dr Peter Auer
CP7.5 S2 L2 T1
Prerequisite: FIBR1001, BIOS1201
Wool marketing systems; comparison with other countries, modelling. Wool commerce; financial factors. Information systems. Future directions.

WOOL3503
Wool Science 2
Staff Contact: A/Prof David Cottle
CP15 F L2 T1
(Metrology and late stage processing) Sampling wool for measurement; measurement of fibre diameter, length, colour, yield, vegetable matter, regain, resistance to compression, bulk, medullation, dark fibres and style; test certificates; statistics; standards; use of measurements in marketing and manufacture; fabric manufacture, dyeing and finishing.

WOOL3511
Wool Marketing
Staff Contact: Dr Gordon King
CP7.5 S2 L2 T1
Wool marketing systems; comparison with other countries, modelling. Wool commerce; financial factors. Information systems. Future directions.

WOOL3521
Wool Biology
Staff Contact: Dr Peter Auer
CP15 S2 L3 T3
The study of the biology of the skin and the fleece which relates the characteristics of the wool follicle and fibre to the production, technology and processing of wool. Follicle morphology and function; the components of wool; development of wool follicles; follicle physiology; regulation of follicle function and fibre production; manipulation of follicle function; individual vs populations of follicles and...
fibres; physical characteristics of the fleece; wool and other textile fibres.

WOOL3701
Animal Health and Welfare 1
Staff Contact: A/Prof John Kennedy
CP7.5 S1 L2 T1
Prerequisite: WOOL2103

WOOL3803
Genetics 1
Staff Contact: A/Prof John James
CP15 F L2 T1

WOOL3901
Biostatistics 1
Staff Contact: A/Prof John James
CP10 S1 L2 T2
Design and analysis of comparative experiments, for continuous and discrete random variables. Analysis of variance for fixed, mixed and random models. Linear regression and correlation. Multiple comparison methods.

WOOL4003
Project
Staff Contact: Dr Geoff Robards
CP30 F T6
Students are required to conduct an experimental or theoretical investigation under supervision and to submit a thesis describing the results of their investigations. Throughout the year students are required to submit progress reports to their supervisors and to present seminars. The written reports of the project shall be submitted by the last day of Session 2.

WOOL4013
Seminar
Staff Contact: Dr Geoff Robards
CP10 F T2
Seminars deal with research and or development work being undertaken or recently completed by students and staff of the Department of Wool and Animal Science, other University schools and research organisations. There are also seminars on communication in wool and pastoral sciences and on problems facing rural industries.

WOOL4113
Livestock Production 3
Staff Contact: Dr Geoff Robards
CP15 CP15 F L1 T2

WOOL4413
Ruminant Nutrition
Staff Contact: Dr Geoff Robards
CP10 S1 L2 T2
Prerequisite: WOOL3401
Utilisation of metabolisable energy; protein digestion and utilisation; digestion of complex carbohydrates; digestive upsets: bloating, acidosis, rumen stasis; techniques for measuring nutrient dynamics and body turnover rates; formulation of specialised rations for: feedlots, live sheep trade, Salear wool production, milk production.

WOOL4513
Wool Science 3
Staff Contact: A/Prof David Cottle
CP20 F L2 T2
(Advanced Technology) Sale by description; modelling wool production; developmental metrology techniques; the Australian wool processing industry; breeding for wool quality; woollen metrology; keratin fine structure; caprine and cameloid fibres; processed wool metrology; wool classification; lot building; current wool research and development.

WOOL4813
Genetics 2
Staff Contact: A/Prof John James
CP20 F L2 T2
Prerequisite: WOOL3803

WOOL4911
Biostatistics 2
Staff Contact: A/Prof John James
CP10 S2 L2 T2
Least squares methods, applied to multiple regression and experimental design models. Factorial experiments. Analysis of co-variance. Elements of multi-variate analysis.

WOOL5113
Livestock Production
Staff Contact: Dr Geoff Robards
CP48 F L2 T4
Biology of reproduction and reproductive performance of sheep and cattle; growth and body composition; meat production and quality.

WOOL5213
Range Management
Staff Contact: Dr Gordon King
CP12 F L1 T3
Objectives in the utilisation and management of rangelands. Ecology of rangelands, with emphasis on the impact of grazing. Degradation of rangelands. Morphology and physiology of range plants in relation to management.

Wool5223
Project in Range Management
Staff Contact: Dr Gordon King
CP36 F T9
A theoretical and/or experimental investigation of some aspect of management of rangelands.

Wool5513
Wool Science
Staff Contact: A/Prof David Cottle
CP48 F L2 T4

Wool5813
Animal Breeding
Staff Contact: A/Prof John James
CP32 F L2 T2
Corequisite: Wool3803
Definition of breeding objectives; case studies of production recording and breed improvement programs for sheep and beef cattle. Development of performance recording systems: choice of traits to be recorded, recording and processing methods. Estimation of breeding value from performance records. Breed evaluation. Optimal design for breeding programs. The impact on genetic improvement of techniques for controlling reproduction and molecular genetics.

Wool5913
Quantitative Methods
Staff Contact: A/Prof John James
CP32 F L2 T2
Selected topics in: biostatistics, with emphasis on experimental design and on least squares procedures; mathematical programming methods for rural industries; data processing and computer programming; systems analysis and simulation methods.
Geographers study the spatial relationships of the phenomena which form humans' physical and social environment, and aim to establish principles which govern those relationships. The geographer may concentrate on specific variables, as in systematic geography, or may deal with variables which affect a specific area, as in regional geography.

The cultural significance of geography lies in its contribution to an understanding of the total environment, but the geographer's skills also find practical application in the conservation and planned development of resources. Increasing numbers of geographers are employed as professionals in these applications. For instance, geomorphologists and biogeographers are undertaking resource inventory surveys and environmental assessment, and economic geographers are engaged as urban and regional planners and spatial analysts.

The School offers three four-year full-time courses leading to the award of the degree of Bachelor of Science, which aim to train professional geographers for entry into applied fields. These vocationally-oriented Applied Geography programs provide an analytical approach to understanding and investigating some of society's most pressing problems, including the use and management of scarce resources, the interaction between people and environment, soil erosion and conservation, land use conflicts, and spatial inequalities in economic and social well-being. These courses provide elective specialisations in physical geography (with special emphasis on either the biologic or geomorphic aspects), economic geography with emphasis on spatial analysis, and in human and physical resources (with emphasis on the integration of human and physical geography).

Students may enrol through the School of Geography for higher research degrees, or for formal graduate courses such as the Master of Applied Science in Geographic Information Systems 8027.1000; Masters and Diploma courses in Remote Sensing 8047.2000 and 5047.2000, Master in Environmental Management 8047.3000 and may undertake projects in the School as part of the Master of Environmental Studies degree 8045. In addition the School welcomes enquiries from graduates who are interested in research leading to the award of the degrees of Doctor of Philosophy or Master of Science.

Students are advised to check notices displayed in the School of Geography ground floor foyer in case of any late changes in teaching arrangements.
Undergraduate Study

Course Outlines

The School offers three four-year full-time courses leading to the award of the degree of Bachelor of Science, which aim to train professional geographers for entry into applied fields.

There are elective specialisations in physical geography (with special emphasis on either the biologic or geomorphic aspects), economic geography (with emphasis on urban and regional analysis), and in human and physical resources (with emphasis on the integration of physical and human geography).

First year subjects involve systematic studies of the physical and economic bases of geography. There is progressive specialisation in the following years, with heavy emphasis on field observation and data handling.

For the award of the degree at Honours level students will be required to have distinguished themselves in coursework, in additional assignments as directed by the Head of the School, and in the final year project for which a Report will be required. Students will incur personal costs in connection with project work in the final year of study.

All students are encouraged to spend a period of four to six weeks with organisations concerned with the investigation and planned use of resources.

Several units in Geography include laboratory and project work involving the use of computer and quantitative techniques. It is required that students provide their own drawing materials such as tracing and graph paper. Details of exact requirements are given at the beginning of the relevant subjects.

Compulsory fieldwork incurs personal expenditure and for some subjects notes and materials are available for a small charge.

Geography is also available as a major sequence in the Arts course 3400, where the emphasis is on the study of where and how people live, and on their activities in relation to the environment.

Major sequences in Science and Mathematics course 3970, programs 2700 and 6581 study the relationships between people and the physical environment, combining geographical studies, particularly in physical geography, with those in related disciplines, notably the biological and earth sciences.

Geography may also be combined with Civil Engineering in course 3730, and with Law in course 4770.

Applied Geography Full-time Courses

Bachelor of Science
BSc

3010.1000
Applied Physical Geography

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Total HPW Session 1 22
Total HPW Session 2 24
Total Credit Points 120

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and either

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Total HPW Session 1 22
Total HPW Session 2 24
Total Credit Points 120
or any two of the following
BIOS2011 Evolutionary and Physiological Ecology 6 0 15
BIOS2051 Flowering Plants 6 0 15
BIOS2061 Vertebrate Zoology 0 6 15
and for all students
General Education subject/s 2 2 15
Total HPW Session 1 21.5
Total HPW Session 2 21.5
Total Credit Points 145

Year 3
GEOG3000 Field Project 3 1.5 1.5 15
GEOG3011 Pedology 4 0 15
GEOG3025 Geomorphology 0 4 15
GEOG3032 Remote Sensing Applications 4 0 15
GEOG3062 Environmental Change 4 0 15
GEOG3082 Project Design & Formulation 0 3 10
GEOG3142 Geographic Information Systems Applications 0 4 15
and one of the following
CHEM1101 Chemistry A 6 0 15
CHEM1401 Introductory Chemistry A 6 0 15
BIOS3061 Plant Ecosystem Processes 6 0 15
BIOS3071 Conservation Biology and Biodiversity 6 0 15
BIOS3111 Population and Community Ecology 0 6 15
GEOL7321 Geology for Geomorphologists and Pedologists 2 4 15
and for all students
General Education subject/s 2 2 15
Total HPW Session 1 17.5/19.5
Total HPW Session 2 16.5/18.5
Total Credit Points 130

Year 4
GEOG3042 Environmental Impact Assessment 4 0 15
GEOG4010 Field Project 4 0 6 20
GEOG4031 Project 8 8 40
GEOG4042 Practical Applications 0 4 10
GEOG4052 Advanced Spatial Analysis* 4 0 15
GEOG4062 Advanced Environmental Analysis* 4 0 15
Total HPW Session 1 20
Total HPW Session 2 18
Total Credit Points 115

*Up to two subjects may be substituted from those offered by the School of Geography, Department of Applied Geology or School of Biological Sciences, subject to approval by the Head of School.

3010.2000
Applied Economic Geography

Year 1
GEOG1000 Field Project 1 2 2 10
GEOG1022 Locational Processes 0 4 10
GEOG1031 Environmental Processes 0 4 15
GEOG1049 Data Processing Systems 4 0 10
GEOG1044 Data Display Systems 0 4 10
GEOG1062 Australia and Global Geographics: Integration and Divergence 4 0 15
MATH1131 Mathematics 1A or
MATH1141 Higher Mathematics 1A or
MATH1011 General Mathematics 1B 6 0 15
MATH1231 Mathematics 1B or
MATH1241 Higher Mathematics 1B or
MATH1021 General Mathematics 1C 0 6 15
and an additional 2 level 1 subjects: recommended and either
ECON1101 Microeconomics 1 and 3 0 15
ECON1102 Macroeconomics 1 0 3 15
or
ECON1103 Microeconomic Principles and 3 0 15
ECON1104 Macroeconomic Principles 0 3 15
Total HPW Session 1 19
Total HPW Session 2 23
Total Credit Points 130

Year 2
GEOG2000 Field Project 2 1.5 1.5 10
GEOG2013 Geographical Data Analysis 4 0 15
GEOG2052 Project in Spatial Analysis 0 4 10
GEOG2061 Regional Theory 4 0 15
GEOG2071 Transport and Land Use 0 4 15
GEOG2092 Australian Social and Economic Landscapes 4 0 15
GEOG3123 Applied Geographic Information Systems 0 4 15
ECON2103 Business and Government 0 3 15
ECON2104 Australian Macroeconomic Policy 3 0 15
and for all students
General Education subject/s 2 2 15
Total HPW Session 1 18.5
Total HPW Session 2 18.5
Total Credit Points 140

*Up to two subjects may be substituted from those offered by the School of Geography, Department of Applied Geology or School of Biological Sciences, subject to approval by the Head of School.
### Year 3

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### Total Credit Points: 115

### Total HPW Session 1: 20

### Total HPW Session 2: 18

### Total Credit Points: 115

*Approved as alternatives for GEOG2010 Industry Economics and Australian Industrial Policy and GEOG3115 Economics of Developing Countries, neither of which is currently offered.

### Year 4

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### Total HPW Session 1: 20

### Total HPW Session 2: 18

### Total Credit Points: 115

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### 3010.3000

**Human and Physical Resources Physical**

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### Total HPW Session 1: 22

### Total HPW Session 2: 24

### Total Credit Points: 120

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### Year 2

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<td>Evolutionary and Physiological Ecology</td>
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<tr>
<td>BIOS2031</td>
<td>Biology of Invertebrates</td>
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<td>6</td>
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<tr>
<td>BIOS2051</td>
<td>Flowering Plants</td>
<td>15</td>
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<td>BIOS2061</td>
<td>Vertebrate Zoology</td>
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</table>

### Total HPW Session 1: 22

### Total HPW Session 2: 19.5

### Total Credit Points: 130

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*Up to two subjects may be substituted from those offered by the School of Geography, Department of Applied Geology or School of Biological Sciences, subject to approval by the Head of School.*
Year 3
GEOG2021  Introduction to Remote Sensing  0 4 15
GEOG3000  Field Project 3  1.5  1.5 15
GEOG3062  Environmental Change  4 0 15
GEOG3082  Project Design and Formulation  0 3 10
GEOG3172  Spatial Population Analysis  0 4 15
plus two of the following
GEOG3011  Pedology  4 0 15
GEOG3025  Geomorphology  0 4 15
GEOG3032  Remote Sensing Applications  4 0 15
GEOG3142  Geographic Information Systems Applications  0 4 15
and one of the following
BIOS3061  Plant Ecosystem Processes  6 0 15
BIOS3071  Conservation Biology and Diversity  6 0 15
GEOL7321  Geology for Geomorphologists and Pedologists  2 4 15
and for all students
General Education subject/s  2 2 15

Total HPW Session 1 15.5/19.5
Total HPW Session 2 16.5/20.5
Total Credit Points 130

Year 4
GEOG3042  Environmental Impact Assessment  4 0 15
GEOG4010  Field Project 4  0 6 20
GEOG4031  Project  8 8 40
GEOG4042  Practical Applications  0 4 10
GEOG4052  Advanced Spatial Analysis*  4 0 15
GEOG4062  Advanced Environmental Analysis*  4 0 15

Total HPW Session 1 20
Total HPW Session 2 18
Total Credit Points 115

*Up to two subjects may be substituted from those offered by the School of Geography, Department of Applied Geology or School of Biological Sciences, subject to approval by the Head of School.

3010.4000
Human and Physical Resources Economic

Year 1 (same as for 3010.2000)
GEOG1000  Field Project 1  2 2 10
GEOG1022  Locational Processes  0 4 10
GEOG1031  Environmental Processes  0 4 15
GEOG1043  Data Processing Systems  4 0 10
GEOG1044  Data Display Systems  0 4 10
GEOG1062  Australia and Global Geographies: Integration and Divergence  4 0 15
MATH1131  Mathematics 1A or  
MATH1141  Higher Mathematics 1A or  
MATH1011  General Mathematics 1B  6 0 15
MATH1231  Mathematics 1B or  
MATH1241  Higher Mathematics 1B or  
MATH1021  General Mathematics 1C  0 6 15
and an additional 2 level 1 subjects: recommended

and either
ECON1101  Microeconomics 1 and  3 0 15
ECON1102  Macroeconomics 1  0 3 15
or
ECON1103  Microeconomic Principles and  3 0 15
ECON1104  Macroeconomic Principles  0 3 15

Total HPW Session 1 19
Total HPW Session 2 23
Total Credit Points 130

Year 2
GEOG2000  Field Project 2  1.5 1.5  10
GEOG2013  Geographical Data Analysis  4 0 15
GEOG2025  Biogeography  0 4 15
GEOG2052  Project in Spatial Analysis  0 4 10
GEOG2061  Regional Theory  4 0 15
GEOG2092  Australian Social and Economic Landscapes  4 0 15
GEOG3123  Applied Geographic Information Systems  4 0 15
ECON2103  Business and Government Policy  0 3 15
ECON2104  Australian Macroeconomic Policy  3 0 15

and for all students
General Education Subject/s  2 2 15

Total HPW Session 1 18.5
Total HPW Session 2 18.5
Total Credit Points 140
### Year 3

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<td>GEOG3082</td>
<td>Project Design and Formulation</td>
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<td>GEOG3172</td>
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<td>GEOG3142</td>
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<td>GEOG3166</td>
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<td>ECON2109</td>
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<td>Economics of Tourism</td>
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and for all students

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Total HPW Session 1 16.5/19.5
Total HPW Session 2 16.5/19.5
Total Credit Points 145

### Year 4

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<td>GEOG4042</td>
<td>Practical Applications</td>
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<td>GEOG4052</td>
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</table>

Total HPW Session 1 20
Total HPW Session 2 18
Total Credit Points 115

*Up to two subjects may be substituted from those offered by the School of Geography, Department of Applied Geology or School of Biological Sciences, subject to approval by the Head of School.

### Graduate Study

A number of coursework Masters degrees and Graduate Diplomas are available through the School of Geography. In addition the School welcomes enquiries from graduates who are interested in research leading to the award of the degrees of Doctor of Philosophy 1080 or Master of Science 2040.

### Course Outlines

#### Graduate Program in Geographic Information Systems

**8047.1000 Geographic Information Systems**

**Master of Applied Science MAppSc**

The Masters degree program in Geographic Information Systems is offered in both Geography and Geology within the Faculty of Applied Science. Entry into either discipline depends on the background of the applicant and the orientation of the proposed program.

**Entry qualifications.** Four-year Honours degree of appropriate standard in Geography, Geology, Geomatic Engineering, or a relevant environmental science.

**Course requirements.** Candidates are required to complete a course totaling a minimum of 120 credit points made up of 3 compulsory subjects, 3 elective subjects and a project. The degree will normally comprise one year of full-time study or two years of part-time study.

**Compulsory Subjects**

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<th>Course Code</th>
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<tr>
<td>GEOG9240</td>
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<td>GEOG9512</td>
<td>Project</td>
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<td>GEOG9280*</td>
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<tr>
<td>GMAT9604*</td>
<td>Land Information Systems</td>
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</table>

*or*
# Graduate Programs in Rangeland Management

Programs are available leading to the award of:

- Master of Applied Science in Rangeland Management 8025
- Graduate Diploma in Rangeland Management 5025

See entry under Wool and Pastoral Science

The University has considerable experience of research and teaching relating to the management of arid zone rangelands, gained over many years by several of its schools. This experience is now used in the provision of these graduate programs based at the University campus in Kensington, Sydney, but also providing for the use of its field station resources including Fowlers Gap Arid Zone Research Station in western New South Wales.

# Graduate Programs in Remote Sensing

Programs are available leading to the award of:

- Graduate Diploma in Remote Sensing 5047.2000

## 8047.2000

### Remote Sensing

**Master of Applied Science**

**MAppSc**

The masters degree program in Remote Sensing is offered in both the Faculty of Applied Science and the Faculty of Engineering. Entry into either faculty depends on the background of the applicant and the orientation of the proposed program.

**Entry qualifications.** Four-year degree of appropriate standard in engineering, geography, geology, geomatic engineering, or in a relevant environmental, biological or agricultural science.

**Course requirements.** Candidates are required to complete a course totalling 120 credit points, made up of 3 compulsory subjects, 3 electives, and a project. Compulsory subjects not offered in a particular year may be substituted by an equivalent subject, approved by the appropriate Course Coordinator. The degree will normally comprise one year of full-time study or two years of part-time study.

### Compulsory Subjects

<table>
<thead>
<tr>
<th>Subject Code</th>
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<td>GEOG9150</td>
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<tr>
<td>GEOG9210</td>
<td>Computer Mapping and Data Display</td>
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<tr>
<td>GEOG9242</td>
<td>Transportation Applications of Geographic Information Systems</td>
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<td>GEOG9250</td>
<td>Special Topic</td>
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<td>GEOG9290</td>
<td>Image Analysis in Remote Sensing</td>
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<td>GMAT9530</td>
<td>Analytical Photogrammetry</td>
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<td>Data Acquisition and Terrain Modelling</td>
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<td>GMAT9600</td>
<td>Principles of Remote Sensing</td>
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<tr>
<td>KCME1110</td>
<td>Geographical Information Systems in Applied Geology</td>
<td>12</td>
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</tbody>
</table>

**Note:** Other subjects may be substituted for those listed with permission of the Course Coordinator to suit the specific needs of individual students.

*Students wishing to include both of these subjects should take one as an elective.*

### Elective subjects

- GEOG9241 Advanced Geographical Information Systems
- GEOG9250 Special Topic
- GEOG9280 Applications and Management of GIS
- GEOLO110 Geological Remote Sensing
- GEOLO310 Image Processing of Spatial Data Sets
- GEOLO360 Remote Sensing Applications in Geoscience
- GMAT9530 Analytical Photogrammetry
- GMAT9532 Data Acquisitions and Terrain Modelling
- GEOG9042 Environmental Impact Assessment
- GEOG9210 Computer Mapping and Data Display
- GEOG9240 Principles of Geographical Information Systems
- GEOG9042 Environmental Impact Assessment
- GEOG9920 Applications and Management of GIS
- GEOLO110 Geological Remote Sensing
- GEOLO310 Image Processing of Spatial Data Sets
- GEOLO360 Remote Sensing Applications in Geoscience
- GMAT9530 Analytical Photogrammetry
- GMAT9532 Data Acquisitions and Terrain Modelling

*Students who take GEOLO110 are precluded from taking GEOLO310 and GEOLO360.

**Note:** Other subjects may be substituted for those listed with permission of the Course Coordinator to suit the specific needs of individual students.

## 5047.2000

### Remote Sensing

**Graduate Diploma**

**GradDip**

The graduate diploma program in Remote Sensing is offered in both the Faculty of Applied Science and the Faculty of Engineering. Entry into either faculty depends on the background of the applicant and the orientation of the proposed program.

**Entry qualifications.** Three-year degree from an approved university and or qualifications deemed appropriate by the relevant faculty.

**Course requirements.** Candidates are required to complete a program totalling a minimum of 84 credit points made up of 5 compulsory subjects (60 credit points) and 2 elective subjects (24 credit points). Compulsory subjects not offered in a particular year may be substituted by an approved equivalent subject.

The course will normally comprise one year of full-time study or two years part-time study.
Subject Descriptions

Descriptions of all undergraduate and graduate subjects are presented in alphanumeric order within organisational units. Note that due to on-going course changes some subjects offered in Year 2 have 3000 numbers and vice versa. For academic advice regarding a particular subject consult with the contact for the subject as listed. A guide to abbreviations and prefixes is included in the chapter 'Handbook Guide', appearing earlier in this book.

GEOG1000
Field Project 1
Staff Contact: Dr B Parolin and Mr D Edwards
CP10 F T2

A five days field project normally undertaken during the mid-year recess, designed to support teaching in Year 1 subjects and to develop basic field methods and skills.

Students will incur some personal expenses in connection with this subject, which is a compulsory part of the course.

GEOG1022
Locational Processes
Staff Contact: Dr B Parolin
CP10 S2 L2 T2

Basic theoretical constructs for explaining the location of human activity. Concepts of optimal location and spatial competition, geographical variations in the factors of production, economies of scale and agglomeration, transaction costs and locational decision making under conditions of uncertainty. Practical study links theory and problem solving in economic geography.
GEOG1031
Environmental Processes
Staff Contact: Mr D Edwards
CP15 S2 L3 T1
Note/s: Excluded GEOG1073.

The subject is an introduction to physical geography outlining the processes and history of physical and biological components of the environment. This knowledge is then used to improve our understanding of global environmental problems. Aspects of the environment considered include the Earth’s energy balance, atmospheric systems, ecosystems, soils and erosion processes.

GEOG1043
Data Processing Systems
Staff Contact: Mr S Filan
CP10 S1 L2 T2
Measurement, management, analysis and display of general and spatial data. Basic use of the University's campus wide network, predominantly with personal computers. Use of software (particularly SPSS for Windows) for management, processing, analysis and display of data.

GEOG1044
Data Display Systems
Staff Contact: Prof B Garner
CP10 S2 L2 T2
Prerequisite: GEOG1043


GEOG1062
Australian and Global Geographies: Integration and Divergence
Staff Contact: A/Prof I Burnley, Dr M Sant, Ms B Scott, Mr K. Dunn
CP15 S1 L3 T1
Note/s: Excluded GEOG1064, GENA3001.


GEOG1064
Global Development, Economy and Environment in Australia
Staff Contact: A/Prof I Burnley, Dr M Sant, Mr K Dunn
CP20 S1 L4 T2
Note/s: Students will incur personal costs. Excluded GEOG1062.

Progressive integration of Australia into global capitalism and development and environmental consequences of this process in Australia. Impacts of specific economic imperatives, population growth and patterns of production and consumption on resources, land degradation and flora and fauna in Australia. Role of political factors and management quality in sustainable development and environmental protection.

GEOG1073
Environmental Processes and Analysis
Staff Contact: Mr D Edwards
CP15 S2 L3 T3
Note/s: Excluded GEOG1031.

This subject has the same content as GEOG1031 but with an additional 2 hour laboratory introducing methods of analysis of climates, soils, hyrology, landforms and vegetation.

GEOG2000
Field Project 2
Staff Contact: Mr J Sammut (Physical)
Dr M Sant (Economic)
CP10 F T1.5
Note/s: Students will incur personal costs.

A five days field project normally undertaken during a recess designed to support teaching in Year 2 subjects in physical and economic geography and to develop more advanced skills in data collection, observation and field methods. Students will incur some personal expenses in connection with this subject, which is a compulsory part of the course.

GEOG2013
Geographical Data Analysis
Staff Contact: Mr S Filan
CP15 S1 L1 T3
Prerequisite: Either GEOG1073 or both GEOG1031 and GEOG1062

Inferential statistics and hypothesis testing in the analysis of spatial data. Methods of sampling, comparing populations and of identifying relationships through correlation, association, regression, time series and classification. Topics covered are applicable to physical and economic geography.
GEOG2021
Introduction to Remote Sensing
Staff Contact: Mr A Evans
CP15 S2 L2 T2
Prerequisite: Successful completion of a Year 1 program in Applied Science, Science or Arts or equivalent as approved by the Head of School

Principles and technical aspects of remote sensing. Forms of available imagery, their utility and facilities for interpretation. Basic airphoto interpretation techniques relevant to environmental assessment. Introduction to principles of the electromagnetic spectrum, photometry and radiometry. Sensor types, image formation and end products associated with selected satellite programs, including Landsat. Land-cover and land-use interpretation procedures in visual image analysis. Basic procedures in machine-assisted image enhancement.

GEOG2025
Biogeography
Staff Contact: A/Prof M Fox
CP15 S2 L2 T2
Prerequisites: GEOG1073 and both BIOS1011 and BIOS1021


GEOG2051
Soils and Landforms
Staff Contact: Dr W Erskine, Mr J Sammut
CP15 S1 L2 T2
Prerequisite: GEOG1031 or GEOG1073

An introduction to soil classification schemes with particular emphasis on the soils and landforms of flood-plains and the Riverine Plain, NSW. Long term development of landscapes with emphasis on the evolution of mountain ranges. Arid zone and coastal landforms emphasising current processes and Quaternary history.

GEOG2052
Project In Spatial Analysis
Staff Contact: Dr M Sant, Mr K Dunn
CP10 S2 L1 T3
Prerequisite: GEOG1022

Supervised application of quantitative methods in selected projects involving the analysis of spatial data and requires integrated applications of skills in data processing, geographic data analysis, and mathematical methods.

GEOG2061
Regional Theory
Staff Contact: Dr M Sant
CP15 S1 L2 T2

Regional theory and analytical methods with a particular focus on the explanation of the Richardson growth model and the practical application of its components, using Australian data. Capital formation and mobility, labour supply and technological change, assessments of recent changes in the Australian regional economic system. Practical work deals with the measurement and analysis of structural change, accessibility and economic interaction and regional economic welfare.

GEOG2071
Transport and Land Use
Staff Contact: Dr B Parolin
CP15 S2 L2 T2

The relationships between transport and land use, mobility, accessibility, and activity systems in urban and rural environments. Emphasis on policy issues and case studies from Australia. Introduction to simple transport-land use models.

GEOG2092
Australian Social and Economic Landscapes
Staff Contact: A/Prof I Burnley, Ms B Scott, Mr K Dunn
CP15 S1 L2 T2
Prerequisite: GEOG1062

Analysis of the principal factors and forces shaping the contemporary social and economic landscapes of Australia and the problems arising. Themes include Australia's changing population profile and distribution, the changing face of Australian cities, regional disparities in social and economic well-being, changing patterns of employment and industrial location, and the declining fortunes of rural Australia. Planning and policy responses to the problems of spatial change and re-organisation are emphasised and future scenarios addressed.

GEOG3000
Field Project 3
Staff Contact: A/Prof M Melville (Physical), Prof B Garner (Economic)
CP15 F T1.5
Prerequisite: One of GEOG2025, GEOG3011, GEOG3025. This prerequisite does not apply to students registered in course 3010

Note/s: Students will incur personal costs.

A five days field project normally undertaken during a recess, designed to support teaching in Year 3 Level III subjects in physical and economic geography and to demonstrate the application of field methods in problem solving and research projects. Students will incur some personal expenses in connection with this subject, which is a compulsory part of the course.

GEOG3011
Pedology
Staff Contact: A/Prof M Melville
CP15 S1 L2 T2
Prerequisites: GEOG1073 and one of CHEM1101 or CHEM1401 or both GEOL1101 and GEOL1201 or both BIOS1011 and BIOS1021

Methodology of pedogenic studies and the application of these studies to the understanding of soil and form relationships. Soil physical and chemical properties and their interrelationships, emphasizing clay-mineral structure and behaviour, soil solution chemistry, soil water movement and the application of these properties to elements of soil mechanics. Soil properties in natural, rural and urban landscapes, including assessment of soil fertility, swelling characteristics, dispersibility, erodibility and.
aggregate stability. Laboratory analysis of soil physical and chemical characteristics with emphasis on properties associated with land capability assessment. Statistical analysis of soil data and its application to mapping. The use of soil micromorphological and mineralogical studies in pedology.

**GEOG3025**

**Geomorphology**  
*Staff Contact: Dr W Erskine*  
CP15 S2 L2 T2  
***Prerequisites:*** GEOG2051

Drainage basin processes including: weathering, the production of runoff and sediment, sediment tracing, sediment budgets and denudation histories. The processes of river channel changes including sediment transport, hydraulics, hydrology, hydraulic geometry and channel patterns. There will be an emphasis on the application of geomorphic principles to land management.

**GEOG3032**

**Remote Sensing Applications**  
*Staff Contact: Mr A Evans*  
CP15 S1 L2 T2  
***Prerequisite:*** GEOG2021 or GMAT8711

Spectral characteristics of natural phenomena and image formation. Ground truthing, collection and calibration. Introduction to computer classification procedures. Multi-temporal sampling procedures, image to image registration and map to image registration. Major applications of remote sensing in the investigation of renewable and non-renewable resources to include: soils, geology, hydrology, vegetation, agriculture, rangelands, urban analysis, regional planning, transportation and route location and hazard monitoring.

**GEOG3041**

**Mathematical Methods for Spatial Analysis**  
*Staff Contact: Mr S Filan*  
CP15 S1 L2 T2  
***Prerequisite:*** MATH1021 or MATH1032 or MATH1231 or MATH1042 or MATH1241 and GEOG1043 or FIBR2201

Selected mathematical methods for the analysis of spatial problems, including applications of calculus in constrained and unconstrained optimisation; mathematical programming methods; network models; input-output analysis; facility location and allocation problems.

**GEOG3042**

**Environmental Impact Assessment**  
*Staff Contact: Dr W Erskine*  
CP15 S1 L2 T2  
***Prerequisites:*** GEOG1031 or GEOG1073 or by permission from Head of School

Rationale and basic objectives; history and legislative framework: standardised types of environmental impact assessment EIA, including matrix approach, adopted methods of EIA in Australia. Techniques of impact evaluation in terms of socio-economic criteria. Environmental decision making and planning under conditions of uncertainty. Case studies exemplifying procedures, techniques and issues. Trends, changes and possible future developments in EIA Practical exercises representing components of typical EIAs.

**GEOG3062**

**Environmental Change**  
*Staff Contact: School Office*  
CP15 S1 L2 T2  
***Prerequisite:*** Successful completion of a Year 2 Program in Applied Science, Science, or Arts or equivalent as approved by the Head of School


**GEOG3082**

**Project Design and Formulation**  
*Staff Contact: Dr B Parolin*  
CP10 S2 L1 T2

Stages in the design of a research project. Undertaking a literature review relating to the project. Identification and formulation of working hypotheses. Writing up a research proposal. Timetables and planning strategies for project execution and completion.

**GEOG3101**

**Sample Surveys and Analysis**  
*Staff Contact: Dr B Parolin (Coordinator), A/Prof I Burnley, Mr K Dunn*  
CP10 S1 L2 T2

An introduction to sample survey data collection methods and techniques for the analysis of survey data. Topics include research design methods, questionnaire design and implementation and the analysis of categorical survey data using log-linear, logit and regression approaches.

**GEOG3122**

**Geographic Information Systems**  
*Staff Contact: Prof BJ Garner, Mr S Filan*  
CP15 S2 L2 T2  
***Prerequisite:*** Successful completion of at least one year of course 2700.0600 Computer Science or course 2700.1400 Information Systems, or by permission from the Head of School.  
***Note/s:*** Enrolments in this subject are constrained by availability of laboratory facilities. All enrolments must be approved by the Head, School of Geography, or representative.

An introduction to geographic information systems with special reference to computer-based systems for resource evaluation. Case study evaluation, application of the MAP and other GIS software.

**GEOG3123**

**Applied Geographic Information Systems**  
*Staff Contact: Prof BJ Garner, Mr S Filan*  
CP15 S2 L2 T2  
***Prerequisite:*** Successful completion of at least three subjects offered by the School of Geography, or by special permission from the Head of the School of Geography, or representative.

An introduction to information systems of particular relevant for geographers with special reference to computer-based systems for resource evaluation. Case study evaluation, application of the MAP and other GIS software.
GEOG3132  
Marketing Geography  
Staff Contact: School Office  
CP15 S1 L2 T2  
Prerequisite: MARK2042. This prerequisite does not apply to students enrolled in course 3010.  
Note/s: Not offered in 1997.

Organisation and operation of the marketing function and trends in its performance. Merchandising strategies of wholesalers and retailers and the consequent location patterns of consumer oriented enterprises within cities. Retail feasibility studies and the structure and analysis of market areas in intra-urban areas. Consumer spatial behaviour, including search and decision processes. Shopping centre images and spatial choice models.

GEOG3142  
Geographic Information Systems Applications  
Staff Contact: Dr Q Zhou  
CP15 S2 L2 T2  
Prerequisite: GEOG3122 or GEOG3123  

Examples of applications of geographical information systems in resources and environmental management and urban and regional analysis. Case studies include the monitoring of land degradation, management of biological and physical resources, environmental conflict resolution, administration of land records, provision of health services, transport and land use planning, marketing and territory assignment. Visits to inspect facilities and activities of key government agencies are included.

GEOG3161  
Computer Mapping and Data Display  
Staff Contact: Prof BJ Garner  
CP15 S1 L1 T3  
Prerequisites: Successful completion of a Year 1 program in Science or Arts or equivalent as approved by Head of School  

Introduction to theoretical and practical problems in displaying data graphically and constructing thematic maps by computer using the Mapinfo mapping package. The emphasis is on developing skills in automated cartography through hands-on experience culminating in the preparation of a folio of maps of selected census data. No previous computing expertise is required.

GEOG3166  
Place and the Politics of Identity  
Staff Contact: Mr K Dunn  
CP15 S2 L2 T2  
Prerequisite: GEOG2092  

Identity and place and intricately bound up with each other. This subject grapples with issues of place, identity, territory and representation. Case studies cover a range of axes of difference including religion, place, gender, sexuality, nationalism and popular culture. Recent influences on, and orientations of, the sub-discipline of cultural geography are introduced. The key theories of identity are critically discussed. Creative and official representations of places and of peoples are critically analysed. Contemporary political issues associated with the deployment and representation of cultural difference are discussed including both oppressive and emancipatory articulations of identity.

GEOG3172  
Spatial Population Analysis  
Staff Contact: A/Prof I Burnley  
CP15 S2 L2 T2  
Prerequisite: GEOG2092  

Population growth and structure in an international urban and regional context. The components and processes of population change; fertility, mortality and migration set within the framework of demographic transition and development theory. Theories of migration and mobility and of optimal populations. Demographic and social indicators for urban and regional analysis and their implications for inequalities in living conditions, at local, regional, and international scales. The adjustment of immigrant and migrant populations to the urban environment.

GEOG3181  
Urban Activity Systems  
Staff Contact: Dr B Parolin  
CP15 S1 L2 T2  
Prerequisite: GEOG2092  

Focus is on trip making, movement, and activity patterns in urban areas. Topics include: the activity concept, travel behaviour and urban spatial structure; constraints to individual travel behaviour and activity pattern linkages; the urban transport disadvantaged; public transport problems and issues in Australian capital cities; travel and activity consequences of transport infrastructure developments.

GEOG3192  
Urban and Regional Development  
Staff Contact: Dr M Sant  
CP15 S2 L2 T2  
Prerequisite: GEOG2092  

Focus is on the growing importance of recreation and tourism in urban and regional systems. Emphasis is on problems of land use and resource allocation and implications for planning in Australia. Theoretical and practical studies of leisure environments, open space provision, recreational demand, methods of forecasting, management of supply, resort development, economic and environmental impact assessment.

GEOG3211  
Australian Environment and Natural Resources  
Staff Contact: A/Prof M Fox, Mr J Sammut  
CP15 S1 L2 T2  
Prerequisite: GEOG1073 or GEOG1031  

The characteristics of Australia’s physical and biotic environment: geology, climate, geomorphology, soils, vegetation and fauna. The problems of exploiting Australia’s water and land resources including the degradation of land by erosion, salinisation and soil fertility decline; and habitat loss and fragmentation.

GEOG3333  
Special Topic  
Staff Contact: A/Prof M Fox  
CP15 F T4  

Admission by permission to suitable students with good passes in at least four subjects at Upper Level. A course of individually supervised reading and assignments as an approved topic in Geography not otherwise offered.
GEOG3334
Special Research Methods
Staff Contact: A/Prof I Burnley
CP15 F T2
Prerequisite: A graded pass average in at least four upper level geography subjects
Note/s: Excluded GEOG3333
A course of individually supervised readings leading towards an advanced understanding of theoretical and analytical developments in one area of geography.

GEOG4010
Field Project 4
Staff Contact: Dr W Erskine
CP20 S2 T6
Develop skills in problem formulation and team-based field work. Preparation and presentation of professional quality reports of applied geographical analysis. Define problem, plan strategy for appropriate investigation. Conduct field studies, and report results of investigation. Field work of five days is compulsory. Students will incur some personal expenses in connection with this subject.

GEOG4031
Project
Staff Contact: Dr B Parolin
CP40 F T8
Prerequisite: GEOG3082
Note/s: The deadline for submission of project reports is the end of Week 7 of Session 2.
Implementation of the research proposal in Applied Geography prepared for GEOG3082 Project Design and Formulation under the direction of a supervisor; preparation of a project report.

GEOG4042
Practical Applications in Geography
Staff Contact: Prof BJ Garner
CP10 S2 T4
Seminars with practitioners in the fields of urban and regional analysis and environmental studies including environmental impact statements; research proposals, report writing, the roles of government agencies and consultants; and budgeting for research projects; applying for positions and personal skills development.

GEOG4100/GEOG4050
Honours Geography
Staff Contact: Dr B Parolin
CP120/60 F
Prerequisite: Arts students must satisfy Faculty requirements for entry to the Honours Level program and must have obtained at least 35 credit points in Geography subjects, including 30 Level 1 credit points and must include GEOG2013. A minimum cumulative average at Credit level is required for all Upper Level subjects taken.
Science students must have completed either program 2700, 2527 or 6851 including GEOG2013 and 120 Level III credit points.
Students are required: 1. To undertake an original piece of work extending throughout the year and to submit a thesis based upon it. 2. To participate in seminars and fieldwork as notified by the School of Geography.

GEOG4052
Advanced Spatial Analysis
Staff Contact: Dr B Parolin
CP15 S1 L2 T2
Selected topics in economic and physical geography chosen to illustrate developments at the frontiers of research in spatial analysis.

GEOG4062
Advanced Environmental Analysis
Staff Contact: A/Prof M Melville
CP15 S1 L2 T2
Selected topics in the study of human and physical environments, chosen to illustrate contemporary frontiers of research and development in environmental studies.

GEOG4300
Vegetation management
Staff Contact: A/Prof M Fox
CP15 S1 L2 T2
Prerequisite: Completion of Stage 3 of a four-year degree program.
Note/s: Contact hours include some fieldwork which forms a compulsory part of this subject. Students will incur some personal costs for fieldwork.
The subject provides a background in theory and practice in vegetation management, particularly under Australian conditions. It covers the description and measurement of vegetation, vegetation dynamics, vegetation response to perturbation and human impacts, theories, and modelling of vegetation change. A third of the subject is devoted to management strategies of selected vegetation types.

GEOG4310
River management
Staff Contact: Dr W Erskine
CP15 S2 L2 T2
Prerequisite: Completion of Stage 3 of a four-year degree program.
Note/s: Contact hours include some fieldwork which forms a compulsory part of this subject. Students will incur some personal costs for fieldwork.
The principles of river management including total or integrated catchment management, environmental impact assessment, in-stream uses and hydrogeomorphic behaviour. Issues covered include regulated rivers, inter-basin diversions, extractive industries, urbanisation, river engineering, legislative controls and institutional responsibilities. The course develops an understanding of how and why rivers respond to human activities and ways of ameliorating negative impacts. Field work is an essential part of the subject and the Nepean River will be used as a case study of management problems.

GEOG4320
Soil Degradation and Conservation
Staff Contact: A/Prof M Melville and Dr W Erskine
CP15 S2 L2 T2
Prerequisite: Completion of Stage 3 of a four-year degree program.
Note/s: Contact hours include some fieldwork which forms a compulsory part of this subject. Students will incur some personal costs for fieldwork.
Identification, assessment and analysis of the main processes of soil degradation, including the role of climate, vegetation, geomorphology and pedology in controlling the
processes. Discussions of appropriate management strategies for reducing degradation and for reclaiming degraded landscapes. Topics include: surface wash, gully erosion, wind erosion, soil acidification, soil structure decline, salinisation, accumulation of toxins and desertification.

**GEOG9042**  
Environmental Impact Assessment  
*Staff Contact: Prof BJ Garner*  
CP12 S1 L2 T2  
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.

**GEOG9130**  
Soil Studies for Arid Lands Management  
*Staff Contact: A/Prof M Melville*  
CP12 S1 L2 T1  
Soil forming processes in arid regions. Physical, mineralogical and chemical characteristics of arid soils, with emphasis on properties significant for land capability. Chemical and physical properties of saline and alkaline soils. Soil response to irrigation, secondary salinisation and alkalinisation. Classifications and distribution of arid zone soils and their environmental relationships. Field methods and soils survey techniques, statistical analysis of soil data and its application to mapping. Laboratory analyses of physical and chemical characteristics of soils, with emphasis on properties significant for land capability. Based on GEOG3011 Pedology, with additional reading, tutorials, seminars and practical classes to stress the features of arid zone soils.

The formal component of the above teaching is completed at Kensington. However, a number of tutorial and laboratory hours are devoted to a field-based soil mapping project based at Fowlers Gap Research Station.

**GEOG9150**  
Remote Sensing Applications  
*Staff Contact: Mr A Evans*  
CP12 S1 L1 T2  
The application of remotely-sensed data and information in the description, classification and assessment of earth resources and environmental conditions. Different types of remote sensing data and imagery, their attributes, acquisition and uses. Relevance of remote-sensing data and imagery to a range of applications, including assessment of conditions of terrain, soils and surface materials; multi-temporal monitoring and inventory of rangelands, croplands and forests; rural and urban land use assessment; surveillance of surface water resources and sedimentation; appraisal of changes in the coastal zone. Use of remote sensing in environmental management and in environmental impact assessment.

**GEOG9160**  
Directed Problems in Remote Sensing  
*Staff Contact: Mr A Evans*  
CP12 S2 T3  
A detailed investigation of a particular aspect of remote sensing technology or an area of applications relevant to candidates interests and background.

**GEOG9210**  
Computer Mapping and Data Display  
*Staff Contact: Prof B Garner*  
CP12 S1 L2 T2  
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.

**GEOG9230**  
Population, Health and Environment  
*Staff Contact: A/Prof I Burnley*  
CP12 S2 L2  
Relationship between environmental factors and disease morbidity and mortality is examined by consideration of the epidemiological transition in different countries, and the spatial and occupational-specific variation in disease incidence in Australia. Methodology for standardising, testing for significance and data quality.

**GEOG9240**  
Principles of Geographic Information Systems  
*Staff Contact: Dr Q Zhou*  
CP12 S1 L1 T2  
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.

**GEOG9241**  
Advanced Geographical Information Systems  
*Staff Contact: School Office*  
CP12 S2 L1 T2  
Prerequisite: GEOG9240  
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 database management.

**GEOG9242**  
Transportation Applications of Geographical Information Systems  
*Staff Contact: Dr B Parolin*  
CP12 S2 L1 T2  
Prerequisite: GEOG9240  
This subject 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 subject, the student will have a sound working knowledge of transportation GIS.
and an ability to work directly with real problems in government and private sectors.

GEOG9250
Special Topic
Staff Contact: Prof B Garner
CP12 S1 or S2 T3

Selected topics may be pursued in the forum of individually supervised readings and assignments linked to studies in postgraduate programs offered through the School of Geography.

GEOG9280
Application and Management of Geographical Information Systems
Staff Contact: Prof B Garner, Dr Q Zhou
CP12 S1 L2 T1

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 the practical use of project management tools.

GEOG9290
Image Analysis of Remote Sensing
Staff Contact: Mr A Evans
CP12 S2 L1 T1

Techniques for extracting information from satellite imagery including image enhancement techniques, classification and feature recognition, statistical methods, and related procedures. Emphasis is on applications relating to vegetation cover and natural resource management. Practical work will be undertaken using the ERDAS image processing software.

GEOG9300
Vegetation management
Staff Contact: A/Prof M Fox
CP12 S1 L2 T1

Note/s: Fieldwork forms a compulsory part of this subject and students will incur personal costs.

The subject provides a background in theory and practice in vegetation management, particularly under Australian conditions. It covers the description and measurement of vegetation, vegetation dynamics, vegetation response to perturbation and human impacts, theories, and modelling of vegetation change. A third of the subject is devoted to management strategies of selected vegetation types.

GEOG9310
River management
Staff Contact: Dr W Erskine
CP12 S2 L2 T1

Note/s: Fieldwork forms a compulsory part of this subject and students will incur personal costs.

The principles of river management including total or integrated catchment management, environmental impact assessment, in-stream uses and hydrogeomorphic behaviour. Issues covered include regulated rivers, inter-basin diversions, extractive industries, urbanisation, river engineering, legislative controls and institutional responsibilities. The course develops an understanding of how and why rivers respond to human activities and ways of ameliorating negative impacts. Field work is an essential part of the subject and the Nepean River will be used as a case study of management problems.

GEOG9320
Soil Degradation and Conservation
Staff Contact: A/Prof M Melville, Dr W Erskine
CP12 S2 L2 T1
Note/s: Fieldwork forms a compulsory part of this subject and students will incur personal costs.

Identification, assessment and analysis of the main processes of soil degradation, including the role of climate, vegetation, geomorphology and pedology in controlling the processes. Discussions of appropriate management strategies for reducing degradation and for reclaiming degraded landscapes. Topics include: surface wash, gully erosion, wind erosion, soil acidification, soil structure decline, salinisation, accumulation of toxins and desertification.

GEOG9330
Spatial Data Processing and Integration
Staff Contact: Dr O Zhou
CP12 S1 L1 T2
Note/s: Not offered in 1997.

Geographical information systems and remote sensing have many similarities, including geometric rectification, incorporation of reference data into the analysis of GIS and remotely sensed data, accuracy assessment, the form and structure of the data, visual analysis of spatial data and digital processing methods (Boolean overlay, decision support systems, affine transformations and expert systems). These topics will be considered and applied in the laboratory using remotely sensed and GIS data. INFO is used for database management and ARCINFO, ERDAS and MAP to demonstrate the practical application of the topics.

GEOG9509
Project
Staff Contact: A/Prof M Melville
CP36 S2 T9

A practical application or investigation in environmental studies or in land classification as a basis for land management or land use planning; or an investigation of soil degradation in relation to soil-vegetation characteristics and land use; or a comparative review of existing approaches to land evaluation. Involves preparation of a report, and fieldwork at Fowlers Gap Research Station or in another part of arid or semi-arid Australia. Tutorial hours are equivalent contact hours, but also involve fieldwork out of session.

GEOG9512
Project
Staff Contact: Prof B Garner, Dr Q Zhou
CP48

An investigation of a problem in remote sensing or geographical information systems which involves an identifiable research component. Such an investigation should be related to the research interests of particular Schools within the Faculty of Applied Science.
Head of School
Professor DJ Young

Administrative Assistant
Mr OS Andersen

The field of Materials Science and Engineering offers unlimited possibilities for innovation and development. Attention is being focussed on developing and processing metals, ceramics, polymers and composites with improved properties.

The activities of the materials engineer range from materials production, including their extraction from ores and their refining, to the design, development, processing and recycling of materials for use in aerospace, transportation, electronics, energy conversion, and biomedical systems.

Advanced materials can provide a major competitive advantage in virtually every part of a country's manufacturing industry. Because Australia is a country rich in minerals, materials science has been designated as a priority area for research and development. Examples of recent and significant developments include the emergence of environmentally friendly and economical metal processing methods; advanced surface coatings; electrical ceramics; engineering polymers, and advanced composites.

The School of Materials Science and Engineering provides education and training for students to prepare them for a significant and important career in the materials industry.

The School of Materials Science and Engineering is in a good position to provide the increased numbers of graduates necessary for development of these new initiatives in materials. It is the only school in Australia which offers professional courses in ceramic engineering, metallurgical engineering, and materials engineering as well as providing postgraduate specialisation in these fields.

The School is extremely well equipped with a wide range of advanced computing, thermal analysis, mechanical testing, X-ray, optical and electron microscopy facilities.
Ceramic Engineering and Ceramics

The ceramic industry produces an enormous volume and variety of products used in engineering applications, building construction and in our everyday life. As well as the traditional bricks, roof tiles, sheet and container glass and tableware, ceramics have been found essential as abrasives, refractories, enamels and in electrical and electronic applications and nuclear fuels. In many of these cases, ceramic articles make possible the manufacture of other products either by being a key component, such as an electronic or magnetic part, or by forming the material of construction of, for example, a blast furnace or an abrasive wheel.

Modern ceramics comprise such a varied and complex group of materials that a high level of training is required to control their manufacture with the required precision and to supervise their proper use.

Ceramic engineers are needed in increasing numbers both in Australia and overseas countries and the School offers the only degree course in Ceramic Engineering in Australasia. This course trains students in the relation between the structure and the properties of ceramic materials, the engineering and process chemistry of their manufacture and the design principles of their use.

Careers open to graduates fall into three broad categories. Some go initially into activities associated directly with production, i.e. the design and layout of plants, supervision of their construction and control of their operations. Others move into research and development in industrial laboratories or research institutions. The final group enters fields outside of Ceramic Engineering directly, where the graduate's background in materials and engineering is utilised. In all cases, graduates with organising ability frequently move into management if they have an interest in this side of the industry.

In Australia, a number of government research organisations are active in ceramic research, e.g. the Australian Nuclear Science and Technology Organisation, and the Divisions of Materials Science and Building Research of the CSIRO. Investigations with more immediate applications are carried out in industrial laboratories. Even when the basic principles of a process have been worked out in the laboratory, its successful transfer to an industrial scale requires a great deal of effort and expertise. This is an area which offers great scope for further development in Australia.

Graduates in Ceramic Engineering are eligible for membership of the Institution of Engineers, Australia, the Institute of Ceramics, Great Britain, the Royal Australian Chemical Institute and the National Institute of Ceramic Engineers, USA.

It is compulsory that, before completion of the course, students in Ceramic Engineering must obtain a minimum of twelve weeks' professionally oriented or industrial experience.

Metallurgical Engineering

The metallurgical profession has developed in importance in keeping with growth of Australian metal and mineral industries. These industries are recognised as being important to the Australian economy and there is a strong demand for professional metallurgists in all sectors of these industries, as well as in the manufacturing industry.

Graduate metallurgists have a wide choice of type of employment and location. They may work in production, technical control or development, in metal or mineral producing plants in locations such as Newcastle, Port Kembla, Broken Hill, Mt Isa, Townsville, Gladstone, Port Pirie, Whyalla, Kwinana, Kalgoorlie or Pilbara; or in manufacturing plants, including the automobile, aircraft, and construction industries located mainly in the population centres.

In the metal industry, opportunities for a career in management are excellent, since it is a tradition in this industry that management should be in the hands of technical people. If graduates are inclined towards research and development, they will find considerable scope in research laboratories.

The undergraduate courses in metallurgical engineering and metallurgy are based on engineering and physical sciences and have been designed to prepare graduates for employment in any field of metallurgy within the metal and manufacturing industries or in research institutions.

Graduates in Metallurgical Engineering are eligible for membership of the Institution of Engineers, Australia, the Australasian Institute of Mining and Metallurgy and the Institution of Metals and Materials Australasia.

Students are required to have gained at least twelve weeks of approved industrial experience before graduation. Industrial experience is usually obtained during the long recess periods.

Materials Engineering

Materials Engineering is a new and broad-ranging discipline which applies the principles of science and engineering to the design and development of metallic, ceramic and plastic materials and, to their manufacture into goods and their subsequent performance in service.

Materials Engineering is founded on the relationship between structure and properties, an understanding of which permits materials to be engineered to specific end use requirements. Virtually every man-made material is now the subject of study of the Materials Engineer.

Due to an increasing demand for optimised materials, graduates in Materials Engineering are presented with an outstanding range of job opportunities.

Many graduates pursue an industrial career either in the materials producing industries, the utilities, or manufacturing sector. Materials and process development and selection, supervision of manufacturing and production processes, technical trouble shooting and testing, are
areas in which Materials Engineers are commonly engaged. Alternatively, graduates may pursue a research career, working in laboratories run by materials producing companies, and statutory commonwealth and state government departments. Graduates with an organising ability frequently move into management both in industry and research. Since materials engineering is a broadly-based scientific/engineering discipline, there is considerable flexibility in career selection.

Graduates in Materials Engineering are eligible for membership of the Institution of Engineers, Australia. Students are required to have gained at least twelve weeks of professionally oriented or industrial experience in an area of industrial setting involving processing, production, characterisation, analysis, testing etc.

### Undergraduate Study

#### Course Outlines

### Ceramic Engineering and Ceramics

A four-year full-time course in Ceramic Engineering leading to the award of the BE degree, and a six-year part-time course in Ceramics leading to the award of the BSc (Tech) degree, are offered within the School.

#### 3025 Ceramic Engineering Full-time Course

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**Total HPW Session 2** 22

**Total Credit Points** 120
### 3030

**Ceramic Engineering Part-time Course**

**Bachelor of Science Technology**

**BScTech**

#### Stage 1

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<td>MATH1141</td>
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<tr>
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**Total Credit Points**: 60

#### Stage 2

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<tr>
<td>MATH1011</td>
<td>Introduction to Materials Engineering</td>
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<tr>
<td>MATH1021</td>
<td>Introduction to Computing</td>
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<tr>
<td>MECH1010</td>
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**Total Credit Points**: 60

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<td>MATH2021</td>
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<td>MATH1072</td>
<td>Physics of Materials and Design</td>
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<td>MATH1082</td>
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<td>MATH1092</td>
<td>Materials and Design</td>
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<td>MATH1102</td>
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**Total Credit Points**: 63

### Stage 4

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<td>MATH1022</td>
<td>Materials Processes Principles</td>
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<td>MATH1032</td>
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<td>MATH1042</td>
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<td>MATH1052</td>
<td>Materials Engineering 1B</td>
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<td>MATH1062</td>
<td>Mechanical Properties of Materials</td>
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**Total Credit Points**: 60

### Stage 5

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<td>MATH2869</td>
<td>Applied Statistics SC</td>
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<td>Ceramic Process Principles</td>
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<td>MATH1123</td>
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<td>MATH1213</td>
<td>Ceramic Raw Materials</td>
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<td>MATH1243</td>
<td>Ceramic Equipment</td>
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<td>MATH2203</td>
<td>Ceramic Processing Laboratory</td>
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**Total Credit Points**: 57.5

### Stage 6

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<td>MATH1163</td>
<td>Chemistry of the Solid State</td>
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<td>MATH1243</td>
<td>Management 1</td>
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<tr>
<td>MATH2183</td>
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<tr>
<td>MATH2213</td>
<td>Diffusion</td>
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<tr>
<td>MINE7341</td>
<td>Mineral Process Engineering</td>
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**Total Credit Points**: 63

---

**Note**: The table above includes a summary of courses and credit points for each stage of the Ceramic Engineering Part-time Course, with a focus on specific subjects and credit values. The course outline is structured to reflect the progression through the stages, with each stage building upon the previous one. The credit points are designed to ensure a comprehensive understanding of ceramic engineering principles, applications, and materials science.
Metallurgical Engineering

A four-year full-time course in metallurgical engineering leading to the award of the BMetE degree (Physical Metallurgy or Process Metallurgy Major) and a six-year part-time course in metallurgy leading to the award of the BSc(Tech) degree are offered within the School.

3125

Metallurgical Engineering Full-time Course

Bachelor of Metallurgical Engineering
BMetE

Students entering the Bachelor of Metallurgical Engineering program may elect to major in either Process Metallurgy or Physical Metallurgy. Selection of these alternative study programs may be deferred until the end of the second year of full-time study.

The Process Metallurgy option is designed to produce graduates with training appropriate to the primary metallurgy industry while the Physical Metallurgy option provides a training more suited to the manufacturing industry.

Year 1 of the course consists of physics, chemistry, mathematics and engineering subjects and is essentially the same as that for a number of other engineering and science courses offered in the Faculty of Applied Science.

Year 2 introduces Materials Science and Materials Engineering subjects supported by chemistry and mathematics and is common with Year 2 in the full-time Ceramic Engineering and Materials Engineering Courses.

Physical Metallurgy and Metallurgical Engineering are introduced in Years 3 and 4. In Year 3 the major strands are supported by other engineering subjects and in Year 4 by a thesis project, seminar and professional electives.

Students are required to have gained at least twelve weeks of approved industrial experience before graduation, and to have submitted satisfactory reports on such work. Industrial experience is usually obtained during the long recess periods at the ends of Years 2 and 3.

During the course, visits are made to various metallurgical works, and students are required to submit reports on some of these.

Students may complete the first one or two years of their degree at their local university engineering school, and then transfer with advanced standing to UNSW.

| Year 1 | CHEM1101 Chemistry 1A | 6 0 15 |
|        | CHEM1201 Chemistry 1B | 0 0 15 |
|        | MATH1131 Mathematics 1A or 1B | 6 0 15 |
|        | MATH1141 Higher Mathematics 1A | 6 0 15 |
|        | MATH1231 Mathematics 1B or 2 | 0 6 15 |
|        | MATH1241 Higher Mathematics 1B | 0 6 15 |
|        | MATS1001 Introduction to Materials Industry | 0 2 5 |
|        | MATS1011 Introduction to Materials Engineering | 1 0 2.5 |
|        | MATS1021 Introduction to Computing | 0 2 5 |
|        | MECH0440 Engineering Statics | 0 3 7.5 |
|        | MECH0130 Engineering Drawing and Descriptive Geometry | 4 0 10 |
|        | PHYS1002 Physics 1 | 6 6 30 |
| Total HPW Session 1 | 23 |
| Total HPW Session 2 | 25 |
| Total Credit Points | 120 |

| Year 2 | CHEM2818 Physical Chemistry | 5 0 12.5 |
|        | MATH2021 Mathematics | 2 2 15 |
|        | MATS1002 Microstructural Analysis | 0 3 7.5 |
|        | MATS1022 Materials Process Principles | 0 1 2.5 |
|        | MATS1032 Materials Engineering 1A | 0 3 7.5 |
|        | MATS1042 Crystallography and X-ray Diffraction | 2 2 10 |
|        | MATS1052 Materials Engineering 1B | 3 0 7.5 |
|        | MATS1062 Mechanical Properties of Materials | 4 0 10 |
|        | MATS1072 Physics of Materials | 3 0 7.5 |
|        | MATS1082 Thermodynamics of Materials 1 | 0 3 7.5 |
|        | MATS1092 Materials and Design 1 | 0 2 5 |
|        | MATS1102 Numerical Methods | 1 2 7.5 |
|        | MATS1112 Phase Equilibria | 0 2 5 |
| General Education subject/s | 2 2 15 |
| Total HPW Session 1 | 22 |
| Total HPW Session 2 | 22 |
| Total Credit Points | 120 |

| Year 3 (Physical Metallurgy Major) | MATH2869 Applied Statistics SC | 2 0 5 |
|        | MATS1093 Thermodynamics of Materials 2 | 2 0 5 |
|        | MATS1183 Non-Ferrous Physical Metallurgy | 2 0 5 |
|        | MATS1203 Materials and Design 2 | 2 2 10 |
|        | MATS1243 Management 1 | 3 0 7.5 |
|        | MATS1273 Ferrous Physical Metallurgy A | 0 4 10 |
|        | MATS2213 Diffusion | 2 0 5 |
|        | MATS2223 Phase Transformations | 0 3 7.5 |
|        | MATS4333 Fracture Mechanics | 2 0 5 |
|        | MATS4513 Deformation of Metals | 2 0 5 |
|        | MATS4523 Strengthening Mechanisms in Metals | 0 2 5 |
### Year 4 (Process Metallurgy Major)

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<td>APSE0002</td>
<td>Social Issues in Applied Science</td>
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<td>MATS1214</td>
<td>Welding and other Joining Processes</td>
<td>2 0 5</td>
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<td>MATS1224</td>
<td>Materials Characterisation</td>
<td>1 0 2.5</td>
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<td>MATS1234</td>
<td>Heat Resisting Alloys</td>
<td>1 0 2.5</td>
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<td>MATS1244</td>
<td>Management 2</td>
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<td>MATS1254</td>
<td>Design Project</td>
<td>1 3 10</td>
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<tr>
<td>MATS1264</td>
<td>Fibre Reinforced Plastic Composites</td>
<td>1 0 2.5</td>
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<tr>
<td>MATS1274</td>
<td>Metal and Ceramic Matrix Composites</td>
<td>0 1 2.5</td>
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<td>MATS1284</td>
<td>Light Alloys</td>
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<tr>
<td>MATS1464</td>
<td>Materials Seminar</td>
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<tr>
<td>MATS3524</td>
<td>Project (Metallurgical Engineering)</td>
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<td>MATS4154</td>
<td>Mechanical and Thermal Processing of Metals</td>
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*Professional Electives*  

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### Total credit points

- **Total HPW Session 1**: 21
- **Total HPW Session 2**: 19
- **Total Credit Points**: 105

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### Year 3 (Process Metallurgy Major)

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<td>INDCC0700</td>
<td>Instrumentation and Process Control 1</td>
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<td>Applied Statistics SC</td>
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<td>MATS1043</td>
<td>Heat, Fluid and Mass Flow in Materials Processing</td>
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<td>MATS1093</td>
<td>Thermodynamics of Materials 2</td>
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<td>MATS1183</td>
<td>Non-Ferrous Physical Metallurgy</td>
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<td>MATS1203</td>
<td>Materials and Design 2 (Unit 1 Design for Corrosion Control)</td>
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<td>(Unit 2 Surface Treatment and Wear)</td>
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<td>MATS1243</td>
<td>Management 1</td>
<td>3 0 7.5</td>
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<td>Ferrous Physical Metallurgy B</td>
<td>0 3 7.5</td>
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<td>MATS2183</td>
<td>Refractories</td>
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<td>MATS5213</td>
<td>Metallurgical Plant Practice</td>
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<td>MATS5263</td>
<td>Extractive Metallurgy</td>
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<td>Kinetics and Mass Transfer in Metallurgical Processes</td>
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*General Education subject/s  

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### Total credit points

- **Total HPW Session 1**: 22
- **Total HPW Session 2**: 22
- **Total Credit Points**: 118

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### Metallurgy – Part-time Course

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

This course is designed for students who are employed in the metallurgical and manufacturing industries and extends over six part-time years of study. Some of the subjects of stages 3, 4, 5 and 6 may be available only in day-time classes, and one day or more of release from industry per week may be required.

The course essentially covers the same subject matter as the first three years and part of Year 4 of the full-time Metallurgical Engineering course and involves the same major strands of study in Physical Metallurgy and Metallurgical Engineering.

In the later stages of the course, there is less emphasis on primary metallurgy than in the full-time course and there is more emphasis on secondary Metallurgical Engineering which is developed to Year 4 level, while Physical Metallurgy is taken to Year 3 level.

Students are required to complete an approved program of industrial training of not less than twelve months prior to the award of the degree.

Industrial training should normally be completed concurrently with attendance in the course, but with approval of the Head of School may be completed after completion of the prescribed course of study.
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<tr>
<td><strong>Total Credit Points</strong></td>
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### Materials Engineering

A four-year full-time course in materials engineering leading to the award of the BMatE degree is offered within the School.

#### 3615

**Materials Engineering Full-time Course**

**Bachelor of Materials Engineering BMatE**

<table>
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**Year 3**

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*A list of Professional Electives will be made available at the end of the Year 3 program and choices for the following year arrived at.*
Graduate Study

Course Outlines

The School welcomes enquiries from graduates in Science, Engineering and Applied Science who are interested in doing research leading to the award of the degrees of:

- Doctor of Philosophy, Materials Science and Engineering 1045
- Doctor of Philosophy, Mineral Processing and Extractive Metallurgy 1046
- Master of Science, Materials Science and Engineering 2055
- Master of Science, Mineral Processing and Extractive Metallurgy 2046
- Master of Engineering in Materials Science and Engineering 2175.

Programs involving formal course work and research leading to the award of Master of Applied Science in Engineering Materials 8065 or Master of Applied Science in Corrosion Engineering 8052 are also available.

Information about research scholarships, fellowships and grants in-aid is available from the Postgraduate Coordinator and graduates are advised to consult him before making a formal application for registration.

8065 Engineering Materials

Master of Applied Science

MAppSc

The MAppSc course in Engineering Materials provides a comprehensive study of the full range of materials. The program is designed for graduates wishing to acquire expertise in the selection, use and design capabilities of modern materials. It is particularly appropriate to graduates in other branches of engineering, and to honours graduates in science. The program consists of one year of full-time study (two sessions) or two years of part-time study (four sessions). This is made up of a formal time allocation of 18 hours per week, and will normally be supplemented by additional project work during the summer break. The balance between formal lecture courses and project work will be varied to suit individual student's needs.

Elective subjects

Additional subjects are chosen from those offered by the School of Materials Science and Engineering, or from those offered by other Schools in the University subject to approval by the Head of School. Full details of all subjects are listed in the University calendar and handbooks. A minimum of two hours per week for one session of elective subjects is required.

Depending on the candidate's background, enrolment in a limited number of unmodified undergraduate subjects may be appropriate, but may not exceed 15% of the non-project component. In all cases, the total of the compulsory core, project and elective subjects will be a minimum of 18 hours per week.

8052 Corrosion Engineering

Master of Applied Science

MAppSc (Corr Eng)

The Master of Applied Science Course in Corrosion Engineering is open to graduates in Engineering, Applied Science or Science who wish to undertake formal studies to promote their careers in industry. The course is designed for those professionals in industry who are faced with the problem of combating corrosion. Its aim is to develop an appreciation of the fundamentals, principles of corrosion and of the available methods whereby it may be overcome.

The program consists of one year's full-time study (2 sessions) or two years' part-time study (4 Sessions). This is made up of a formal time allocation of 18 hours per week and will normally be supplemented by additional project work during the summer break. The balance between formal lecture courses and project work will be varied to suit individual student's needs.

Compulsory subjects

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Elective subjects

MATS1092 Materials and Design 1 0 2 5
MATS6005 Corrosion Project 6 6 30
MATS6203 Design for Corrosion Control 0 2 5
MATS6475 Materials Science and Engineering 3 3 15
MATS6495 Corrosion Materials 4 2 15
MATS6535 Industrial Coatings for Corrosion Protection 2 0 5
MATS6545 Corrosion Technology 3 3 15

*UNSW graduates who have done MATS9542 (4.952, 5.4222), CIVL2402 (8.240), MATS9530 (4.913), and/or CIVL4403 (8.440) must substitute other appropriate subjects approved by the postgraduate coordinator in the School of Materials Science and Engineering.*
Subject Descriptions

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

APSE0002
Social Issues in Applied Science
Staff Contact: A/Prof CC Sorrell
CP5 S1 L/T2
The subject covers social issues arising from future technological developments and the role that a professional applied scientist can play in influencing future directions. It will be taught by a combination of group activity, case studies and projects and seminars from visiting speakers, some of whom will be from disciplines other than the applied sciences.

MATS1001
Introduction to the Materials Industry
Staff Contact: School Office
CP5 S2 L1 T1
The role of materials science and engineering in industry. Engineering materials. Information retrieval. Communication skills. Plant visits. Introductory materials science. Structure and properties of main types of engineering materials with emphasis on the ways in which properties may be controlled by controlling structure.

MATS1002
Microstructural Analysis
Staff Contact: Dr P Krauklis
CP7.5 S1 L1 T2

MATS1011
Introduction to Materials Engineering
Staff Contact: Dr A G Crosky
CP2.5 S1 L1
Metals, ceramics, polymers and composites, their structure, chemical, physical and mechanical properties, engineering applications and production with particular reference to Australian industries.

MATS1021
Introduction to Computing
Staff Contact: Dr P Wong
CP5 S2 L2
Introductory computing. Outline of computer architecture. Features of common computing languages; syntax, structure, variable typing, portability. Basic syntax. Common numerical techniques, function evaluation, Monte Carlo techniques; assignments involving application of these techniques. Word processing, spreadsheets and databases.

MATS1022
Materials Process Principles
Staff Contact: Dr P Wong
CP2.5 S2 L0.5 T0.5
Introduction to engineering calculations. Material balances. Techniques for solving problems, including selection of a basis for calculations, use of tie elements and recycle calculations. General energy balances. Unsteady-state material and energy balances. Examples are drawn from ceramic, materials and metallurgical engineering practices.

MATS1032
Materials Engineering 1A
Staff Contact: Dr V Sahajwalla
CP7.5 S1 L2 T1
Fluid flow in materials processing. Application of the principles of fluid flow in the production and application of ceramic and metallic materials. Subject examples are drawn from ceramic, materials and metallurgical engineering practice in the broadest sense.

MATS1042
Crystallography and X-Ray Diffraction
Staff Contact: Dr V Sahajwalla
CP10 S1 L2 T1

MATS1043
Heat, Fluid and Mass Flow in Materials Processing
Staff Contact: Dr V Sahajwalla
CP5 S1 L2
In-depth understanding of fundamental principles dictating transport phenomena in materials processing. Development of governing equations related to the transfer of fluid, energy and mass and their inter-dependence based upon fundamentals to analyse and solve problems encountered in current metallurgical operating environments. Application of the understanding developed to the emerging new technologies for metals processing such as direct reduction and smelting for iron-making, near net shape casting.

MATS1052
Materials Engineering 1B
Staff Contact: Dr P Wong
CP7.5 S2 L1 T2
Heat applications of principles of steady and unsteady heat transfer in the production and application of materials. Course examples are drawn from materials engineering practice in the broadest sense. Heat flow in materials processing involving high temperature solid, liquid and gaseous phases. Thermal properties of dense and porous materials. Heat treatment, casting, sintering, corrosion, etc. Computer programs for calculating heat flow in materials.

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, anti-ferromagnetism. Elementary perturbation theory, covalent bond; crystal structures, properties. Ionic bond, force.


An appreciation of the relationships between the properties of materials, component design, manufacturing and product performance. Materials selection as an integral part of successful design. Long-term potential for materials improvement and substitution. Plant visits to selected materials processing plants.


Perfect and regular ionic solutions. Calculation of chemical equilibria in complex systems.

Finite difference and finite element techniques and their application to materials phenomena involving heat transfer, elasticity and plasticity.


Crystal chemistry; nature of bonding in solids, ionic, and silicate structures; and structure-composition relationships. Glass and glass-ceramics. Reaction with solids, grain boundary and interfacial effects, ceramic reactions and polymorphic transformations (oxides, non-oxides, alumino-silicates).

Fusion welding and allied processed. Capabilities, advantages and limitations.

Metallurgical aspects of fusion welding and allied processes. Cause of welding defects and weldability of carbon and alloy steels, stainless steels, aluminium and other common nonferrous alloys. Assessment of welds by mechanical testing and non-destructive methods.
MATS1183 Non-Ferrous Physical Metallurgy
Staff Contact: Dr P Krauklis
CP5 S1 L1 T1
Constitution, microstructure, processing and properties of non-ferrous alloys. Cast and wrought alloys based on aluminium, copper, magnesium, lead, tin and zinc.

MATS1203 Materials and Design 2
CP7.5
Unit 1 Design for Corrosion Control
Staff Contact: Prof DJ Young
S1 L1 T1

Unit 2 Surface Treatment and Wear
Staff Contact: Dr P Krauklis
S2 L1 T1

MATS1214 Welding and other Joining Processes
Staff Contact: Dr A Crosky
CP5 S1 L1 T1
Fusion welding. Capabilities, advantages and limitations. Metallurgical aspects of fusion welding. Cause of welding defects and weldability of carbon and alloy steels, stainless steels, aluminium and other common non-ferrous alloys. Design of welded fabrications to reduce distortion and the risk of failure by fatigue, brittle fracture, etc. Soldering, brazing, adhesive bonding.

MATS1224 Materials Characterisation
Staff Contact: Dr B Gleeson
CP2.5 S1 L5 T5
Materials characterisation by advanced techniques including secondary ion mass spectroscopy (SIMS), auger electron spectroscopy (AES), X-ray photoelectron spectroscopy (XPS) and laser Raman spectroscopy.

MATS1234 Heat Resisting Alloys
Staff Contact: Prof D Young
CP2.5 S1 L1

MATS1243 Management 1
Staff Contact: Dr P Wong
CP7.5 S1 L3


Operations management: systems, strategies and benefits. Quality assurance, and quality management systems. The elements of total quality management, TQM.

MATS1244 Management 2
Staff Contact: Dr P Krauklis
CP10 S1 or S2 L4
The major issues, research findings and management strategies relating to the human side of enterprise. Topics include management and power, leadership and innovation, managerial decision-making, stress at work, group dynamics and inter-group conflict, organisational design, goal setting and performance appraisal, approaches to personal and organisational development. Marketing and sales; marketing research, marketing strategies, customer relations, total product package. Project management: project planning and scheduling, contract planning and control, recent developments.

MATS1254 Design Project
Staff Contact: Dr A Crosky
CP10 S1 T1 S2 T3
This project will cover the design of a selected piece of processing equipment or an engineering component. It will involve selection and specification of materials and other relevant aspects covered within the undergraduate course.

MATS1264 Fibre Reinforced Plastic Composites
Staff Contact: Dr A Crosky
CP2.5 S1 L1

MATS1273 Ferrous Physical Metallurgy A
Staff Contact: Dr P Krauklis
CP10 S2 L2 T2
MATS1274
Metal and Ceramic Matrix Composites
*Staff Contact: Dr S Bandyopadhyay*

Metal and ceramic matrix composites their advantage and scope; various systems of MMCs and CMCs. Role of interface; fabrication techniques; effect of volume fraction; size and size distribution. Strengthening and toughening mechanisms.

MATS1283
Ferrous Physical Metallurgy B
*Staff Contact: Dr P Krauklis*


MATS1284
Light Alloys
*Staff Contact: Dr P Munroe*


MATS1294
Electrical Ceramics
*Staff Contact: School Office*


MATS1464
Materials Seminar
*Staff Contact: A/Prof CC Sorrell*

Demonstration of public speaking skills and techniques. Preparation of visual aids. Library usage. Preparation and standards of written material. Chairpersonship. Each student is required to make two oral presentations based on the honours project.

MATS1534
Design with Brittle Materials
*Staff Contact: Mr SA Prokopovich*


MATS2123
Ceramic Process Principles 2
*Staff Contact: Mr SA Prokopovich*


MATS2133
Ceramic Raw Materials
*Staff Contact: Mr SA Prokopovich*

The geological origin of ceramic raw materials. The minerals, mineralogical composition, properties and uses of commercial clays. The sources, physical properties and uses of non-clay raw materials.

MATS2143
Ceramic Equipment
*Staff Contact: Mr SA Prokopovich*

The principles of operation, construction and fields of application of equipment used in the ceramic industry in the following areas: preparation of raw materials and auxiliary processing operations; forming, drying and firing of ceramic products.

MATS2153
Ceramic Processing Laboratory
*Staff Contact: Mr SA Prokopovich*

Laboratory program illustrating processing and engineering aspects of ceramic technology. Students are required to take part in a series of factory inspections.

MATS2183
Refractories
*Staff Contact: A/Prof CC Sorrell*

Classification of refractories. Chemical and physical properties of refractories. Introduction to raw materials and manufacturing technology. A detailed study of chemical reactions occurring between refractories and solid, liquid and gas phases in ferrous and nonferrous metal industry. Review of phase equilibria.

MATS2203
Physico Chemical Ceramics Laboratory
*Staff Contact: Mr S Prokopovich*

Laboratory program illustrating the physical and chemical properties associated with the processing and performance of ceramic materials. Students are required to take part in a series of factory inspections.
MATS2213
Diffusion
Staff Contact: Prof DJ Young
CP5 S1 L1 T1
Fick's first and second laws. Solutions for short and long times by analytical and numerical methods. Boundary conditions for solid-fluid and solid-solid interfaces. Diffusion couples. Atomic level diffusion theory

MATS2223
Phase Transformations
Staff Contact: Dr B G gleeson
CP7.5 S2 L2 T1

MATS2224
Ceramic Engineering Design
Staff Contact: Mr SA Prokopovich
CP5 S2 L2
Engineering aspects of ceramic processing. Ceramic engineering design including design of dryers, kilns and glass tanks. Case studies. Pollution control equipment.

MATS2264
Sintering of Ceramics
Staff Contact: A/Prof CC Sorrell
CP5 S1 L1.5 T5

MATS2273
Chemistry of Ceramic Processes
Staff Contact: A/Prof CC Sorrell
CP5 S1 L2
High-temperature reactions involving clays, silicates, oxides, and nonoxides. Processing effects of calcining, chemical reaction and vitreous and crystalline bond formation. Chemical and physical aspects of production of whitewares, porcelain, heavy clay products, glass, cements, cermets, and advanced high-purity ceramics.

MATS2284
Thermal Properties of Ceramics
Staff Contact: A/Prof CC Sorrell
CP5 S2 L2

MATS3443
Polymer Science and Engineering
Staff Contact: Dr S Bandyopadhyay
CP15 S2 L4 T2

MATS3524
Project
Staff Contact: Dr B G lleeson
CP30 S1 T3 S2 T9
An experimental or technical investigation or design related to some aspects of materials engineering in the specific discipline (ceramic engineering, metallurgical engineering or materials engineering).

MATS3544
Polymer Engineering
Staff Contact: Dr S Bandyopadhyay
CP15 S1 L3.5 T1.5

MATS4154
Mechanical and Thermal Processing of Metals
Staff Contact: Dr AG Crosby
CP2.5 S1 L1

MATS4204
Industrial Metallurgy Project
Staff Contact: School Office
CP15 F3
An experimental investigation of some aspect of industrial metallurgy.

MATS4333
Fracture Mechanics
Staff Contact: Dr A Crosby
CP5 S1 L1 T1
MATS4513
Deformation of Metals
Staff Contact: School Office
CP5 S1 L2
Atomic and molecular description of deformation. Introduction to dislocation theory and its application to mechanical properties.

MATS4523
Strengthening Mechanisms in Metals
Staff Contact: Dr B Gleeson
CP5 S2 L1 T1
Strengthening mechanisms, creep, fracture, grain size dependence of strength. Introduction to generation of deformation and recrystallisation textures. Measurements of age-hardening, activation energy of strain ageing.

MATS4533
Metal Forming Processes
Staff Contact: Dr AG Crosky
CP5 S1 L2

MATS4543
Fractographic Analysis
Staff Contact: Dr AG Crosky
CP7.5 S2 L1 T2
Classification of macroscopic and microscopic fracture mechanisms. Initiation and propagation of ductile, brittle, fatigue, stress corrosion, and corrosion fatigue fractures. Effect of material defects, design deficiencies and incorrect processing on the origin and cause of fracture. Analysis of various modes of fracture using fractographic techniques involving optical microscopy and scanning and transmission electron microscopy.

MATS4553
Non-Destructive Testing
Staff Contact: Dr AG Crosky
CP2.5 S2 L1

MATS4580
Electrometallurgy of Steel and Ferroalloys
Staff Contact: A/Prof O Ostrovski
CP2.5 S2 L1

MATS4590
Solidification and Casting
Staff Contact: Dr V Sahaywalla
CP2.5 S2 L1
Understanding the fundamentals of solidification (cast structure development, high temperature properties) in casting processes. Emphasis on conventional and emerging near net shape casting processes. Application of the solidification fundamentals to understand mechanisms of various quality problems encountered in these processes. Process optimisation (machine design, chemistry, temperature, heat extraction) to control casting defects.

MATS5213
Metallurgical Plant Practice
Staff Contact: Dr P Wong
CP2.5 S1 or S2 T1
Up to 2 days of metallurgical plant inspections and case studies equivalent to 14 tutorial hours are associated with this subject. Ferrous and non-ferrous plant practice.

MATS5253
Metallurgical Reaction Engineering
Staff Contact: A/Prof O Ostrovski
CP5 S1 or S2 L2

MATS5263
Extractive Metallurgy
Staff Contact: A/Prof O Ostrovski
CP17.5 S1 L3 S2 L2 T2

Application of principles of aqueous thermodynamics, electrochemistry, chemical and electrochemical kinetics to hydrometallurgical processes: leaching of mineral and concentrates, solution purification, precipitation, and other separation processes, ion-exchange and liquid-liquid extraction, electrowinning and electorefining.

MATS5314
Kinetics and Mass Transfer in Metallurgical Processes
Staff Contact: Dr A Yu
CP10 S1 L1 S2 L2 T1
MATS5324
Modelling Metallurgical Processes
Staff Contact: Dr P Wong
CP10 S2 L4
The mathematical and physical modelling of primary and secondary metals processing operations. Ladle metallurgy operations, entrainment of gases by molten metals, electromagnetically driven flows, dispersion of alloying additions, coalescence of inclusions, modelling metal flow and solidification, blast furnace drainage.

MATS5384
Air Pollution Control in the Metallurgical Industry
Staff Contact: Dr V Sahajwalla
CP2.5 S1 or S2 L1
Air pollutants from the different metallurgical industries. Technical principles and equipment to control the emission of pollutants. Examples from the primary and secondary metallurgical industries.

MATS6005
Corrosion Project
Staff Contact: School Office
CP30 F HPW6
A substantial project on some aspect of corrosion science or technology.

MATS6203
Materials and Design 2
Unit 1 Design for Corrosion Control (Unit 1 of MATS1203)
Staff Contact: Prof DJ Young
CP5 S1 L1 T1

MATS6405
Graduate Materials Seminar
Staff Contact: School Office
CP10 F HPW2
Instruction in written and oral presentation of technical and scientific material at an advanced level which involves a presentation by the candidate of a lecture on a selected topic.

MATS6475
Materials Science and Engineering
Staff Contact: School Office
CP15 F L2 T1

MATS6485
Materials Technology
Staff Contact: School Office
CP15 F L1 T1.5

MATS6495
Corrosion Materials
Staff Contact: School Office
CP15 F L2 T1
Properties and efficient selection of materials for corrosion resistance. Applications in manufacturing, mining and process industries, in transportation equipment and in structures. Materials selection for service in particular environments.

MATS6535
Industrial Coatings for Corrosion Protection
Staff Contact: School Office
CP5 S1 L2
Special topics on heavy-duty organic, inorganic and metallic coatings used in atmospheric, marine and industrial environments.

MATS6545
Corrosion Technology
Staff Contact: School Office
CP15 F L3
Environmental fracture; corrosion in specific environments; corrosion of specific equipment types; principles of materials selection and design; surface preparation and maintenance coatings; polymeric materials and linings, inhibitors and electrochemical tests methods; cathodic protection.

MATS6555
Minor Graduate Materials Project
Staff Contact: School Office
CP15 F HPW3
A small technical investigation or a design project, including a written report.

MATS6565
Major Graduate Materials Project
Staff Contact: School Office
CP45 F HPW9
A substantial experimental or theoretical investigation, or design project, including a written thesis.
MATS7132
Structure and Properties of Metallurgical Phases
Unit 2 only
Staff Contact: A/Prof O Ostrovski
CP2.5 S1 or S2 L1
The atomistic and microscopic approach to melts in process metallurgy, liquid metals and slags. Relationships between melt structure, mechanism and reaction kinetics in smelting and refining operations.

MATS7134
Structure and Properties of Metallurgical Phases
Unit 1 Structure and Properties of Solids
Staff Contact: School Office
CP7.5 S1 or S2 L1 T1
Application of defect solid state chemistry to materials preparation and reactivity. Non-stoichiometric and stoichiometric-dependent physical and chemical properties of metal compounds.

Unit 2 Structure and Properties of Melts
Staff Contact: A/Prof O Ostrovski
S1 or S2 L1
The atomistic and microscopic approach to melts in process metallurgy, liquid metals and slags. Relationships between melt structure, mechanism and reaction kinetics in smelting and refining operations.

MATS7144
Powder Metallurgy
Staff Contact: School Office
CP5S1 or S2 L1

MATS7244
Advanced Electron Optics
Staff Contact: School Office
CP5 S1 or S2 L1 T1
See School for details.

MATS7409
High Temperature Techniques
Staff Contact: School Office
CP2.5 S1 or S2 L1
Experimental methods for the determination of thermophysical and thermochemical properties at elevated temperatures.

MATS7490
Mathematical Plasticity
Staff Contact: Dr P Wong
CP2.5 S1 or S2 L1
Mathematical approaches to macroscopic plastic deformation; slip line field analysis, upper and lower bound techniques, finite element techniques. Application to estimation of loads and stresses developed during industrial deformation processes: rolling, drawing, bending.

MATS9421
Materials for Mining Engineers
Staff Contact: Dr P Krauklis
CP10 S1 L2 T1 S2 L1 T1
Session 1: Microstructure, phase equilibrium and properties of steels, light alloys, ceramics, polymer and composites. Metal forming by casting and mechanical working. Elastic and plastic deformation, recrystallisation, fracture, corrosion.


MATS9520
Engineering Materials
Staff Contact: Dr AG Crosky
CP7.5 S1 L2 T1
Microstructure and structure-property relationships of the main types of engineering materials (Metals, Ceramics, Polymers and Composites). Micromechanisms of elastic and plastic deformation. Fracture mechanisms for ductile, brittle, creep and fatigue modes of failure in service; corrosion. Metal forming by casting and wrought processes. Phase Equilibria of alloys; microstructural control by thermomechanical processing and application to commercial engineering materials. Laboratory and tutorial work includes experiments on cast and recrystallised structures, ferrous and non-ferrous microstructures and fracture and failure analysis.

MATS9530
Materials Engineering
Staff Contact: A/Prof CC Sorrell
CP7.5 S1 or S2 L2 T1
Prerequisite: MATS9520
Materials used in Mechanical Engineering and related fields (Manufacturing Engineering Management, Aerospace Engineering, Naval Architecture) are discussed with emphasis on the dependence of properties and performance on microstructure. Aspects of materials selection during the design of engineering components which affect the service performance in applications where failure can occur by brittle fracture, corrosion, creep or fatigue, will also be discussed.
MATS9640
Materials Science and Engineering for Electrical Engineers
Staff Contact: School Office
CP10 S2 L3 T1
Metallic, ceramic, organic, polymeric and composite materials and their technology for electrical engineering applications. Structures and structure property relations, phase equilibria and their effect on mechanical, electrical, magnetic, thermal and chemical properties. The shaping, treating and joining of materials. Aqueous and gaseous corrosion. Metallic glasses, superconductors, fast ion conductors. The role of materials science in the development of electrical energy systems.

MATS9650
Pyrometallurgical Processes
Staff Contact: Dr O Ostrovski
CP5 S1 L2
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.

MATS9712
Materials and Techniques in Design Craft 1
Staff Contact: A/Prof CC Sorrell
CP10 S1 L2 T1
An introduction to the science and technology of materials, emphasizing relationships between structure, composition and properties. Introduction to processing of metallic, ceramic and fibrous materials. Materials recognition and design possibilities are discussed.

MATS9722
Materials and Techniques in Design Craft 2B
Staff Contact: A/Prof CC Sorrell
CP7.5 S2 L1.5 T1.5
Casting, working and surface finishing of metals and alloys. Soldering, brazing and welding. Joining metals to glasses, ceramics and gemstones.

MATS9732
Materials and Techniques in Design Craft 2C
Staff Contact: A/Prof CC Sorrell
CP7.5 S2 L1.5 T1.5
Structures and properties of clays, non-clays, cements, porcelains, glazes, glasses and other ceramics. Optical properties and colours of glasses, glazes and gemstones. Forming and firing of ceramic bodies, reactions during firing. Kilns and oxidation/reduction effects.
The School of Mines, which was formed in 1986, consists of two Departments and three Centres corresponding to the main professions on which the mining and minerals industry of Australia depend. These are the Departments of Applied Geology and Mining Engineering, and the Centre for Minerals Engineering (in conjunction with the School of Chemical Engineering), the UNSW Groundwater Centre (in conjunction with the School of Civil Engineering), and the Key Centre for Mines.

The Key Centre for Mines provides a full range of education and training services to the minerals industry and offers graduate courses in mining management. The UNSW Groundwater Centre offers specialised graduate courses in groundwater studies and carries out general teaching in hydrogeology. The Centre for Minerals Engineering coordinates and conducts teaching and research activities of relevance to the minerals industry. It offers professional electives in minerals engineering to undergraduate students enrolled in the BE course in Chemical Engineering.

Prior to the formation of the School of Mines, Applied Geology and Mining Engineering were separate Schools and Mineral Processing and Extractive Metallurgy (referred to as Minerals Engineering) was spread among several other Schools in the Faculty. Bringing the three together into the School of Mines is an important development in mining industry education in Australia.

Geologists, Mining Engineers and Minerals Engineers work closely together in the mining industry. The Geologist is responsible for discovering new mineral resources and for defining the size, value and condition of the deposit. Geologists are also involved in control of ore grades during the mining operation and in environmental management during and after mining. The Mining Engineer decides on the mining method, assesses the financial viability of the project, designs the mine and thereafter manages it throughout its life. The Minerals Engineer deals with these resources after they have been mined, and designs and manages the large plants needed to turn the crude ore into metal or the raw coal into saleable fuel. Groundwater geologists are employed in many fields including mining, civil engineering, water resources management and environmental management.

Each is an expert in her or his own field, but each also needs to have a good appreciation of the work of the others. Professional roles in the mining industry are not always clear cut and it is a distinct advantage for geologists, mining engineers and minerals engineers to study and interact together while at University, in preparation for their necessarily close involvement with each other during their professional careers.

Separate degree courses are available in each discipline, as described below. Students enrol in the course of their own choice and many activities are departmentally centred, but others are School-based to provide a corporate identity with the mining and allied industries.
Department of Applied Geology

Head of Department
Associate Professor CR Ward

Geology is 'the science of the earth', and as such covers a broad spectrum of knowledge on the constitution and evolution of our planet. Applied Geology involves a specific interest in the use of earth science for the benefit of humanity, including, for example, the search for and evaluation of metallic ore-bodies and accumulations of fossil fuels, or the application of geological knowledge to a range of engineering and environmental problems.

Undergraduate Study

Course Outlines

The Applied Geology course provides a comprehensive education in all aspects of earth science. It leads to the award of a Bachelor of Science (BSc) degree in four stages normally taken over four years full-time study, with honours for students who perform with merit throughout the course program. The fourth stage can be taken part time over two years, normally Years 4 and 5.

Students learn the fundamental principles of geology through lectures, laboratory work, projects and field tutorials. At the same time they gain the practical skill and knowledge of geological applications necessary for employment in research, industry or government.

Graduates are prepared by the course to enter any branch of the geological profession, or to undertake further studies leading to a higher degree. They are also well equipped to change their field of employment as different opportunities arise.

No previous knowledge of geology is required to enter this course but a sound background in mathematics together with at least one other science subject is essential.

Students who have not undertaken chemistry at HSC level should take chemistry at the introductory level (CHEM1401 and CHEM1101) in Year 1, and CHEM1201 in the summer session before commencing Year 2.

Reciprocal courses are offered through the Board of Studies in Science and Mathematics in Geology (double major), Geochemistry, Geophysics, Earth and Environmental Science and courses that combine a single major in Geology with Physics, Chemistry, Mathematics or Botany and Zoology. These courses are all of three years full-time duration leading to a BSc at Pass level. An optional fourth year leading to Honours is available for students achieving a good academic standing.

### 3000

**Applied Geology Full-time**

**Bachelor of Science**

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Total Credit Points: 125
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#### Total HPW Session 1: 20
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#### Total Credit Points: 120

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### Stage 4

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#### Total HPW Session 1: 20
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### 3000

**Applied Geology Part-time**

**Bachelor of Science BSc**

Part-time study is only available in Stage 4.

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### Stage 5 (P/T)

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#### Total HPW Session 1: 10
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#### Total Credit Points: 60
Graduate Study

A number of coursework Masters degrees are available through the Department of Applied Geology. In addition, the Department offers the research degrees of Doctor of Philosophy PhD in Applied Geology 1000 and Master of Science MSc in Applied Geology 2000.

Course Outlines

8022
Applied Geology

Master of Applied Science
MAppSc

Master of Applied Science courses in Applied Geology are designed to give advanced training in developing specialisations within geology and are structured specifically for candidates from industry to take on a part-time basis.

Specialist programs currently offered are in the fields of Engineering Geology, Hydrogeology, Environmental Geology, Groundwater Studies and Geological Data Processing.

Alternative Graduate Programs

Alternative Graduate Programs in association with the Department of Applied Geology are available in the following areas:

Department of Safety Science
8045 Environmental Studies Graduate Course (MEnvStudies)
School of Geography
5047.2000 Graduate Diploma in Remote Sensing (GradDip)
8047.2000 Remote Sensing Graduate Course (MAppSc)
Faculty of Engineering
5496 Graduate Diploma in Remote Sensing (GradDip)
8641 Remote Sensing Graduate Course (MEngSc)

8022.1000
Engineering Geology/
Hydrogeology/Environmental Geology

This is a flexible program covering a range of geotechnical disciplines. Completion of the course requires 120 credit points of which up to 96 (and no less than 60) credit points should be coursework subjects. The balance is made up of a research project of 24, 36 or 60 credit points which may be completed internally or externally. Most subjects are given in the first session, but some are available in second session, or in short course or external format. Core subjects are recommended but not compulsory. Intending students should discuss their choice of subjects with the Program Director, Mr GH McNally.

Core subjects

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Project

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<td>GEOL9464</td>
<td>Project</td>
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Elective subjects

<table>
<thead>
<tr>
<th>Subject Code</th>
<th>Subject Name</th>
<th>CP</th>
</tr>
</thead>
<tbody>
<tr>
<td>CIVL9799</td>
<td>Stability of Slopes</td>
<td>12</td>
</tr>
<tr>
<td>GEOL0110</td>
<td>Geological Remote Sensing</td>
<td>12</td>
</tr>
<tr>
<td>GEOL9031</td>
<td>Engineering Geology of Surficial Deposits</td>
<td>12</td>
</tr>
<tr>
<td>GEOL9032</td>
<td>Soil and Rock Construction Materials</td>
<td>12</td>
</tr>
<tr>
<td>GEOL9033</td>
<td>Terrain Evaluation</td>
<td>12</td>
</tr>
<tr>
<td>GEOL9070</td>
<td>Engineering Geophysics</td>
<td>12</td>
</tr>
</tbody>
</table>

Other elective subjects may be drawn from those offered by the Key Centre for Mines, UNSW Groundwater Centre and the School of Civil Engineering.

8022.2000
Groundwater Studies

This program is coordinated through the UNSW Groundwater Centre. Candidates are required to complete 120 credit points, made up of the five core subjects, elective subjects and a project. The degree may be taken internally on a full-time (normally 2 sessions) or a part-time (normally 4 sessions) basis. The course of study must be approved by the Head of School or the Head's nominee with core subjects totalling 60 credit points.

Core subjects

<table>
<thead>
<tr>
<th>Subject Code</th>
<th>Subject Name</th>
<th>CP</th>
</tr>
</thead>
<tbody>
<tr>
<td>CIVL9860</td>
<td>Investigation of Groundwater Resources</td>
<td>12</td>
</tr>
<tr>
<td>CIVL9875</td>
<td>Hydrological Processes</td>
<td>12</td>
</tr>
<tr>
<td>CIVL9891</td>
<td>Groundwater Contamination and Remediation</td>
<td>12</td>
</tr>
<tr>
<td>GEOL9010</td>
<td>Groundwater Environments</td>
<td>12</td>
</tr>
<tr>
<td>GEOL9051</td>
<td>Hydrogeochemistry</td>
<td>12</td>
</tr>
</tbody>
</table>

Project

<table>
<thead>
<tr>
<th>Subject Code</th>
<th>Subject Name</th>
<th>CP</th>
</tr>
</thead>
<tbody>
<tr>
<td>GEOL9124</td>
<td>Groundwater Project or</td>
<td>36</td>
</tr>
<tr>
<td>GEOL9144</td>
<td>Groundwater Project</td>
<td>48</td>
</tr>
</tbody>
</table>

Elective subjects

<table>
<thead>
<tr>
<th>Subject Code</th>
<th>Subject Name</th>
<th>CP</th>
</tr>
</thead>
<tbody>
<tr>
<td>CIVL9799</td>
<td>Environmental Geomechanics</td>
<td>12</td>
</tr>
<tr>
<td>CIVL9880</td>
<td>Groundwater Modelling</td>
<td>12</td>
</tr>
<tr>
<td>CIVL9890</td>
<td>Spatial Decision Support</td>
<td>12</td>
</tr>
<tr>
<td>GEOL9052</td>
<td>Advanced Hydrogeochemistry</td>
<td>12</td>
</tr>
<tr>
<td>GEOL9070</td>
<td>Engineering Geophysics</td>
<td>12</td>
</tr>
<tr>
<td>GEOL9100</td>
<td>Remote Sensing of Groundwater Resources</td>
<td>12</td>
</tr>
<tr>
<td>KCME1110</td>
<td>Geographic Information Systems in Applied Geology</td>
<td>12</td>
</tr>
</tbody>
</table>
Geological Data Processing

This program is intended for industry-based geologists who wish to enhance their skills in the computer processing of geological data. It is delivered as a series of separate academic subjects, each consisting of a one week residential short course with additional assignment material and an industry-based project. The short courses are scheduled to allow the degree program to be completed on a part-time basis over two years.

The program allows an emphasis to be placed on data processing in mineral exploration, exploration geochemistry, ore reserve estimation, image processing and remote sensing, exploration geophysics or fossil fuel deposits.

Optional subjects are also available to provide complimentary training in topics such as mine and environmental management and project evaluation.

Candidates are required to complete a course of 120 credit points including either a 24 or 48 credit point project. Alternative subjects may be substituted in the published program at the discretion of the Head of the Department.

<table>
<thead>
<tr>
<th>Core subjects (12 credit points)</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>GEOL0300  Computing and Statistics for Geologists*</td>
<td></td>
</tr>
<tr>
<td>GEOL0310  Image Processing of Spatial Data Sets</td>
<td></td>
</tr>
<tr>
<td>GEOL0320  Geostatistical Ore Reserve Estimation</td>
<td></td>
</tr>
<tr>
<td>Project</td>
<td></td>
</tr>
<tr>
<td>GEOL0304  Project 1 (24 credit points) or</td>
<td></td>
</tr>
<tr>
<td>GEOL0314  Project 2 (48 credit points)</td>
<td></td>
</tr>
<tr>
<td>Elective subjects (12 credit points)</td>
<td></td>
</tr>
<tr>
<td>Technical</td>
<td></td>
</tr>
<tr>
<td>GEOL0330  Conceptual Models for Exploration Geology</td>
<td></td>
</tr>
<tr>
<td>GEOL0340  Geochemical Exploration Techniques</td>
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<tr>
<td>GEOL0350  Exploration Geochemical Data Processing</td>
<td></td>
</tr>
<tr>
<td>GEOL0360  Remote Sensing Applications in Geoscience</td>
<td></td>
</tr>
<tr>
<td>GEOL0370  Fundamentals of Exploration Geophysics</td>
<td></td>
</tr>
<tr>
<td>GEOL0380  Electrical Methods in Geophysical Exploration</td>
<td></td>
</tr>
<tr>
<td>GEOL0390  Data Processing for Fossil Fuel Resources</td>
<td></td>
</tr>
<tr>
<td>KCME1106  Soil and Rock Construction Materials</td>
<td></td>
</tr>
<tr>
<td>KCME1108  Applied Structural Geology</td>
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</tr>
<tr>
<td>KCME1109  Geophysics for Mine Development</td>
<td></td>
</tr>
<tr>
<td>KCME1110  Geographical Information Systems in Applied Geology</td>
<td></td>
</tr>
<tr>
<td>KCME4133  An Introduction to Environmental Geology</td>
<td></td>
</tr>
<tr>
<td>KCME4302  Environmental Assessment</td>
<td></td>
</tr>
<tr>
<td>KCME4303  Mine Geology and Grade Control</td>
<td></td>
</tr>
<tr>
<td>Business Management</td>
<td></td>
</tr>
<tr>
<td>KCME4201  Export Marketing for the Mining Industry</td>
<td></td>
</tr>
<tr>
<td>KCME4202  Mine Evaluation and Project Assessment</td>
<td></td>
</tr>
<tr>
<td>KCME4203  Mine Management</td>
<td></td>
</tr>
<tr>
<td>KCME4204  Exploration Project Management</td>
<td></td>
</tr>
<tr>
<td>KCME4301  Environmental Management for the Mining Industry</td>
<td></td>
</tr>
</tbody>
</table>

or such other subjects as the course authority may deem to be appropriate and equivalent.

*For students with an adequate background in computing and statistics this subject may be replaced by an additional elective subject. The approval of the course authority is required.
Department of Mining Engineering

Head of Department
Professor JM Galvin

Mining Engineering is concerned with the design, development and management of mines for the extraction of the earth's mineral and energy resources. Mining production whether underground, at the surface, offshore or on the sea floor is a technically advanced engineering activity and the mining engineering course caters for the present day and future requirements of the industry.

The mining engineer is a front line executive in control of all phases of a mining project from evaluation of a coal or an ore deposit, the planning and development of its extraction, its processing on site, the safe disposal of waste products and the restoration of the environment during and after mining.

Most mining engineers are trained for careers in mine production and management and their engineering and managerial roles necessitate liaison with a range of experts, from those engaged in exploration geology, to those in end-product development and marketing.

The mining engineering course involves a strong grounding in basic sciences, engineering principles and management as a foundation to training for production and mine management functions. The course also provides a good appreciation of the science of geology, the technology of mineral processing and the economics of resources so that the mining engineer can effectively work in any section of the mining industry from evaluation of ore reserves to marketing and finance.

The mining engineer's training has an appeal to many other industries in that it combines excellence in a broad range of disciplines from science and engineering to economics of management of human resources. With such a background, mining engineers can easily adapt to work in almost any industry either on graduation or at a later stage in their career.

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 course at the University of New South Wales.

Undergraduate Study

Course Outlines

The Department offers a 4 year full-time course in Mining Engineering leading to the award of the degree of Bachelor of Engineering at Pass or Honours level. A five-year combined degree course is also available in Civil Engineering and Mining Engineering.

3140 Bachelor of Engineering
BE

Year 1 of the course is similar to that of several other Engineering courses and Year 2 includes those subjects which are of common relevance to the Engineering disciplines. Year 3 is largely devoted to basic mining subjects and Year 4 provides advanced instruction in subjects essential to all mining engineers. In addition, the fourth year offers a wide range of elective subjects, allowing students, if they so wish, to concentrate their studies on a particular sector of the industry, such as coal mining or metalliferous mining. 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.

Some subjects in Years 3 and 4 of the course will be conducted at the Department's residential Underground Teaching Unit located at Wyee Coal Mine. This provides a unique opportunity for students to gain immediate practical insight into 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 Department, and in the final year project.

In the undergraduate course it is compulsory for students to gain practical experience in the mining industry during successive long recesses. The minimum requirement is 100 days which must be completed before graduation. The School assists students as much as possible in securing suitable vacation employment. Students are required to submit for assessment an industrial training report on the vacation and other relevant experience acquired.
Year 1

CHEM1807 Chemistry 1 ME 4 0 15
MATH1131 Mathematics 1A or 6 0 15
MATH1141 Higher Mathematics 1A 0 6 15
MATH1231 Mathematics 1B or 12 3 0 12
MATH1241 Higher Mathematics 1B 12 0 6
MINE0010 Applied Mechanics 0 3 3
MINE0110 Stress Analysis 1 0 12
MINE0210 Introduction to Mining Engineering* 1 1 6
MINE0410 Technical Communication 0 2 7
MINE0710 Computing 1 0 2 7
PHYS1002 Physics I 6 6 30
Total HPW Session 1 20
Total HPW Session 2 19
Total Credit Points 119

Year 2

ELEC0807 Electrical Engineering 1E 2 3 7.5
GEOL5211 Geology for Mining Engineers 1 2 2 10
GMAT0441 Surveying for Engineers 0 4 11.5
MATH1209 Engineering Mathematics 2 4 2 20
MATH1219 Statistics SA 2 2 10
MATS9421 Materials for Mining Engineers 2 3 1 10
MINE0120 Stress Analysis 0 3 10
MINE1320 Fluid Mechanics and Thermodynamics 2 1 10
MINE1321 Mine Water and Drainage 0 1 3
MINE1420 Elements of Mining 1 0 6
PHY52920 Electronics 3 0 7.5
General Education subject/s 2 2 15
Total HPW Session 1 22
Total HPW Session 2 20.5
Total Credit Points 120.5

Year 3

GEOL5311 Geology for Mining Engineers 3 3 20
GMAT0540 Mining Surveying 3 0 7.5
MINE1131 Mining of Metalliferous Deposits 3 0 10
MINE1132 Mining of Coal Deposits 3 0 10
MINE1231 Rock Mechanics 0 4 10
MINE1232 Soil Mechanics 0 2 6
MINE1330 Bulk Materials Handling and Transport 0 2 6
MINE1530 Power Supply in Mines 2 0 6
MINE1630 Excavation Engineering (Blasting) 2 0 6
MINE1631 Excavation Engineering (Machine Mining) 0 1 3
MINE1830 Mine Ventilation and Environment 0 4 10
MINE1930 Industrial Training 0 0 0
MINE7342 Minerals Engineering Processes 2 2 12
General Education subject/s 2 2 15
Total HPW Session 1 20
Total HPW Session 2 20
Total Credit Points 121.5

Year 4

APSE0002 Social Issues in Applied Science 2 0 5
MINE1140 Geotechnical Engineering 2 2 12
MINE1740 Mining Legislation 0 2 6
MINE2141 Mineral Economics 1 2 6
MINE2142 Mine Planning and Design 3 3 20
MINE2240 Mining Management 0 3 10
MINE3040 Mine Safety Engineering 0 3 10
MINE3041 Hazard and Risk in Mining 2 0 6
MINE4140 Minerals Industry Project 4 4 24
MINE4240 Industrial and Research Seminars 1 1 5
MINE4540 The Mining Engineering Profession in Society 0 2 5
together with an approved group of two advanced elective subjects selected from the following:

Advanced Electives

MINE1940 Tunnel Engineering and Shaft Sinking 2 0 5
MINE7440 Mineral Process Technology 2 0 5
MINE3140 Computational Methods in Geomechanics 2 0 5
MINE3240 Operations Research 2 0 5
Total HPW Session 1 20
Total HPW Session 2 20
Total Credit Points 121

3146
BE(Civil) BE(Mining) in Civil Engineering and Mining Engineering – Full-time Course

Students enrol in the Bachelor of Engineering in Civil Engineering Course 3620 which is administered by the School of Civil Engineering. The first three and a half years of the combined degree course are therefore identical to course 3620. After completing 7 Sessions of this course, students may apply to enter the Bachelor of Engineering in Mining Engineering Course 3146 which is administered by the School of Mines in the Faculty of Applied Science and aim to complete the mining requirements in 3 additional Sessions.

Students considering this option should discuss the above arrangements with the relevant Course Authorities.
Graduate Study

A number of coursework Masters degrees and Graduate Diplomas are available through the Department of Mining Engineering. In addition, the Department offers the research degrees of Doctor of Philosophy PhD in Mining Engineering 1050, Master of Engineering ME in Mining Engineering 2180 and Master of Science MSc in Mining Engineering 2060.

Course Outlines

8055
Mining and Mineral Engineering Graduate Course

Master of Applied Science MAppSc

This course is offered to provide postgraduate training in subjects appropriate to the mining industry. There is a core of professional subjects, and the electives needed to complete the course be taken to suit a graduates previous experience or a chosen career path.

The MAppSc course is linked with the Mining Management Graduate and Graduate Diploma Courses offered through the Key Centre for Mines, and transfer between these programs will be possible with appropriate credit for subjects completed. 120 credit points in one year full time.

The teaching components should be completed in two sessions. The subjects which are listed below may be offered in two formats dependent on class sizes and student skills, and in general should be completed within one session.

A full teaching session subject will comprise approximately fourteen weeks of lectures, tutorials, and any associated laboratory work. Alternatively, the lecture material may be offered as a one week short course module in conjunction with the Key Centre equivalent course. The module would be preceded and followed by appropriate reading and tutorials. Assessment will consist of a combination of assignments and examinations complement the lecture mode.

Due to the varied entry routes there will be a difference of skills among candidates. Consequently there are two prescribed core courses, one for non-mining entrants, and the other for qualified mining graduates and entrants from the Graduate Diploma course. Exemptions may be given from one or more core subjects to appropriate candidates but a full complement of 120 credit points must still be attained.

Entry for Four Year Graduates Non-Mining

Core subjects

<table>
<thead>
<tr>
<th>Subject</th>
<th>Code</th>
<th>Title</th>
</tr>
</thead>
<tbody>
<tr>
<td>MINE0130</td>
<td>8</td>
<td>Principles of Mining</td>
</tr>
<tr>
<td>MINE1224</td>
<td>24</td>
<td>Mining Engineering Technology</td>
</tr>
<tr>
<td>MINE1524</td>
<td>12</td>
<td>Mining Conservation</td>
</tr>
<tr>
<td>MINE3114</td>
<td>12</td>
<td>Mineral Beneficiation</td>
</tr>
</tbody>
</table>

Project

<table>
<thead>
<tr>
<th>Subject</th>
<th>Code</th>
</tr>
</thead>
<tbody>
<tr>
<td>MINE5064</td>
<td>24</td>
</tr>
<tr>
<td>MINE5124</td>
<td>46</td>
</tr>
<tr>
<td>MINE5184</td>
<td>72</td>
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Elective subjects for all candidates

<table>
<thead>
<tr>
<th>Subject</th>
<th>Code</th>
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</thead>
<tbody>
<tr>
<td>Rock Slope Stability</td>
<td>8</td>
</tr>
<tr>
<td>Subsidence Engineering</td>
<td>8</td>
</tr>
<tr>
<td>Fire and Explosion</td>
<td>8</td>
</tr>
<tr>
<td>Computing and Statistics for Geologists</td>
<td>12</td>
</tr>
<tr>
<td>Geostatistical Ore Reserve Estimations</td>
<td>12</td>
</tr>
<tr>
<td>Conceptual Models for Exploration Geology</td>
<td>12</td>
</tr>
<tr>
<td>Exploration Drilling</td>
<td>12</td>
</tr>
<tr>
<td>Ground Control and Excavation Engineering</td>
<td>12</td>
</tr>
<tr>
<td>Environmental Conditions in Mines</td>
<td>12</td>
</tr>
<tr>
<td>Rock Excavation and Transportation</td>
<td>12</td>
</tr>
<tr>
<td>Mineral Beneficiation Plant Design</td>
<td>12</td>
</tr>
<tr>
<td>Minerals Engineering Laboratory</td>
<td>12</td>
</tr>
</tbody>
</table>

Entry for Graduates in Mining Engineering or from Course 5040

Core subjects

<table>
<thead>
<tr>
<th>Subject</th>
<th>Code</th>
</tr>
</thead>
<tbody>
<tr>
<td>Principles of Mining Engineering (2)</td>
<td>24</td>
</tr>
<tr>
<td>Mining Conservation (1)</td>
<td>12</td>
</tr>
<tr>
<td>Mineral Beneficiation Technology or</td>
<td>24</td>
</tr>
<tr>
<td>Mineral Industry Analysis</td>
<td>10</td>
</tr>
</tbody>
</table>

Project

<table>
<thead>
<tr>
<th>Subject</th>
<th>Code</th>
</tr>
</thead>
<tbody>
<tr>
<td>Minor Project or</td>
<td>24</td>
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<tr>
<td>Project or</td>
<td>48</td>
</tr>
<tr>
<td>Major Project or</td>
<td>72</td>
</tr>
<tr>
<td>Minerals Engineering Project</td>
<td>36</td>
</tr>
</tbody>
</table>

Elective subjects for all candidates

<table>
<thead>
<tr>
<th>Subject</th>
<th>Code</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rock Slope Stability</td>
<td>8</td>
</tr>
<tr>
<td>Subsidence Engineering</td>
<td>8</td>
</tr>
<tr>
<td>Fire and Explosion</td>
<td>8</td>
</tr>
<tr>
<td>Computing and Statistics for Geologists</td>
<td>12</td>
</tr>
<tr>
<td>Geostatistical Ore Reserve Estimations</td>
<td>12</td>
</tr>
<tr>
<td>Conceptual Models for Exploration Geology</td>
<td>12</td>
</tr>
<tr>
<td>Exploration Drilling</td>
<td>12</td>
</tr>
<tr>
<td>Ground Control and Excavation Engineering</td>
<td>12</td>
</tr>
<tr>
<td>Environmental Conditions in Mines</td>
<td>12</td>
</tr>
<tr>
<td>Rock Excavation and Transportation</td>
<td>12</td>
</tr>
<tr>
<td>Mineral Beneficiation Plant Design</td>
<td>12</td>
</tr>
<tr>
<td>Minerals Engineering Laboratory</td>
<td>12</td>
</tr>
</tbody>
</table>
COURSE OUTLINES  MINE  135

MINE4424  Minerals Industry Analysis  12
MINE4055  Numerical Methods in Geomechanics  12
MINE4155  Stability of Slopes  12
MINE5155  Rock Mechanics Measurements  12
MINE5255  Strata Control Engineering  12
MINE5355  Mine Fill Technology  12
MINE5455  Advanced Rock Cutting Technology  12
MINE5555  Blasting Technology  12
MINE9364  Equilibrium Concepts in Water Systems  12
MINE9374  Hydrogeochemistry  12
MINE9415  Advanced Rock Mechanics  12
MINE3224  Mineral Beneficiation Technology  24
MINE3614  Minerals Engineering 1  24
MINE3624  Minerals Engineering 2  24
MINE3644  Minerals Engineering 3  24

Notes:
(1) Any Key Centre module may also be taken, subject to (2).
(2) Electives must be chosen on enrolment and approved by the Course Director; some electives are mutually exclusive.
(3) Attention is also drawn to subjects available from the Department of Safety Science, the Centre for Waste Management and the School of Chemical Engineering. Subjects to timetables and minimum class sizes in various departments, electives may be chosen from those and other course authorities.
(4) Not all electives in the above list will be offered each year.

5040
Mining and Mineral Engineering Graduate Diploma Course

Graduate Diploma GradDip

The Graduate Diploma course in Mining and Mineral Engineering serves two purposes. It can provide a professional introduction to the mining industry for graduates in Science, Applied Science or Engineering and it is a qualifying course for entry to the Master of Applied Science and Master by Research programs.

The Graduate Diploma will be awarded after successful completion of one year full-time or two years part-time study. The course is a blend of lecture and laboratory work and an appropriate choice of the laboratory work and project can lead to some specialisation in either mining engineering or minerals engineering. When appropriate, some sections of the course may be offered as a unit over a short period to permit mineral industry personnel to attend on a part-time basis.

The level of the Graduate Diploma is designed to be equivalent to a four-year honours degree and on that basis up to 120 credit points of undergraduate subjects may be substituted for the topics shown where appropriate to the skills of the student concerned.

Full-time Program

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Subject Name</th>
<th>CP</th>
</tr>
</thead>
<tbody>
<tr>
<td>MINE0130</td>
<td>Principles of Mining</td>
<td>8</td>
</tr>
<tr>
<td>MINE1114</td>
<td>Mining Engineering</td>
<td>24</td>
</tr>
<tr>
<td>MINE1224</td>
<td>Mining Engineering Technology or</td>
<td>24</td>
</tr>
<tr>
<td>MINE3224</td>
<td>Mineral Beneficiation Technology</td>
<td>24</td>
</tr>
<tr>
<td>MINE1324</td>
<td>Mining Engineering Laboratory and</td>
<td>32</td>
</tr>
<tr>
<td></td>
<td>Project</td>
<td></td>
</tr>
<tr>
<td>MINE3324</td>
<td>Mineral Engineering Laboratory</td>
<td>32</td>
</tr>
<tr>
<td></td>
<td>and Project</td>
<td></td>
</tr>
<tr>
<td>MINE3114</td>
<td>Mineral Beneficiation</td>
<td>12</td>
</tr>
<tr>
<td>MINE7140</td>
<td>Mineralogical Assessment</td>
<td>4</td>
</tr>
<tr>
<td>MINE7341</td>
<td>Mineral Process Engineering</td>
<td>8</td>
</tr>
<tr>
<td></td>
<td>Total</td>
<td>30</td>
</tr>
</tbody>
</table>

Part-time Program

This should be discussed with the Head of Department. In principle, the part-time program should be completed in two years by taking approximately 15 credit points in each year. MINE1224 and MINE1324, or MINE3224 and MINE3324 would be taken in the second year.

Electives

Subjects with a value of up to 24 credit points taken from within the School of Mines may be substituted for those listed above, subject to approval by the Course Director. Subjects from other courses in the University may also be chosen by agreement with the appropriate Head of School.
Key Centre for Mines

Graduate Study

Course Outlines

8057
Master of Mining Management
MMinMgmt

5057
Graduate Diploma in Mining Management
GradDipMinMgmt

The courses are designed to give mining personnel the opportunity to extend their career paths into management levels. Candidates will be able to select course work modules from Business Management and Science and Technology Streams.

The delivery of the course work modules has been designed to enable the participation of professional staff in the minerals industries no matter how remote the location of their particular operation. This delivery will either be in the form of one week short courses, with follow-up assignments, or by correspondence only. Each module is of 12 credit points value. In normal circumstances no more than two modules may be undertaken by correspondence.

It is anticipated that candidates will come from a wide range of educational and training backgrounds.

The normal entry qualification for the Graduate Diploma is a relevant three-year degree or equivalent. This may be demonstrated by equivalent experience and/or the holding of a position of appropriate responsibility.

The normal entry qualification for the Masters Degree is a relevant four-year degree or equivalent. This may be demonstrated by equivalent experience and/or the holding of a position of appropriate responsibility. A preliminary program is available for candidates who do not fully meet the normal requirements.

A 36 credit point industry-based project and five modules are required for the GradDipMinMgmt with a minimum of two from either the Business Management or the Science and Technology Streams.

For the Master of Mining Management it is necessary to complete eight modules, with a minimum of three from either stream. The Master’s program also includes an industry-based project equivalent to one third of the course. The courses will be structured in a way that allows movement between the two programs in some circumstances; a graduate of the GradDipMinMgmt course may be able to continue to a MMinMgmt by completing a further three modules and the larger industry-based project.

Assessment is by assignment for most modules but may be by formal examination. Examination of the correspondence components of the course is undertaken at a number of regional centres.

Science and Technology Modules (12 credit points)
KCME1102 Mine Safety Management*
KCME1103 Drilling and Blasting
KCME1105 Slope Stability for Surface Mining
KCME1106 Soil and Rock Construction Materials
KCME1107 Introductory Computing for Geologists and Mining Engineers
KCME1108 Applied Structural Geology
KCME1109 Geophysics for Mine Development
KCME1302 Mine Ventilation and Environment
KCME2101 Strata Control
KCME2104 Application of Computers in the Mining Industry
KCME2105 Geostatistical Ore Reserve Estimation
KCME2107 Mine Water Origin, Inflow, Prediction and Control
KCME3101 Coal Preparation
KCME4102 Placer Technology
KCME4133 An Introduction to Environmental Geology
KCME4301 Environmental Management for the Mining Industry*
KCME4302 Environmental Assessments
KCME4303 Mine Geology and Grade Control

Business Management Modules (12 credit points)
KCME1102 Mine Safety Management*
KCME3201 Financial Management**
KCME3202 Management Perspectives**
KCME3203 Economic Decision Making**
KCME3204 Management of Innovation**
KCME3205 Strategic Planning**
KCME3206 Mining Law
KCME4201 Export Marketing for the Minerals Industry
KCME4202 Mine and Project Evaluation
KCME4203 Mine Management
KCME4204 Mineral Exploration Project Management
KCME4301 Environmental Management for the Mining Industry*

*May be taken as either a Science and Technology or a Business Management module
**May be offered by correspondence

Industry-Based Projects
KCME1300 Mining Management Project
48 credit points (course 8057 only)
KCME1400 Mining Management Project
36 credit point (course 5057 only)

Equivalent or additional courses can be added at the discretion of the Head of the School of Mines.
Subject Descriptions

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

APSE0002
Social Issues in Applied Science
Staff Contact: Department of Applied Geology Office
Department of Mining Engineering Office
CP5 S1 L1 T1

Social Issues and the Applied Sciences The subject covers social issues arising from future technological developments and the role that a professional applied scientist can play in influencing future directions. It will be taught by a combination of group activity, case studies and projects and seminars from visiting speakers, some of whom will be from disciplines other than the applied sciences.

GEOL0004
Special Program Applied Geology
Staff Contact: Dr AC Dunlop, Mr GH McNally
CP120
Note/s: For programs 8022.1000, 8022.2000 and 8022.3000.

GEOL0005
Research Thesis Applied Geology Full-time
Staff Contact: Dr AC Dunlop
CP120
Note/s: For programs 1000 and 2000.

GEOL0006
Research Thesis Applied Geology Part-time
Staff Contact: Dr AC Dunlop
CP60
Note/s: For programs 1000 and 2000.

GEOL0110
Geological Remote Sensing
Staff Contact: A/Prof GR Taylor
CP12 S1 L4 HPW3

The physics of various remote sensing techniques; interpretation of conventional aerial photography in exploration; Infrared remote sensing techniques; side looking airborne radar; theory and applications of Landsat imagery; enhancement techniques for satellite imagery; interpretation of Landsat photographic products and application to several case history areas. Integration of remote sensing information with the overall data base as applied to exploration.

GEOL0114
Project in Geological Remote Sensing
Staff Contact: A/Prof GR Taylor
CP48
Note/s: Restricted to program 8026.

GEOL0300
Computing and Statistics for Geologists
Staff Contact: Dr DR Cohen
CP12 SS L2 T1

Introduction to the use of PC's, operating systems, communications and networks, common software packages. An introduction to programming, spreadsheets, graphics software and the SYSTAT package. Fundamentals of statistics including types of data, population characterisation, tests of significance, analysis of variance and basic geostatistical methods.

GEOL0304
Data Processing Project 1
Staff Contact: A/Prof GR Taylor
CP24 SS

A minor project equivalent to 6HPW study for one session which will require the student to carry out detailed processing and analysis of a comprehensive data set for an exploration project that may relate to the student's field of employment.

GEOL0310
Image Processing of Spatial Data Sets
Staff Contact: A/Prof GR Taylor
CP12 SS L2 T1

Data sources and formats, remotely sensed, geophysical, geochemical and topographic. Image display systems; data pre-processing, image rectification, spatial filtering and enhancement techniques. Statistical analysis, classification and image display as a tool for data integration.

GEOL0314
Data Processing Project 2
Staff Contact: A/Prof GR Taylor
CP48 SS

A research project equivalent to 12 HPW study for one session which requires the student to carry out detailed processing, analysis and integration of a multi-attribute data set for an exploration project that may relate to the student's field of employment.

GEOL0320
Geostatistical Ore Reserve Estimation
Staff Contact: Key Centre for Mines Office
CP12

When to apply geostatistics; brief review of univariate statistics; bivariate statistics and correlation; exploratory data analysis; measures of spatial correlation: the variogram, the covariance; variogram calculation and how to obtain a good variogram; random function models and stationarity; desirable properties of estimators; estimation of variance; dispersion variance and uses; optimal weighted average estimator, ordinary kriging; recoverable reserve estimation, problems and solutions; application examples, coal, copper, gold; blasthole kriging for ore/waste selection; geotechnics and the environment.
GEOL0330
Conceptual Models for Exploration Geology
Staff Contact: Dr AC Dunlop
CP12 SS L2 T1
The development and use of ore deposit models as a guide for exploration. Examples drawn from the major categories of deposit such as epithermal gold, greenstone associated gold, vein-type uranium, porphyry copper, volcanogenic massive sulphides, carbonate and shale-hosted lead-zinc and ultramafic hosted nickel sulphides. Exploration strategies and tactics; risk analysis and prospect evaluation.

GEOL0340
Geochemical Exploration Techniques
Staff Contact: Key Centre for Mines Office
CP12 SS L2 T1

GEOL0350
Exploration Geochemical Data Processing
Staff Contact: Dr DR Cohen, Dr AC Dunlop
CP12 SS L2 T1

GEOL0360
Remote Sensing Applications in Geoscience
Staff Contact: A/Prof GR Taylor
CP12 SS L2 T1
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.

GEOL0370
Fundamentals of Exploration Geophysics
Staff Contact: Mr D Palmer
CP12 SS L2 T1
An introduction to the theory and application of geophysical methods to engineering, environmental, and groundwater studies. The methods covered include gravity, magnetic, seismic refraction, shallow seismic reflection, DC electrical resistivity, electromagnetic, transient electromagnetic, radar, and geophysical well logging. Each method is described in terms of the fundamental physical principles, data acquisition and field techniques, data processing and presentation, and quantitative interpretation.

GEOL0380
Electrical Methods in Geophysical Exploration
Staff Contact: Mr D Palmer
CP12 SS L2 T1
The relationships between geology and electrical geophysical properties; basic theory of resistivity, induced polarisation and electromagnetic method. Evaluation of applications, survey design, instrumentation, data acquisition, interpretation and productivity. Computer methods of interpretation are emphasised by the extensive use of hands-on microcomputer tutorials. An introduction to recent advances in electrical geophysics: inversion, multi-electrode array resistivity, spectral induced polarisation, transient electromagnetics and ground probing radar.

GEOL0390
Data Processing for Fossil Fuel Resources
Staff Contact: A/Prof C R Ward
CP12 SS L2 T1
Sedimentary basin analysis with special emphasis on the geology of coal deposits; coal deposit evaluation, data acquisition, computer processing, analysis and display.

GEOL1101
Geological Processes
Staff Contact: Dr MD Buck
CP15 S1 L3 T2
Prerequisites: HSC mark range required 2 unit Mathematics 60-100, 2 and 3 unit Mathematics 1-50, or 3 and 4 unit Mathematics 1-100, and 2 unit Science (Physics) 53-100, or 2 unit Science (Chemistry) 53-100, or 2 unit Science (Geology) 53-100, or 2 unit Science (Biolo) 53-100, or 4 unit Science 1-50, or 3 unit Science 90-150
Note/s: Up to 2 days of fieldwork is a compulsory part of this subject. Students will incur personal costs. Details will be provided during the first week of the subject.

GEOL1201
Geological Environments
Staff Contact: Dr MD Buck
CP15 S2 L3 T2
Prerequisites: GEOL1101
Note/s: Up to 4 days of fieldwork is a compulsory part of this subject and may be held in the last week of the mid-year recess. Students will incur personal costs. Details will be provided during the first week of the subject.
Note/s: Fieldwork of up to 4 days is a compulsory part of this subject. Students will incur personal costs. Details will be provided during the first week of the subject.


Note/s: Fieldwork of up to 5 days is a compulsory part of this subject. Students will incur personal costs. Details will be provided during the first week of the subject.


GEOL2092
Geochemistry
Staff Contact: Dr DR Cohen
CP7.5 S2 L2 T1
Prerequisite: GEOL1201

GEOL3011
Mineralogical Techniques
Staff Contact: Dr PC Rickwood
CP7.5 S1 L2 T1
Prerequisite: GEOL1201

GEOL3021
Igneous and Metamorphic Processes
Staff Contact: A/Prof BJ Hensen
CP15 S1 L2 T1.5
Prerequisite: GEOL2011 and GEOL2022
Note/s: Fieldwork of up to 3 days is a compulsory part of this subject. Students will incur personal costs. Details will be provided during the first week of the subject.

GEOL3031
Stratigraphy and Basin Analysis
Staff Contact: Prof J Roberts
CP22.5 S1 L2 T2
Prerequisite: GEOL1201
Note/s: Fieldwork of up to 8 days is a compulsory part of this subject. Students will incur personal costs. Details will be provided during the first week of the subject.

GEOL3052
Exploration Geophysics
Staff Contact: Mr D Palmer
CP15 S2 L2 T1
Prerequisite: GEOL1201
Note/s: Fieldwork of up to 3 days is a compulsory part of this subject. Students will incur personal costs. Details will be provided during the first week of the subject.
An introduction to the theory and application of geophysical methods to mineral, petroleum, coal, groundwater, and geotechnical studies. The methods covered include gravity, magnetic seismic refraction, shallow seismic reflection, DC electrical resistivity, induced polarization, electromagnetic, transient electromagnetic, radar, and geophysical well logging. Each method is described in terms of the fundamental physical principles, data acquisition and field techniques, data processing and presentation, and quantitative interpretation.

GEOL3072
Engineering Geology
Staff Contact: Dr PG Lennox
CP7.5 S2 L2 T1
Intact rock, discontinuities and rock masses; weathering; engineering properties and testing of soils; soil and rock mechanics fundamentals; soil and rock as construction materials; applications of geology in the investigation and design of roads, dams, tunnels and mines.

GEOL3082
Structural Geology
Staff Contact: Dr PG Lennox
CP15 S2 L2 T1
Prerequisite: GEOL2022
Note/s: Fieldwork of up to 5 days is a compulsory part of this subject. Students will incur personal costs. Details will be provided during the first week of the subject.
Structural Geology. Structural analysis at the microscopic, mesoscopic and macroscopic scales. Structural analysis using Bermagui, Cooma and Broken Hill Terrains. Folds, faults and foliation development. Strain analysis, deformation mechanisms and the relationship between deformation and metamorphism.
Exploration Geochemistry
Staff Contact: Dr AC Dunlop, Prof GJS Govett, Dr DR Cohen
CP7.5 S2 L2
Prerequisites: GEOL2092 and GEOL3101

Principles and techniques of soil drainage and rock geochemistry as applied to mineral exploration.

Ore Deposits
Staff Contact: Dr AC Dunlop
CP15 S1 L3 T2
Prerequisite: GEOL2022 and GEOL2092

Note/s: Fieldwork of up to 4 days is a compulsory part of this subject and will be held in the last week of the mid-year recess. Students will incur personal costs. Details will be provided during the first week of the subject.

Geological setting, characteristics and genesis of the major categories of ore deposits. Laboratory study of hand specimens, thin sections and polished sections from these ore deposit categories.

Fossil Fuels and Non-metallic Resources
Staff Contact: A/Prof CR Ward, Dr PG Lennox
CP15 S2 L3 T2
Prerequisites: GEOL1201
Note/s: Fieldwork of up to 3 days is a compulsory part of this subject. Students will incur personal costs. Details will be provided during the first week of the subject.


Advanced Geological Techniques
Staff Contact: Dr PC Rickwood, Dr DR Cohen, A/Prof GR Taylor, A/Prof BJ Hensen
CP15 S1 L T6
Note/s: Fieldwork of up to 7 days is a compulsory part of this subject. Students will incur personal costs. Details will be provided during the first week of the subject.

Geochemical Techniques. Sampling strategy and methodology; preparation of samples for analysis. Practical usage of modern destructive and non-destructive methods of rock and mineral analysis including AAS, ICP, DCP, and XRF.
GEOL4213
Field Project (P/T)
Staff Contact: Dr PG Lennox
CP30 S2 HPW10 (Year 1) S2 HPW 10 (Year 2)
Note/s: Students will incur personal costs.

A major field/laboratory project, which generally includes geological mapping, on some aspect of mineral or sedimentary basin resources, engineering or environmental geology or resource geophysics.

GEOL5211
Geology for Mining Engineers 1
Staff Contact: Dr MB Katz
CP10 F L1 T1
Note/s: Fieldwork of up to 1.5 days is a compulsory part of this subject. Students will incur personal costs.

Main branches of geology and their application to mining. Introduction to mineralogy, petrology, stratigraphy and geomorphology. Rock weathering; Structural geology; faults, folds, joints and foliation. Plate tectonics. The use of geological maps.

GEOL5301
Introduction to Petroleum Geology
Staff Contact: Dr PG Lennox
CP7.5 S1 L2 T1
Note/s: Fieldwork of up to 2 days is a compulsory part of this subject. Students will incur personal costs. This is a servicing subject taught within courses offered by other schools or faculties.

Introduction to earth science, nature and properties of rocks and minerals; sedimentation, sedimentary structures and sedimentary environments; stratigraphy and the geological time scale, geologic maps and structures; introduction to plate tectonics. Minerals under the microscope. Microscopic features of sandstone and limestone. Nature and identification of clay minerals. Coal and Petroleum formation; development of sedimentary basins.

GEOL5311
Geology for Mining Engineers 2
Staff Contact: Dr MB Katz
CP20 F L1 T2
Note/s: Fieldwork of up to 1 day is a compulsory part of this subject. Students will incur personal costs. This is a servicing subject taught within courses offered by other schools or faculties.

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 metallic and non-metallic resources, processes of ore formation. Exploration methods.

GEOL5312
Petroleum Geology and Geophysics
Staff Contact: A/Prof CR Ward, Dr PG Lennox
CP7.5 S2 L2 T1
Prerequisite: GEOL5301
Note/s: This is a servicing subject taught within courses offered by other schools or faculties.

Petroleum Geology: Petroleum generation, including kerogen types and maturation migration, entrapment and degradation; Sedimentary features of reservoir sequences; Structural traps, diapirs and fractured-rock reservoirs, including coal-bed methane; primary and secondary porosity development; exploration techniques and resource evaluation; case studies of selected petroleum fields. Petroleum Geophysics: fundamentals of seismic wave propagation, seismic data acquisition, seismic data processing, seismic interpretation, three dimensional seismic methods, case studies, vertical seismic profiling.

GEOL5401
Petroleum Production Geology and Geophysics
Staff Contact: Dr PG Lennox, Mr D Palmer
CP5 S1 L1.5T5
Prerequisite: GEOL5312
Note/s: This is a servicing subject taught within courses offered by other schools or faculties.

Petroleum exploration and development programs; sub-surface maps and sections; geologic characteristics of selected reservoir types: porosity characteristics and recovery effects; estimation of petroleum resources. Interpretation and application of 2D and 3D seismic reflection data. Structural maps, amplitude seismic velocities, amplitude versus offset and frequency effects. Estimation of petroleum resources.

GEOL5410
Geology for Mineral Engineers
Staff Contact: A/Prof CR Ward, Dr MB Katz
CP5 S2 L2
Note/s: This is a servicing subject taught within courses offered by other schools or faculties.

Nature and properties of coal; methods of testing and analysis; introduction to coal petrology; geological factors in coal preparation and use. Chemical and physical properties of rock forming and economic minerals.

GEOL7321
Geology for Geomorphologists and Pedologists
Staff Contact: Dr MD Buck, A/Prof AD Alban
CP15 S1 L1 T1 S2 L2 T2
Prerequisites: GEOL1201
Note/s: This is a servicing subject taught within courses offered by other schools or faculties.


GEOL9010
Groundwater Environments
Staff Contact: Dr J Jankowski
CP12 S1
Physical properties of groundwater. Darcy flow; hydraulic conductivity - field and laboratory methods; storage and transmissivity; flow nets - local and regional flow systems. Drilling methods; well design and completion; well...
development; pumping tests and interpretation. Study of the detailed occurrence, methods of development and environmental problems associated with groundwater in aquifer systems of importance to Australia. Environments will include fractured rock systems (upland salinity); the Murray-Darling Basin; The Great Artesian Basin; Oceanic Islands and coastal aquifers and karstic aquifer systems.

**GEOL9030**
**Geological Engineering**  
*Staff Contact: Mr GH McNally*  
*CP12 S1*


**GEOL9031**
**Engineering Geology of Surficial Materials**  
*Staff Contact: Mr GH McNally*  
*CP12 S2*

Geotechnical characteristics of alluvial, colluvial, eolian, coastal and residual soils; duricrusts and deep water weathering; problem soils (expansive, dispersive, collapsing, compressible and saline); stabilisation and improvement of inferior materials; influence of Cainozoic climatic changes and geological history of regolith in Australia and adjacent areas.

**GEOL9032**
**Soil and Rock Construction Materials**  
*Staff Contact: Mr GH McNally*  
*CP12 S2*

Location and assessment of sand, gravel, hard rock, brick clay, building stone and limestone; specification and testing of aggregate, ballast and roadbase; concrete and asphaltic materials; blasting, crushing and beneficication; environmental considerations, blast monitoring and quarry reclamation; waste and synthetic materials.

**GEOL9033**
**Terrain Evaluation**  
*Staff Contact: Mr GH McNally*  
*CP12 S2*

Introduction to photogeology and image interpretation, with emphasis on geotechnical applications; interpretation of geological structure, lithology and surficial deposits; terrain evaluation for engineering purposes, with Australian examples. Course content includes lectures, supervised practical work and individual assignments. Intended to complement GEOL0110 (Geological Remote Sensing), emphasising airphotos as a data source.

**GEOL9040**
**Fundamentals of Geomechanics**  
*Staff Contact: Mr GH McNally*  
*CP12 S1 L1.5 T1.5*

Note/s: This subject is being revised. Intending students should contact Mr G H McNally.

Engineering mechanics, limit equilibrium, equilibrium of multiple bodies, stress and strain in two and three dimensions, equations of equilibrium and compatibility. Isotropic and anisotropic elasticity, plastic and viscous yield criteria and potential surfaces. Stereographic projection methods for rock mechanics. Geomechanical properties and classification of soils and rocks. Laboratory and field testing techniques for soils and rocks. Deformability and strength properties of rocks and shear strength of rock discontinuities. Stresses about rock openings and beneath point loads. Stress measurement in rocks.

**GEOL9051**
**Hydrogeochemistry**  
*Staff Contact: Dr J Jankowski*  
*CP12 S1*

Chemical composition of natural and contaminated groundwaters; inorganic parameters in natural waters; methods of expressing concentration and representation of hydrochemical data; interpretation of chemical analyses, chemical types of waters; aqueous geochemistry, chemical thermodynamics, activities of ionic species, equilibrium reactions, non-equilibrium approaches, the carbonate system and pH control; chemical weathering, water-rock interactions; clay minerals and ion exchange, silicate equilibria, mass balance, oxidation and reduction, redox equilibria, redox processes and reactions. Application of physical chemistry to groundwater systems. Geochemical evolution of groundwater. Introduction to hydrochemical modelling. Introduction to isotope studies; case studies in natural and polluted environments.

**GEOL9052**
**Advanced Hydrogeochemistry**  
*Staff Contact: Dr J Jankowski*  
*CP12 S2*

Note/s: Not offered in 1996.

Environmental isotopes; radioactive decay; stable and radioactive isotopes and their application to groundwater studies; bacteriology: basic principles of bacteriology and microbiology of polluted environments; biochemistry, advanced thermodynamics and kinetics; mass transport and mass balance studies in groundwater systems; computer methods in geochemical modelling including forward and inverse methods and geochemical modelling codes; case studies and application of computer codes in groundwater modelling; practical field measurement and use of field hydrochemical equipment; laboratory analysis and the use of the chemical laboratory equipment.

**GEOL9060**
**Environmental Geology**  
*Staff Contact: Mr GH McNally*  
*CP12 S1 L3*

Geology and urban planning; geological input to Environmental Impact Statements; soil and rock construction materials; ground subsidence due to mining and groundwater pumping; geological hazards; land degradation and problem soils; engineering geomorphology.

**GEOL9070**
**Engineering Geophysics**  
*Staff Contact: Mr D Palmer*  
*CP12 S1 L2 T1*

Note/s: Short field tutorials are included as part of this subject. Students will incur personal costs.

An introduction to the theory and application of geophysical methods to engineering, environmental, and groundwater studies. The methods covered include gravity, magnetic
seismic refraction, shallow seismic reflection, DC electrical resistivity, electromagnetic, transient electromagnetic, radar, and geophysical well logging. Each method is described in terms of the fundamental physical principles, data acquisition and field techniques, data-processing and presentation, quantitative interpretation, and case histories.

GEOL9100
Remote Sensing of Groundwater Resources
Staff Contact: Applied Geology Office
CP12 S1 L1.5 T1.5
The physics of various remote sensing techniques; interpretation of conventional aerial photography in exploration; Infrared remote sensing techniques; sidelaying airborne radar; theory and applications of Landsat imagery; enhancement techniques for satellite imagery; interpretation of Landsat photographic products and application to several case history areas. Integration of remote sensing information with the overall database as applied to exploration. Remote sensing for hydrogeological mapping, recognition of aquifers and recharge, discharge zones, salinity mapping. Application of Landsat, TM, SPOT, RADAR and integrated information systems.

GEOL9110
Hydro and Environmental Geology
Staff Contact: Dr I Acworth
CP7.5 S2 L2 T1
**Prerequisite:** GEOL5100
**Note/s:** This is a servicing subject taught within courses offered by other schools or faculties.

Hydrogeology: determination of intrinsic permeability in field and laboratory, tracer tests, finite difference modelling methods applied to groundwater flow, drilling methods for unconsolidate and consolidated deposits, piezometer design and installation, remote sensing methods for contaminated groundwater investigations, sampling methods.

Hydrogeochemistry: Chemical composition of natural and contaminated groundwater, inorganic parameters in groundwaters, chemical types of groundwaters, chemical reactions and processes, chemical evolution and chemical classification of groundwaters, chemical equilibrium, disequilibrium, acid-base chemistry, the carbonate system and pH control, oxidation and reduction.

GEOL9120
Groundwater Contaminant Transport
Staff Contact: Dr J Jankowski
CP7.5 S1 L2 T1
**Prerequisites:** GEOL9110
**Note/s:** This is a servicing subject taught within courses offered by other schools or faculties.

Weathering reactions and geochemical processes, ion exchange, salt sieving and brine development, dryland salinity, fresh water saline water interaction, application of stable and radioactive isotopes in groundwater studies, groundwater microbiology, corrosion and incrustation in groundwater bores, practical field and laboratory measurements, monitoring and sampling of contaminants in groundwater, sources and types of contaminants, groundwater quality and environmental standards, contaminant mass transport in groundwater, chemical dispersion, chemical diffusion and retardation, Kd test, hydrogeochemical modelling, physical and empirical models, modelling of subsurface transport, trace metals in groundwater speciation and transport, restoration and clean-up.

GEOL9124
Groundwater Project
Staff Contact: Dr I Acworth
CP36 S2
Study of similar content to GEOL9144 but at a smaller scale.

GEOL9144
Groundwater Research Project
Staff Contact: Dr I Acworth
CP48 S2
**Note/s:** Students undertaking field work may incur personal costs.
Research investigation consisting of one or more of: modelling, laboratory experiments, field work related to groundwater studies.

GEOL9444
Project in Engineering Geology
Staff Contact: Mr GH McNally
CP24
Study of similar content to GEOL9464 but at a much smaller scale.

GEOL9454
Project in Engineering Geology
Staff Contact: Mr GH McNally
CP36
Study of similar content to GEOL9464 but at a smaller scale.

GEOL9464
Project in Engineering Geology
Staff Contact: Mr GH McNally
CP60
**Note/s:** students undertaking field work may incur personal costs.
The project is a research investigation of field and laboratory work in any of the disciplines: Engineering Geology, Environmental Geology or Hydrogeology.

KCME1102
Mine Safety Management
Staff Contact: Prof J Cross
CP12
**Note/s:** Offered by correspondence.
The course includes the following: safety management; hazard and risk analyses, safety hazard identification, management techniques (MORT STEP), safety audits; statistics; HAZOP management and maintenance of change risk analysis; cost benefit analysis; attitudes to safety in mining; safety and personal problems; 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.
KCME1103  
Drilling and Blasting  
Staff Contact: Dr G Sen  
CP12  
Drilling methods, types of drills, types of bits and other accessories, drilling economics, maintenance schedules for drills and accessories; history and theory of explosives, explosive types; new developments and applications; blast design and secondary blasting; controlling ground vibration; airblast and flyrock; blasting economics; controlled blasting; precautions against extraneous electricity; misfires and deteriorated explosives safety and legislation for storage; transportation and handling of explosives.

KCME1105  
Slope Stability for Surface Mining  
Staff Contact: Key Centre for Mines Office  
CP12  
This comprehensive course will deal with the major topics of engineering geology and groundwater controls, 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 subject may involve workshops and field inspections so that the participants gain hands-on experience of practical cases.

KCME1106  
Soil and Rock Construction Materials  
Staff Contact: Mr GH McNally  
CP12  
This course provides an introduction to the location, assessment, mining and processing of soil and rock construction materials and to the environmental problems associated with their extraction. The main themes explored include the maximum use of existing quarries, the use of upgraded marginal materials and the reclamation of quarried lands. The materials covered include aggregates, ballast, armour-stone and prepared road base, sand, gravel and natural pavement materials, artificial aggregates and stabilised road base, brick clay, limestone and cementitious materials.

KCME1107  
Introductory Computing and Statistics for Geologists and Mining Engineers  
Staff Contact: Dr DR Cohen  
CP12  
Introduction to the use of PCs, operating systems, communications and networks, common software packages. An introduction to programming, spreadsheets, graphics software and the SYSTAT package. Fundamentals of statistics including types of data, population characterisation, tests of significance, analysis of variance and basic geostatistical methods.

KCME1108  
Applied Structural Geology  
Staff Contact: Dr PG Lennox  
CP12  

KCME1110  
Geographical Information Systems in Applied Geology  
Staff Contact: A/Prof GR Taylor  
CP12  
Introduction to GIS; raster versus vector systems; overview of GIS in geology and geological applications of GIS. Introduction to raster systems; spatial associations and analysis tools; digital terrain modelling; spatial modelling site and route selection. Introduction to vector systems; vector data models and data base systems. Input of spatial data into vector based GIS; building a vector geographical data base. Managing attribute data; data analysis and modelling using a vector based GIS. Cartographic output and data display; TIN and network. Spatial data analysis methods in geology; geological case studies; integration of GIS and Remote Sensing. GIS hardware, GIS organisational and management issues.

KCME1300  
Mining Management Project  
Staff Contact: A/Prof GR Taylor  
CP48  
A study of either an administrative or technical nature with relevance to the management of a mining or mineral processing operation. This may be based on simulated or actual situations but projects of relevance to the candidates employment will be encouraged. As far as is possible projects will be designed in consultation with the mining industry.

KCME1302  
Mine Ventilation and Environment  
Staff Contact: Mr VS Vutukuri  
CP12  
The course includes the following topics: ventilation network analysis and simulation; fan selection; role of booster fans; ventilation of long headings; recirculation; gases from diesel engines and their control; methane and its control in underground coal mines; dust in mine air and its control; mine climate and its control; ventilation planning.  
Subject to be delivered as a short course consisting of 35 hours of class contact and additional tutorials equivalent to a further 7 hours of class contact.
KCME1400
Mining Management Project
Staff Contact: Dr MB Katz
CP36
A study of either an administrative or technical nature with relevance to the management of a mining or mineral processing operation. This may be based on simulated or actual situations but projects of relevance to the candidate’s employment will be encouraged. As far as possible, projects will be designed in consultation with the mining industry.

KCME2101
Strata Control
Staff Contact: Key Centre for Mines Office
CP12
This course presents to the practising engineer the latest developments in the field of strata mechanics and develops a sound design background to enable the carrying out of efficient mining operations for increased productivity consistent with safety. The course covers the fundamentals of strata mechanics together with advanced topics including engineering technology and rock mechanics aspects of coal mining strata control. Emphasis will be given to the various design aspects of mine structures, such as mine pillars, gate roads and long wall mining. The role played by instrumentation in providing for the safe design of the mine opening will be addressed. Special sessions will be devoted to rock and cable bolting techniques and powered support design.

KCME2104
Application of Computers in the Mineral Industry
Staff Contact: Key Centre for Mines Office
CP12
Geostatistical ore reserve estimation on a personal computer; computerised open pit design and planning; mine system simulation using GPSS/PC. An expert system for the mineral industry. Mine ventilation planning on a personal computer, using Lotus 123 spreadsheet to solve mining problems.

KCME2105
Geostatistics and Ore Body Modelling
Staff Contact: Key Centre for Mines Office
CP12
When to apply geostatistics; brief review of univariate statistics; bivariate statistics and correlation; exploratory data analysis; measures of spatial correlation: the variogram, the covariance; variogram calculation and how to obtain a good variogram; random function models and stationarity; desirable properties of estimators; estimation of variance; dispersion variance and uses; optimal weighted average estimator, ordinary kriging; recoverable reserve estimation, problems and solutions; application examples, coal, copper, gold; blasthole kriging for orewaste selection; geotechnics and the environment.

KCME2107
Mine Water Origin, Inflow, Prediction and Control
Staff Contact: Key Centre for Mines Office
CP12
Note/s: This is a short course subject and can be done by correspondence.
This course investigates the origin of mine water, and hydrological and hydrogeological factors affecting mine drainage. The method of predicting mine water inflow and techniques of mine water control will be considered. Pumping tests, surface stability, inflow and calculations of water inflow in open cut operations are studied. Underground mine dewatering techniques, pumps, and pumping systems, mine inundation as well as methods for mine water pollution control and treatment are compared.

KCME3101
Coal Preparation
Staff Contact: Dr AC Partridge
CP12
Coal characterisation, principles of separation, materials handling, sampling theory, sampling equipment and practice, screening and comminution, cleaning of coarse and small coal, water based separation, dense medium separation, cleaning of fine coal, solid liquid separation theory, cyclones, vacuum and pressure filtration, centrifuges (product and tailing), clarification/thickening practice, pumping, piping, valving, plant design, layout and upgrading, maintenance, control concepts (basic process control), on-stream analysis, overall plant control and optimisation.

KCME3201
Financial Management
Staff Contact: Key Centre for Mines Office
CP12
Note/s: Offered by correspondence.
The course covers the following topics: financial management, an overview; accounting concepts and the accounting process; financial statements; public sector accounting; corporate accounting; the interpretation of financial statements; the recording of costs; management cost information (1); management cost information (2); the budgeting process.

KCME3202
Management Perspectives
Staff Contact: Key Centre for Mines Office
CP12
Note/s: Offered by correspondence.
The course covers the following topics: what is management?; managing individuals; managing groups; managing organisations; managing information; managing operations; managing decision making.

KCME3203
Economic Decision Making
Staff Contact: Key Centre for Mines Office
CP12
Note/s: Offered by correspondence.
The course covers the following topics: introduction to economic concepts demand; supply and the market consumers; firms and market structures; welfare economics and government intervention; international economics; macroeconomics and national income analysis; national economic policy benefit cost analysis and expenditure decisions; business finance.
KCME3204
Management of Innovation
*Staff Contact: Key Centre for Mines Office*
*CP12*

*Note/s: Offered by correspondence.*

The course covers the following topics: innovation and innovators; technology and innovation; opportunity analysis; marketing and innovation; the business plan; management of innovation; innovations in corporations; maintaining innovations.

KCME3205
Strategic Planning
*Staff Contact: Key Centre for Mines Office*
*CP12*

*Note/s: Offered by correspondence.*

The course covers the following topics: the nature and scope of strategic management; the practice of strategic management; the mission of the organisation; analysing organisational resources; formulating strategic objectives; generating strategic alternatives; evaluating strategic alternatives; strategic implementation; assessing strategic performance.

KCME3206
Mining Law
*Staff Contact: Key Centre for Mines Office*
*CP12*

Topics to be covered with course include: definitions of ‘minerals’; common law; ownership; Aboriginal land rights; miners’ rights and claims; exploration titles; production titles; private land/Crown land; administrative processes; environmental protection and royalties. These topics will be illustrated by reference to a number of case histories.

KCME4102
Placer Technology
*Staff Contact: Key Centre for Mines Office*
*CP12*

Sources of placer minerals; natural processes producing concentration of placer minerals; nature of placer deposits; trends in placer exploration; placer sampling; reserves calculations; mining methods; processing methods; project evaluation; environmental implications and pollution control technology.

KCME4133
An Introduction to Environmental Geology
*Staff Contact: Key Centre for Mines Office*
*CP12*


KCME4201
Export Marketing for the Mining Industry
*Staff Contact: Ms J Morgan*
*CP12*


KCME4202
Mine and Project Evaluation
*Staff Contact: Mr EJ Malone*
*CP12*

Topics to be covered in the course include: introduction to accounting, understanding financial statements, financial theory in relation to project evaluation, evaluation techniques, project financing, cost of capital, revenue assumptions, cost assumptions, risk analysis and responses to uncertainty, project optimisation, feasibility 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. Coal industry topics: coal qualities, marketing and economics. Mineral Industry topics: significance of technical inputs; preliminary investigations and asset determinations, and underground base metal development study.

KCME4203
Mine Management
*Staff Contact: Mr SG Gemeil*
*CP12*

The subject covers general management functions, planning, organisation, control, communication, command, coordination, production functions, marketing, financial aspects, personnel, purchasing, public relations, environmental matters, contracts and stock market requirements and implications.

KCME4204
Mineral Exploration Project Management
*Staff Contact: Mr EJ Malone*
*CP12*

This course stresses the need to define the exploration target in order to design appropriate exploration programs and establish criteria for monitoring the effectiveness of the programs. Exploration techniques are reviewed with emphasis on the applicability of specific techniques in particular circumstances, their limitations and the use of orientation work to establish performance criteria. Specific topics include: introduction to program design; review of available techniques; remote sensing techniques; geochemical techniques; airborne geophysical surveys; ground geophysical surveys; data interpretation; reporting
and supervision; sequential exploration; definition of drill targets; budgeting and budget management.

**KCME 4301**
Environmental Management for the Mining Industry
*Staff Contact: Key Centre for Mines Office*
CP12

*Note/s: May be taken as either a Science and Technology or a Business Management Module.*

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 techniques; formal environmental impact assessment procedures, including public submissions and hearings; lease and licence 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 EPM applications in mining, oil, manufacturing, petrochemical, civil engineering and infrastructure, building and construction; coastal management and other industries; EPM issues and concerns in Asia-Pacific nations and the region as a whole. Subject to be delivered as a short course consisting of 35 hours of class contact and additional tutorials equivalent to a further 7 hours of class contact.

**KCME 4302**
Environmental Assessments
*Staff Contact: Dr D R Cohen*
CP12

This course is an introduction to methods for assessing existing and potential contamination of industrial sites and mining operations. The course includes elements such as the policy and legal framework of environmental assessments; sources of information on a range of chemical contaminants and recommended exposure limits; the role of the assessor (or auditor). Selected environmental assessment case studies will be considered.

**KCME 4303**
Mine Geology and Grade Control
*Staff Contact: Mr EJ Malone*
CP12

Sampling theory and sampling techniques relevant to various styles of ore bodies, mining methods and scales of mining; statistical and geostatistical techniques for verifying and manipulating sample analytical data; reserves modelling; grade interpolation; fundamental grade control problems; case histories; computer modelling demonstrations; practical exercises.

**KCME 4304**
Mine Geology and Mining Methods
*Staff Contact: Mr EJ Malone*
CP12

Review the effects of rock mechanics and mining methods on mining selectivity, optimal mining units, ground control and mining dilution and combined effects of all of these on the appropriate grade control sampling techniques to achieve reliable estimation of minable reserves; the rock mechanics component will enable mine personnel to appreciate the influence of rock mechanics on mining processes and to make use of expert rock mechanics advice; review the theory of rock mechanics, including the behaviour of mined excavations and ground support to control that behaviour; review open pit and underground mining methods for a range of ore body types and ground conditions; case studies.

**KCME 4305**
Resource Evaluation
*Staff Contact: Mr EJ Malone*
CP12

This subject covers the use of geostatistical techniques to access a mineral resource, the estimation of recoverable reserves, ore and waste selection and grade control. Valuation, financing and feasibility are also considered.

**MINE 0010**
Applied Mechanics
*Staff Contact: Dr JO Watson*
CP7.5 S1 L2 T1

Statics: definition of force; free body diagrams; static equilibrium of rigid body; static equivalence of systems of forces; centre of mass, centroid, centre of pressure; friction: clutch, screw jack, belt drive. Kinematics: rectilinear and angular motion; motion in a plane; relative displacement, velocity and acceleration; gear trains and linkages. Dynamics: equations of motion for particle and rigid body; work and energy; impulse, momentum and impact.

**MINE 0014**
Exploration Drilling
*Staff Contact: Key Centre for Mines Office*
CP12 S1 or S2 HPW3


**MINE 0110**
Stress Analysis 1
*Staff Contact: Dr JO Watson*
CP7.5 S2 L2 T1

Structures: forces and stresses in pin jointed frames; bending moment, shear force in beams; stress due to bending of beams; deflection of beams; buckling of struts; stress due to torsion of shafts; combined axial and bending stress; stress in thin walled pressure vessels. Stress and strain: definition of stress in three dimensions; stress transformation in two dimensions; principal stresses in two dimensions. Mohr's circle of stress; definition of strain in three dimensions; strain-displacement relations in two dimensions; Mohr's circle of strain; principal strains in two dimensions; electrical and mechanical methods for measurement of strain; isotropic elasticity.

**MINE 0120**
Stress Analysis 2
*Staff Contact: Dr JO Watson*
CP7.5 S1 L2 T1

Prerequisite: MINE 0110

Structures: shear stresses in beams; bending moment and shear force in continuous beams; slope-deflection equations and fixed end moments; stiffness matrix and generalised nodal force vector; computer programs for analysis of continuous beams. Stress and strain: stress
transformation and principal stresses in three dimensions; strain-displacement relations in three dimensions; strain transformation and principal strains in three dimensions; equations of equilibrium in terms of stress; boundary conditions; Navier equations; strain compatibility and the Airy stress function; stress in thick walled tubes under pressure; stresses around circular tunnel; anisotropic elasticity; the equivalent continuum; yield criteria; the stress space; strain hardening and softening; flow rules; viscoplasticity.

MINE0130
Principles of Mining
Staff Contact: Prof FF Roxborough
CP8 S1 LI2

MINE0210
Introduction to Mining Engineering
Staff Contact: Prof FF Roxborough
CP2.5 S2 L1
Note/s: Visits to mines and related undertakings are a requirement of this subject.

MINE0410
Technical Communication
Staff Contact: Dr CR Daly
CP5 S2 L1 T1

MINE0710
Computing 1
Staff Contact: Dr CR Daly
CP5 S2 L1 T1
Introduction to hardware and operating systems; application software: word processing, spreadsheets, databases. Programming languages. Use of microcomputers for control, monitoring and data acquisition.

MINE1114
Mining Engineering
Staff Contact: Dr VS Vutukuri
CP24 F HPW3

MINE1131
Mining of Metalliferous Deposits
Staff Contact: Mr D Panich
CP7.5 S1 L3
Prerequisites: MINE0210, MINE1420, GEOL5211

MINE1132
Mining of Coal Deposits
Staff Contact: Prof M Galvin
CP7.5 S1 L3
Prerequisites: MINE0210, MINE1420, GEOL5211

MINE1140
Geotechnical Engineering
Staff Contact: Dr VS Vutukuri
CP10 F L1 T 1
Prerequisites: MINE1231, MINE1232

MINE1224
Mining Engineering Technology
Staff Contact: Dr VS Vutukuri
CP24 F HPW3

MINE1231
Rock Mechanics
Staff Contact: Dr VS Vutukuri
CP10 S2 L2 T2
Prerequisites: MATH1032 or MATH1231 or MATH1042 or MATH1241, MINE0120

MINE1232
Soil Mechanics
Staff Contact: Dr JO Watson
CP5 S2 L1 T1
Prerequisites: MATH1032 or MATH1231 or MATH1042 or MATH1241, MINE0120
Soil description and classification; engineering behaviour of soils; basic definitions in soil mechanics, effective stress concept; shear strength of soils, soil permeability, flow of water in soils, consolidation, stresses in soil from external loading; design of shallow foundations, compaction, compaction control, pavement and haul-road design, lateral earth pressures, soil slope stability, expansive and dispersive soils, filter design.

MINE1320
Fluid Mechanics and Thermodynamics
Staff Contact: Dr JO Watson
CP7.5 F L1 T5
Prerequisites: MINE0010, MINE0110, PHYS1002, MATH1032 or MATH1231 or MATH1042 or MATH1241
Corequisite: MATH2001

MINE1321
Mine Water and Drainage
Staff Contact: Dr VS Vutukuri
CP2.5 S2 L1
Corequisite: MINE1320
Engineering hydrology, sources of mine water, forecasting water inflows, drainage.

MINE1324
Mineral Engineering Laboratory
Staff Contact: Dr VS Vutukuri
CP32 F HPW4
A selection of advanced laboratory investigations in sampling and valuation, mine support, temporary or long term; mine design and plant related to extraction and servicing functions; rock properties; programming of mining methods and transport; non-entry mining; petroleum engineering; gasification; solvent processes.

MINE1330
Bulk Materials Handling and Transport
Staff Contact: A/Prof GC Sen
CP5 S2 L1.5 T5
Transport systems for minerals, waste and supplies. Descriptions and power requirements for: conveyors (belt and chain), rope haulage systems, free steered vehicles and locomotive haulage systems. Descriptions and pressure loss calculations for hydraulic and pneumatic transport systems. Mine winding systems for shafts: mechanics for hoisting; winding cycle diagrams; power requirements. Safety aspects and maintenance programs for haulage and winding systems.

MINE1420
Elements of Mining
Staff Contact: A/Prof GC Sen
CP6 S1 L1
Prerequisite: MINE0210
Note/s: Visits to mines and related undertakings are a requirement of this subject.
Exploration. Development of mines, infrastructure requirements; environmental assessment. Ore body parameters for surface and underground mines; stratified and non-stratified deposits; mine layout for surface and underground operations; underground access; introduction of techniques of rock breakage and support for coal and metal mines; processing of minerals; disposal of overburden and rejects rehabilitation.

MINE1514
Ground Control and Excavation Engineering
Staff Contact: Dr VS Vutukuri
CP12 FHPW3

MINE1524
Mining Conservation
Staff Contact: Dr VS Vutukuri
CP12 S1 or S2 L2 T2
The reclamation of excavated land; integration with operational stages of mining. Mining cycles of alluvial, strip, and open cuts, land clearing, stabilising the mined area, socio-economic aspects of mining, rehabilitation costs, government regulations. Examination and evaluation of a current operation.

MINE1530
Power Supply In Mines
Staff Contact: Dr CR Daly
CP5 S1 L1 T1
Prerequisites: MINE0310, MINE1320, PHYS2920,

MINE1534
Environmental Conditions In Mines
Staff Contact: Dr VS Vutukuri
CP12 S1 or S2 HPW3
The energy equation applied to ventilation, sources of heat in mines, geothermal gradients, thermodynamics, pressure-volume diagrams. Practical aspects of high air temperatures and the control of atmospheric conditions in deep underground mines. Fan design, installation and testing. Psychrometry, ventilation planning. Computer applications. Selected laboratory experiments and network designs.

MINE1544
Rock Excavation and Transportation
Staff Contact: Dr VS Vutukuri
CP12 S1 or S2 HPW3
Rock fragmentation drilling, blasting large rounds. Loading techniques, shovels, draglines, bucket wheel excavators, dredges, front-end loaders, tractor scrapers. Operating factors, selection procedures, cost estimating. Materials handling, continuous, semi continuous, batch systems, cost analysis.

MINE1630
Excavation Engineering (Blasting)
Staff Contact: A/Prof GC Sen
CP5 S1 L2

MINE1631
Excavation Engineering (Machine Mining)
Staff Contact: Prof FF Roxborough
CP2.5 S2 L1

MINE1740
Mining Legislation
Staff Contact: Prof JM Galvin
CP5 S2 L2
An appreciation of the laws relating to coal and metal mining practice and to safety and health in mines.

MINE1830
Mine Ventilation and Environment
Staff Contact: Dr VS Vutukuri
CP10 S2 L2 T2
Prerequisites: MINE0210, MINE1420, MINE1320
Mine ventilation: practice in mines, forces causing airflow, resistance of workings and distribution of mine air, network analysis, fans and their operation, auxiliary ventilation, economic size of airways; ventilation surveys. Mine environment: mine gases; hazards, occurrence, detection, monitoring and control, airborne dust; physiological effects, sampling, measurement and analysis, sources and control, mine climate; physiological effects, air cooling power, factors affecting mine climate and control. Ventilation planning: airflow requirements based on pollutant gas, airborne dust and heat.

MINE1930
Industrial Training
Staff Contact: Dr AC Partridge
CP0 L0 T0
Students are required to gain practical experience totalling no less than 100 days during successive long recesses and are required to submit for assessment a suitably presented report on their experience gained during the recess prior to their final year of study. Reports are to include a review of the operations of the company providing the experience and full details of the work carried out by the student. After appraisal by a staff member and any required amendments, a copy is provided for the mine manager or other responsible person at the place of employment.

MINE1940
Tunnel Engineering and Shaft Sinking
Staff Contact: A/Prof GC Sen
CP5 S1 L2
MINE2141
Mineral Economics
Staff Contact: Mr D Panich
CP5 S1 L2
Prerequisites: MINE1131, MINE1132

MINE2142
Mine Planning and Design
Staff Contact: Mr D Panich
CP15 F L1 T2
Prerequisites: MINE1131, MINE1132
Corequisite: MINE2141

MINE2240
Mining Management
Staff Contact: Dr CR Daly
CP7.5 S2 L2 T1

MINE3040
Mine Safety Engineering
Staff Contact: Dr VS Vutukuri
CP7.5 S2 L1.5 T1.5
Prerequisites: MINE 0210, MINE1420

MINE3041
Hazard and Risk in Mining
Staff Contact: Prof J Cross
CP5 S1 L2

MINE3101
Mineral Process Engineering C
Staff Contact: Dr AC Partridge
CP10 F L1 T1

MINE3114
Mineral Beneficiation
Staff Contact: Dr AC Partridge
CP12 S1 or S2 HPW3
Prerequisite: MINE7341 or equivalent

MINE3140
Computational Methods in Geomechanics
Staff Contact: Dr JO Watson
CP5 S1 L2
Prerequisites: MINE1231, MINE1232
Boundary value problems: review of strategies for solution, and limitations of analytical methods; finite differences. Finite elements: variational principle and finite elements for Poisson's equations; global and elemental stiffness matrices and equivalent nodal force vectors; matrix assembly and equation solution; variational principle and finite elements for elasticity; constant strain triangular element, isoparametric elements; design of meshes; error estimates; adaptive mesh refinement; computer program for elastic analysis of plain strain; elastoplasticity, elastoviscoplasticity. Boundary elements: fundamental solution and integral equations for Poisson's equation; isoparametric boundary elements; construction and solution of discrete systems of equations; direct boundary element method for elasticity; design of meshes; computer programs for elastic analysis of strain.

MINE3224
Mineral Beneficiation Technology
Staff Contact: Dr AC Partridge
CP24 F HPW4
Prerequisite: MINE3114 or equivalent
1. Fluid mechanics of mineral pulps, free, hindered and zone settling, thickening, classification, hydrocyclones, dewatering, filtration. Gravity concentration jiggings, sink and float, flowing film fluidized beds. 2. Interfacial
phenomena, the structure of solid-water, air-water, solid-air and oil-water interfaces. Experimental techniques, applicable to the study of these interfaces. Electrokinetic theory, electrical double layer interaction. Adsorption mechanisms. Collectors, activators, depressants, modifiers, frothers, flocculants. 3. Sulphide mineral flotation, xanthate chemistry, oxide mineral flotation, salt mineral flotation. Coal preparation, coal constitution, bore core evaluation, selective preparation, blending for mineral flotation. Coal preparation, coal constitution, bore core evaluation, selective preparation, blending for mineral flotation.

MINE3240
Operations Research
Staff Contact: Dr CR Daly
CP5 S1 L1 T1
Linear programming, decision analysis, queuing theory, simulation, forecasting, reliability, replacement, inventory and production, dynamic programming. Project management, use of project management software.

MINE3324
Mineral Engineering Laboratory
Staff Contact: Dr AC Partridge
CP32 S1 or S2 HPW3
Prerequisite: MINE3114 or equivalent
Laboratory investigations may be selected from the following according to availability and specialisation: metalliferous ore concentration; coal preparation; beneficiation of non-metals; processing of mineral fluids.

MINE3514
Mineral Beneficiation Plant Design
Staff Contact: Dr AC Partridge
CP12 S1 or S2 HPW3
Prerequisite: MINE3732 or MINE3114 or their equivalent
Process design based upon mineral properties; extraction processes and environmental conditions. Selection of technology to be adopted. Basis of feasibility studies. Special considerations for coal preparation and treatment of industrial minerals. Flowsheet planning, solid and fluid flows, auxiliary units, materials handling, product disposal. Experimental techniques used in testing. Scale up procedures. Plant control, automation, use of computers. Management of mineral processing operations.

MINE3614
Minerals Engineering 1
Staff Contact: Dr AC Partridge
CP24 S1 L3 T4

MINE3624
Minerals Engineering 2
Staff Contact: Dr AC Partridge
CP24 S1 L4 T4

MINE3634
Minerals Engineering Laboratory
Staff Contact: Dr AC Partridge
CP12 S1 T3
A series of laboratory investigations relating to material covered in subjects MINE314 and MINE3624.

MINE3644
Minerals Engineering 3
Staff Contact: Dr AC Partridge
CP24 S2 L4 T4

MINE3654
Minerals Engineering Project
Staff Contact: Dr AC Partridge
CP36 F HPW4.5
Labatory work to evaluate information necessary for the design of a process for the beneficiation of ore from a metalliferous deposit, preparation of coal or treatment of industrial minerals. Candidate's report to include a process flowsheet, an equipment and materials flowsheet and a plant design layout.

MINE4055
Numerical Methods in Geomechanics
Staff Contact: Dr JO Watson
CP12 S1 or S2 HPW3

MINE4101
Mineral Processing Practices
Staff Contact: Dr AC Partridge
CP5 S1 L2
Prerequisites: MINE3101

MINE4140
Minerals Industry Project
Staff Contact: Dr AC Partridge
CP20 F T4
Candidates are required to submit a dissertation or thesis on a mining, minerals engineering or other topic approved by the Head of Department. The work may take the form of an engineering analysis, experimental investigation, theoretical study or design project. Candidates may be required to present themselves for oral examination on the subject of their submission.

MINE4155
Stability of Slopes
Staff Contact: Prof J M Galvin
CP12 S1 or S2 HPW3

MINE4240
Industrial and Research Seminars
Staff Contact: Prof FF Roxborough
CP5 F L1
A series of seminars presented by invited speakers from within the university, other research establishments and selected industrial operations, covering special topics of current interest.

MINE4401
Mine Waste Disposal and Environment
Staff Contact: Dr AC Partridge
CP5 S2 L2

MINE4424
Mineral Industry Analysis
Staff Contact: Dr VS Vutukuri
CP10 S1 or S2 L2 T2
Aspects of micro and macroeconomics. Type of companies, private, public, reliability. State ownership and participation. Financing of mining ventures. Contracts and project assessment. Obsolescence and replacement. Operations research control networks, decision analysis, linear programming, queueing theory, simulation, improvisation. Grade control, estimation of cutoff grades. Includes advanced work in the technical and economic analysis of mining or mineral operators. Cases are selected for examination and analysis; critical review.

MINE4540
The Mining Engineering Profession in Society
Staff Contact: Dr JO Watson
CP5 S2 L1 T1
Prerequisite: APSE0002
The numerous sections of society with which mining engineers may interact and their diverse expectations; the potential for divided loyalty, mistrust and conflict. The consequences of mining engineers being employed as professionals; codes of ethics and their effectiveness; scepticism about the attitude of 'limited responsibility'. Possible future controls of the profession and industry. One of the following: (a) The potential impact of an international policy of sustainable development on the mineral industry and how it may be implemented; or (b) a systematic process of decision making, illustrated by assessment procedures
for major projects and raising the issue of who would be involved; or (c) how responsible people outside the mineral industry see key problems associated with the industry in Australia. The subject will be taught via tutorials and a mini-project.

**MINE4555**
**Mining Geomechanics Project**  
*Staff Contact: Dr JO Watson*  
*CP48 F HPW6*

Individual project on an investigation related to an actual mining geomechanics problem, the topic to be chosen after consultation with a staff member. A report is required.

**MINE5064**
**Minor Project**  
*Staff Contact: Dr VS Vutukuri*  
*CP24 F HPW3*

This subject will comprise a literature-based review and a thesis presentation requiring interpretative skills. Experimental work is preferable but not essential. Projects may be based on mining, geology, mineral processing or engineering aspects of industrial processes.

**MINE5124**
**Project**  
*Staff Contact: Dr VS Vutukuri*  
*CP48 F HPW6*

A critical literature review and an experimental program or laboratory work to prove an hypothesis or produce a technical report at a professional level. The report must either be a conventional bound thesis or a combination of covered report, program disks and drawing suitable for permanent library storage. Projects may be based on mining, geology, mineral processing or engineering aspects of industrial processes.

**MINE5155**
**Rock Mechanics Measurements**  
*Staff Contact: Dr VS Vutukuri*  
*CP12 S1 or S2 HPW3*


**MINE5184**
**Major Project**  
*Staff Contact: Dr VS Vutukuri*  
*CP72 F HPW9*

As for MINE5124 Project, but this will comprise a critical literature review accompanied by a comprehensive experimental program of a substantial nature and an interpretative thesis. The candidate is encouraged to seek industrial support for the practical work.

**MINE5255**
**Strata Control Engineering**  
*Staff Contact: Dr VS Vutukuri*  
*CP12 S1 or S2 HPW3*


**MINE5324**
**Principles of Mining Engineering**  
*Staff Contact: Dr VS Vutukuri*  
*CP24 F L2 T1*

Office, workshop, stores and materials handling layout for mines. Layout of shafts, declines and main drives for optimum mineral recovery. Review of underground mining techniques for coal and metalliferous mines with emphasis on cost control and efficient operation. Surface mining techniques, design and layout of haul roads and stripping benches. Dragline and shovel operation. Effect of ventilation requirements and drainage on mine layouts. Scheduling for equipment transfer, maintenance and installation (e.g. longwall face transfers, underground crusher stations, dragline overhaul). Computer software for mine and plant maintenance and management.

**MINE5355**
**Mine Fill Technology**  
*Staff Contact: Department Office*  
*CP12 S1 or S2 HPW3*


**MINE5455**
**Advanced Rock Cutting Technology**  
*Staff Contact: Prof FF Roxixirougti*  
*CP12 S1 or S2 HPW3*


**MINE5555**
**Blasting Technology**  
*Staff Contact: A/Prof GC Sen*  
*CP12 S1 or S2 HPW3*


**MINE5655**
**Rock Slope Stability**  
*Staff Contact: Dr VS Vutukuri*  
*CP8 S1 or S2 HPW2*

**MINE5755**

**Subsidence Engineering**  
*Staff Contact: Dr US Vutukuri*  
CP8 F HPW2  

Trough subsidence resulting from the extraction of bedded mineral deposits. Parameters influencing subsidence. Subsidence-related phenomena causing damage to structures at or below the surface. Measurement and empirical prediction. Theories and modelling of subsidence. Control of subsidence.

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**MINE7342**

**Minerals Engineering Processes**  
*Staff Contact: Dr AC Partridge*  
CP10 F L1 T1  


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**MINE7440**

**Mineral Process Technology**  
*Staff Contact: Dr AC Partridge*  
CP5 S1 L1.5T5  


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**MINE9174**

**Fire and Explosion**  
*Staff Contact: Dr VS Vutukuri*  
CP8 S1 or S2 L2  

Chemistry and physics of combustion reactions; types of flames; deflagration and detonation; ignition; fire point; flammable limits. Industrial fuel-fired appliances; fire risks in buildings; fire fighting equipment; flame proofing; fire and explosive risks in chemical process industries; case studies. Use of appropriate standards and legislation. Fire research; insurance.

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**MINE9364**

**Equilibrium Concepts in Water Systems**  
*Staff Contact: Dr VS Vutukuri*  
CP12 S1 or S2 HPW3  

The application and limitations of chemical thermodynamics in water systems. Aqueous inorganic process systems including water treatment and minerals processing. The effects and control of pollution. Thermodynamic diagrams such as InE pH, potential pH, temperature pH and concentration pH are developed as an aid to assessing system energetics. Sources and estimation of thermodynamic data. Kinetics and mechanism in relation to aqueous system energetics. Analysis of kinetic data.

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**MINE9415**

**Advanced Rock Mechanics**  
*Staff Contact: Dr VS Vutukuri*  
CP12 S1 or S2 HPW3  

Director:
Professor WV Pinczewski

This Centre is an autonomous unit within the Faculty of Applied Science. Petroleum Engineering is a specialised engineering discipline which prepares graduates for a career in the oil and natural gas industries and its related operations applying physical, mathematical and engineering principles to identify and solve problems associated with exploration, exploitation, drilling, production, processing, transportation and all the related economic and management problems associated with recovery of hydrocarbons from deep beneath the earth's surface.

The Centre for Petroleum Engineering differs from other Centres as it is responsible for its own degrees and therefore functions as an autonomous Department. It offers both undergraduate and postgraduate research degrees as well as a formal graduate diploma.

The Centre has a four-year course leading to the award of a Bachelor of Engineering in Petroleum Engineering.

Entry is normally into Year 1 of the program. The first two years of the Petroleum Engineering Course are essentially identical to the first two years of the Chemical Engineering Course. The University has approved an arrangement whereby, upon recommendation of the Head of School, students who satisfy the requirements of the first two years of the Chemical Engineering, Mechanical Engineering, Civil Engineering or Mining Engineering degree courses at the University may be admitted into the final two years of the BE degree course in Petroleum Engineering. Such students would complete an appropriately modified Year 3 program as approved by the Head of School.

The University has also approved an arrangement whereby, upon the recommendation of the Head of School, students who satisfy the requirements of the first two years of the Chemical, Mechanical, Civil or Mining Engineering full-time degree courses at any other Australian tertiary institution may be admitted to the final two years of the Petroleum Engineering course. Such students will be required to undertake an appropriately modified Year 3 program as approved by the Head of School. Acceptance into the course will be on the basis of academic merit. This applies equally to students from accredited tertiary institutions in other countries.

For the award of Honours in Petroleum Engineering degree courses, students need to have distinguished themselves in the formal work, in other assignments as directed by the Director of the Centre, and in the final year project, for which a thesis is required.

Because the first two years of the Petroleum Engineering course are identical to the first two years of the Chemical Engineering course, it is possible, upon completion of the Petroleum Engineering program, to obtain a double BE degree in Petroleum and Chemical Engineering with one additional year of study.
## Undergraduate Study: Course Outline

### 3045

**Petroleum Engineering Full-time Course**

**Bachelor of Engineering**  
BE

<table>
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The Centre also offers courses that cover the areas of Reservoir Engineering, Drilling Engineering, Production Engineering and Formation Evaluation. Suggested course outlines are available from the Director of the Centre.
Subject Descriptions

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

APSE0002
Social Issues in Applied Science
Staff Contact: School Office
CP5 S1 L2

The subject covers social issues arising from future technological developments and the role that a professional applied scientist can play in influencing future directions. It will be taught by a combination of group activity, case studies, projects and seminars from visiting speakers, some of whom will be from disciplines other than the applied sciences.

PTRL3001
Reservoir Rock Properties and Fluid Flow in Porous Media
Staff Contact: Prof WV Pinczewski
CP5 S1 L2
Prerequisites: CHEN2020, MATH2021

An integrated reservoir engineering and formation evaluation laboratory incorporating experiments in porosity, permeability, capillary pressure and resistivity of reservoir rocks and PVT properties of crude oil.


The program 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 program also includes a workshop on log interpretation.

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.


Communication Skills and Business Practices for Engineers
Staff Contact: Dr HA Salisch
CP5 S1 L2
Prerequisites: All Year 3 subjects.

Communications 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. Key oil industry methods of operation including joint ventures, contracts and relationships with specialist contractors. Role of Engineer in all types of petroleum industry companies including international majors, small domestic producers and service companies. Realistic case studies based on industry experience and practices are included in all phases of this subject.

Well Completions and Stimulation
Staff Contact: A/Prof SS Rahman
CP5 S2 L2
Prerequisites: PTRL3002, PTRL3004, PTRL3009


Petroleum Economics 1
Staff Contact: Dr HA Salisch
CP5 S1 L2
Prerequisites: All Year 3 subjects.

Basic elements of profitability analysis. Depreciation, financial statements, interest, time value of money. The financial plan, outside share, planning and scheduling, pricing and costs. Profitability. Criteria, applications of present value profiles, risk and risk adjustment.

Petroleum Production Engineering
Staff Contact: A/Prof SS Rahman
CP5 S2 L2
Prerequisites: PTRL3002, PTRL3004, PRL3006, PTRL3009

Introduction to multiphase flow in tubing. Design of sucker rod pumping systems. Design of gas lift and other lifting techniques. Design and operation of surface facilities associated with the primary processing of well head fluids; gathering systems, water separation, oil metering, gas dehydration and stripping. Compression. Pumping and pipeline facilities. Surface facilities associated with artificial lift.

Petroleum Economics 2
Staff Contact: Dr HA Salisch
CP2.5 S2 L1
Prerequisite: PTRL4018


Design Project for Petroleum Engineers
Staff Contact: Dr HA Salisch
CP15 S1 T1 S2 T3
Prerequisites: All Year 3 subjects

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.

Formation Evaluation 2
Staff Contact: Dr HA Salisch
CP10 F L2
Prerequisites: PTRL3001, PTRL3107


Petroleum Engineering Project
Staff Contact: Dr HA Salisch
CP30 S1 T4 S2 T2

A major design or research project on a problem relevant to petroleum engineering and concluding in the submission of an individual thesis. Projects of relevance to the research efforts in the School plus approved topics of particular interest to industry.

Reservoir Rock Properties and Fluid Flow in Porous Media
Staff Contact: Prof WV Pinczewski
CP5 S1 L2


PTRL5002  
Rock and Fluid Properties Laboratory  
Staff Contact: A/Prof SS Rahman  
CP7.5 S1 L3

An integrated reservoir engineering and formation evaluation laboratory incorporating experiments in porosity, permeability, capillary pressure and resistivity of reservoir rocks and PVT properties of crude oil.

PTRL5003  
Well Pressure Testing  
Staff Contact: Dr HA Salisch  
CP5 S1 L2


PTRL5004  
Reservoir Simulation Fundamentals  
Staff Contact: Prof AK Khurana  
CP5 S2 L2


PTRL5005  
Petroleum Thermodynamics  
Staff Contact: Prof WV Pinczewski  
CP5 S1 L2


PTRL5007  
Reservoir Engineering  
Staff Contact: Prof AK Khurana  
CP5 S2 L2


PTRL5008  
Petroleum Production Economics  
Staff Contact: Mr WG Allinson  
CP5 S1 L2


PTRL5009  
Fundamentals of Drilling Engineering  
Staff Contact: A/Prof SS Rahman  
CP5 S1 L2

Rotary drilling rig components. Drilling fluid circulating system. Bottom-hole assemblies, well control and blowout prevention equipment and methods. Special marine equipment and drilling cost analysis.

PTRL5012  
Drilling Fluids and Cementing  
Staff Contact: A/Prof SS Rahman  
CP7.5 S2 L3

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.

PTRL5016  
Well Completion and Stimulation  
Staff Contact: A/Prof SS Rahman  
CP5 S2 L2


PTRL5106  
Introduction to Formation Evaluation  
Staff Contact: Dr HA Salisch  
CP2.5 S1 L1


PTRL5107  
Formation Evaluation  
Staff Contact: Dr HA Salisch  
CP7.5 S2 L3


PTRL5109  
Petroleum Engineering Project  
CP20 S1 L2 S2 L2

A literature survey of a topic of relevance to the research effort of the Centre and of practical interest to the oil industry. To be submitted as an individual thesis. Topic must be approved by the Director of the Centre.
Safety Science is a multidisciplinary activity concerned with the application of engineering principles and behavioural and health sciences to improve the health and safety of people at work and in their other activities. Safety Science considers the interface between people and technology and incorporates areas of study such as ergonomics, biomechanics, occupational disease, toxicology, educational psychology and engineering safety.

The Department offers postgraduate courses leading to the award of:

- Master of Safety Science 8671
- Master of Applied Science (Occupational Health Safety) 8044
- Master of Applied Science (Ergonomics) 8075
- Master of Applied Science (Industrial Safety) 8077
- Master of Engineering Science (Industrial Safety) 8545
- Graduate Diploma in Safety Science 5480
- Graduate Diploma in Ergonomics 5485
- Graduate Certificate in Safety Science 7040
- Graduate Diploma Qualifying Course 6347

which allows non-graduates with extensive appropriate work experience to enter the courses leading to a graduate diploma.

There are no undergraduate courses in Safety Science but undergraduate students may take individual subjects from the graduate diploma and masters courses where these are appropriate to their undergraduate course or career.

The Department also administers the Environmental Studies Courses,

- Master of Environmental Studies 8045
- Graduate Diploma in Environmental Studies 5488

The Department is active in research in the areas of ergonomics, biomechanics, safety engineering, safety management, and occupational toxicology. Opportunities are available for graduate research leading to the degrees of

- Master of Science 2775
- Master of Engineering 2695
- Doctor of Philosophy 1665.
Graduate Study

Course Outlines

Master of Applied Science Courses

Admission to the Master of Applied Science courses in the Department of Safety Science is available to candidates with a relevant degree of bachelor for four full-time years duration (or part-time equivalent) from the University of New South Wales or a qualification considered to be equivalent from another university or tertiary institution.

Candidates with a three year degree may be admitted to the Masters program if they are able to demonstrate at least two years experience in a relevant area or may be admitted first to a Graduate Diploma but can upgrade on satisfactory performance.

Other candidates with extensive experience in a relevant area may also be admitted at the discretion of the Head of School.

8044 Master of Applied Science (Occupational Health and Safety)

MAppSc (OHS)

The Master of Applied Science in Occupational Health and Safety is a multidisciplinary course, and is designed to accept students from a range of backgrounds. The course is offered either full-time or part-time. Students may enrol either as internally registered students (by attendance) or externally registered students (by open learning).

The normal duration is 3 sessions full-time or 6 sessions part-time. However, students who are granted advanced standing in the preliminary subjects may be able to complete the course in one calendar year by completing the project in the summer recess.

Candidates are required to complete a total of 180 credit points, made up of 36 credit points of preliminary subjects, 60 credit points of core subjects, 48 credit points of elective subjects and a 36 credit point research project.

Preliminary subjects

Preliminary subjects are designed to provide a common base of knowledge for students from diverse backgrounds. Students who have studied equivalent subjects in their undergraduate courses or who are able to demonstrate a satisfactory standard of understanding are given advanced standing in these subjects.

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Core subjects

There are 60 credit points of core subjects required. Four core subjects are required to be taken by all students, the fifth core subject is dependent on subsequent areas of study.

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<td>SAFE9224</td>
<td>Principles of Ergonomics</td>
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Elective subjects

There are 48 credit points of elective subjects required. Students may structure their program so that they receive training as an occupational health and safety generalist, or they are able to specialise, taking electives in one of a number of strands, such as occupational hygiene, safety engineering, chemical safety, occupational medicine, ergonomics or safety management.

Subjects offered by the Department of Safety Science

Not all elective subjects are offered every year.

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Subjects offered by other Departments

Students may also choose to take subjects offered by other Departments, subject to the approval of both the School concerned and the Course Coordinator. Examples of acceptable subjects in a study program in occupational health and safety include:

CEIC5930  Safety in Laboratories  4
CIVL9872  Solid Waste Management  12
CIVL9881  Hazardous Waste Management  12
CMED9600  Disability  10
CMED9604  Tobacco, Alcohol and Other Drug Issues  10
CMED9609  Community Genetics  10
GEOG9230  Population, Health and the Environment  12
HEAL9411  Epidemiology  15
HEAL9421  Public Health  15
LAWS5020  Occupational Safety and Health Law  15
MANF9400  Industrial Management  12
MANF9410  Total Quality Management  12
MEED9108  Program Evaluation and Planned Change  10
MEED9125  Planning, Conducting and Evaluating Educational Workshops  10

Project

Students are required to undertake an investigative project and to present a satisfactory report. The project will normally be of 36 credit points value (SAFE9609). Projects may be based on studies carried out at a student’s place of work or in the laboratories of the Department or at any other place by arrangement with the Head of the Department. A range of instrumentation is available in the Department and liaison can be arranged with industry if students do not have a suitable project at their place of work. Each student is required to present a progress report at regular seminars which all project students are expected to attend. Generally there are at least three such seminars in each session.

Shorter projects are also available in some circumstances.

SAFE9601  Report  4
SAFE9602  Report  8
SAFE9603  Report  12
SAFE9606  Report  24

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8075

Master of Applied Science (Ergonomics)

MAppSc

The Master of Applied Science degree in Ergonomics is multi-disciplinary and is designed to accept students from a range of backgrounds. To provide for a common base of knowledge some students are required to study some preliminary subjects which depend on their background.

The course is offered full-time or part-time. The normal duration is 3 sessions full-time or 6 sessions part-time. However, students with advanced standing in preliminary subjects may complete the course in one calendar year of full-time study by completing the project in the summer recess.

Candidates are required to complete a total of 180 credit points, made up of 36 credit points of preliminary subjects, 84 credit points of compulsory core subjects, 24 credit points of elective subjects and a 36 credit point Project. For candidates with previous ergonomics qualifications a 72 credit point Project may be undertaken in place of 24 credit points of subjects.

Preliminary subjects

Preliminary subjects are designed to provide a common base of knowledge for students from diverse backgrounds. Students who have studied equivalent subjects in their undergraduate courses or who are able to demonstrate a satisfactory standard of understanding are given advanced standing in these subjects.

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Core subjects

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Elective subjects

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<td>12</td>
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<tr>
<td>SAFE9211</td>
<td>Introduction to Safety Engineering</td>
<td>12</td>
</tr>
<tr>
<td>SAFE9232</td>
<td>Introduction to Occupational Health and Safety Law</td>
<td>12</td>
</tr>
<tr>
<td>SAFE9260</td>
<td>Introduction to Occupational Health</td>
<td>12</td>
</tr>
<tr>
<td>SAFE9343</td>
<td>Innovation, Productivity and Safety</td>
<td>12</td>
</tr>
<tr>
<td>SAFE9350</td>
<td>Risk Management</td>
<td>12</td>
</tr>
<tr>
<td>SAFE9523</td>
<td>Plant and Construction Safety</td>
<td>12</td>
</tr>
<tr>
<td>SAFE9544</td>
<td>Traffic Safety</td>
<td>12</td>
</tr>
<tr>
<td>SAFE9551</td>
<td>Experimental Biomechanics</td>
<td>12</td>
</tr>
</tbody>
</table>

Note: Other graduate subjects offered by other Schools may be taken subject to the approval of both the School concerned and the Ergonomics Course Coordinator. Not all elective subjects are offered every year.
Project
Students are required to undertake an investigative project and to present a written report according to guidelines established by the Department. The project will normally be of 36 credit points value (SAFE9609) although in special cases, for example when a student enters the course with substantial background in the core material, a superior Project of 72 credit points value (SAFE9618) may be taken.

Projects may be based on studies carried out at the student's workplace, in the Department's laboratories or at any other appropriate place with the agreement of the Ergonomics Course Coordinator.

Each student is required to present progress reports at regular seminars which all Project students are expected to attend. Generally there are at least three seminars in each Session.

8077
Master of Applied Science (Industrial Safety)

MAppSc

This course is designed as a specialist course which builds on a previous four year degree. It is suitable for people who manage safety as part of their line management role and wish to extend their learning in their base discipline in addition to gaining a grounding in Safety. It is also suitable for people looking for a specialist safety course building on a first degree. The course has a core of only three subjects and a very wide choice of elective subjects to suit students from widely varying backgrounds. No preliminary subjects are required for this course as the specialist area chosen must be based on the discipline of a students first degree.

Entry to the Master of Applied Science (Industrial Safety) course requires a four year degree in an approved discipline.

The Master of Applied Science degree is obtained by satisfactory completion of 120 credit points of study, 24 of which represent a project. The degree is normally completed by one year of full-time study or two years of part-time study. Part-time students may undertake the project at their place of work. Candidates may undertake interdisciplinary studies and, subject to approval, are able to take subjects 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 project. Students are also required to demonstrate either a satisfactory standard of understanding of all the preliminary subjects listed below, or to pass those subjects in addition to the 180 credit point program. This enables students from a wide range of disciplines (such as engineering, science, medicine, physiotherapy and education) to reach an adequate standard of comprehension for studying the compulsory subjects.

Candidates are required to complete a program totalling 180 credit points made up of 84 credit points of compulsory subjects, 60 credit points of electives and a 36 credit point project. Students are also required to demonstrate either a satisfactory standard of understanding of all the preliminary subjects listed below, or to pass those subjects in addition to the 180 credit point program. This enables students from a wide range of disciplines (such as engineering, science, medicine, physiotherapy and education) to reach an adequate standard of comprehension for studying the compulsory subjects.

Preliminary subjects

<table>
<thead>
<tr>
<th>Subject Code</th>
<th>Subject Name</th>
<th>CP</th>
</tr>
</thead>
<tbody>
<tr>
<td>ANAT6151</td>
<td>Introductory Functional Anatomy</td>
<td>7.5</td>
</tr>
<tr>
<td>SAFE9011</td>
<td>Physical Principles of Safety</td>
<td>12</td>
</tr>
<tr>
<td>SAFE9012</td>
<td>Statistics for Health and Safety Scientists</td>
<td>12</td>
</tr>
</tbody>
</table>

Core subjects

<table>
<thead>
<tr>
<th>Subject Code</th>
<th>Subject Name</th>
<th>CP</th>
</tr>
</thead>
<tbody>
<tr>
<td>SAFE9210</td>
<td>Research Methods</td>
<td>12</td>
</tr>
<tr>
<td>SAFE9260</td>
<td>Introduction to Occupational Health</td>
<td>12</td>
</tr>
<tr>
<td>SAFE9211</td>
<td>Introduction to Safety Engineering</td>
<td>12</td>
</tr>
<tr>
<td>SAFE9224</td>
<td>Principles of Ergonomics</td>
<td>12</td>
</tr>
<tr>
<td>SAFE9232</td>
<td>Introduction to Occupational Health and Safety Law</td>
<td>12</td>
</tr>
<tr>
<td>SAFE9242</td>
<td>Effective Behaviour in Organisations</td>
<td>12</td>
</tr>
<tr>
<td>SAFE9350</td>
<td>Risk Management</td>
<td>12</td>
</tr>
</tbody>
</table>
Electives
Students are required to take at least 60 credit points from
the list of electives for the Master of Applied Science (OHS) 8044.

Students may select as electives up to two graduate
subjects offered by other Schools in the University, subject
to the approval of the School concerned and the Head of
the Department. A selection of approved subjects is shown
in the list of electives for the Master of Applied Science
(OHS) 8044.

Project
Project Students are required to undertake an investigative
project and to present a satisfactory report. The project will
normally be of 36 credit points value (SAFE9609). In special
circumstances, for example when a student enters the
course with substantial prior knowledge in the coursework,
a superior Project Report of 72 credit points value (SAFE9618) may be permitted. Projects may be based on
studies carried out at a student's place of work, or in the
laboratories of the Department, or at any other place by
arrangement with the Head of the Department. A range of
instrumentation is available in the Department and liaison
can be arranged with industry if students do not have a
suitable project at their place of work. Each student is
required to present a progress report at regular seminars
which all project students are expected to attend. Generally
there are at least three such seminars in each Session.

Graduate Diploma Courses
Graduate Diploma courses in the Department of Safety
Science consists of 72 credit points of compulsory core
subjects, 24 credit points of elective subjects and 36 credit
points of preliminary subjects. Students may be given
advanced standing in preliminary subjects, if they have
completed equivalent subjects in their undergraduate
course or can demonstrate a satisfactory level of
understanding of the subjects. Most students will need to
complete two preliminary subjects and hence 120 credit
points to complete the course.

The course is offered full-time or part-time and requires 3
sessions of full-time study or 6 session part-time after
completion of preliminary subjects.

Preliminary subjects
To broaden the base of their previous tertiary studies,
students take up to three preliminary subjects from the list
below. The selection of these subjects is determined according to previous qualifications and experience. Thus
engineers are usually required to include Introductory
Functional Anatomy, and students from a health sciences
background include Physical Principles of Safety. Students
are expected to enter the course with a basic understanding of mathematics, physics and Chemistry. Where this is
lacking students must undertake a bridging course.

Graduate Diploma in Safety Science
Grad Dip
Preliminary subjects
ANAT6151 Introductory Functional Anatomy 12
SAFE9011 Physical Principles of Safety 12
SAFE9012 Statistics for Health and Safety Scientists 12

Core subjects
SAFE9211 Introduction to Safety Engineering 12
SAFE9224 Principles of Ergonomics 12
SAFE9232 Introduction to Occupational Health and Safety Law 12
SAFE9242 Effective Behaviour in Organisations 12
SAFE9260 Introduction to Occupational Health 12
SAFE9350 Risk Management 12

Elective subjects
Students are required to select two or more subjects from
the list of electives or core subjects presented for the MSafetySc program. In special cases a 12 credit point
Report in Safety Science SAFE9603 may be taken.

Graduate Diploma in Ergonomics
Grad Dip
The Graduate Diploma in Ergonomics is multidisciplinary
and is designed to accept students from a range of
backgrounds. To provide for a common base of knowledge
some students are required to study some preliminary
subjects which depend on their background.

Preliminary subjects
ANAT6151 Introductory Functional Anatomy 7.5
SAFE9011 Physical Principles of Safety 12
SAFE9012 Statistics for Health and Safety Scientists 12

Core subjects
SAFE9224 Principles of Ergonomics 12
SAFE9242 Effective Behaviour in Organisations 12
SAFE9424 Applied Ergonomics 12
SAFE9425 Physical Ergonomics 12
SAFE9426 Ergonomics and New Technology 12

Elective subjects
To complete the requisite total of 96 credit points, students
are required to select one or more subjects from the list of
Electives presented for the MAppSc (Ergonomics). In special cases a 3 credit point Report in Safety Science
SAFE9603 may be taken which must involve the solution
of a practical ergonomics problem.
7340
Graduate Certificate in Safety Science*

The Graduate Certificate provides recognition to students who are limited to study for one session full time or one year part time. The course provides a general introduction to safety science and is suitable as an introductory course for safety professionals or as a course in safety science for people who manage safety as part of their other roles within an organisation.

The Graduate Certificate is available full time (1 session) or part time (2 sessions) in internal or external mode. External students may be required to attend at least one residential course of 2-3 days duration.

Candidates are required to complete 48 credit points of compulsory core subject and 12 credit points of electives selected from the core and elective subjects of the Graduate Diploma and Masters courses offered by the Department.

Core subjects
SAFE9211 Introduction to Safety Engineering 12
SAFE9242 Effective Behaviour in Organisations 12
SAFE9260 Introduction to Occupational Health 12

Electives
Elective subjects are listed in the Master of Safety Science (OHS).

No advanced standing will be granted for the Graduate Certificate. Where students have previously studied material equivalent to one of the core subjects exemption may be granted and an additional elective selected.

*Subject to UNSW Council approval

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Environmental Studies Courses

8045
Master of Environmental Studies

MEnvStudies

This is a faculty-wide, interdisciplinary course, administered by the Department of Safety Science. The course draws from schools, departments, and centres throughout the University and covers a model of environmental studies as an interactive process of three overlapping headings:

- an understanding of natural systems and processes at global, regional and local levels, and the technical assessment and measurement tools for understanding them;
- an appreciation of how human activities impact on the environment (environment as a resource, environmental change, pollution, effects on health, recreational use of the environment) and the methodologies for examining this impact (environmental impact assessment techniques, systems approaches and so on);
- the social context of the environment and human responses to environmental issues (philosophy, ethics, values and ideology, economics, decision making, policy, environmental planning and management, law and politics).

The UNSW Masters Program in Environmental Studies is designed to provide students and graduates with:

- A conceptual framework for the study of environmental issues and problems, including:
- an understanding of natural systems and processes;
- an appreciation of how human activities impact on the environment;
- the ways in which these areas interact, including understanding of scientific, social, philosophical, economic, ethical, legislative and political concepts. Knowledge and skills in a range of environmental subject areas, including environmental assessment, environmental planning, environmentally oriented decision-making and the ways in which various disciplines may be integrated together.
- Experience in the design and conduct of projects in environmental studies.

The overall objective of the course is to provide opportunities for students to increase their skills in environmental management by extending their knowledge of environmental systems and processes. The course is one that has practical value which will help the careers of graduates.

Entry qualifications

The entry qualification for the Master of Environmental Studies degree is a four year honours degree or equivalent, in a field relevant to environmental studies. Applicants may also be admitted if they have a three year degree plus another qualification at an acceptable level, or have other professional or academic attainments. In the past, the course has attracted students from a wide variety of backgrounds, including those with first degrees in geography, biological sciences, geology, ecology, civil engineering, chemistry, physics, law, health administration, agriculture, social science and archaeology.

Course requirements

Students enrolled on the Master of Environmental Studies Program are required to complete a course totalling 120 credit points made up of compulsory Core Subjects (24 credit points), Elective Subjects (48 credit points) and a Project (48 credit points). The structure of the course allows students to pursue specialised interests through the electives and the project, or to develop new areas of expertise.

Some subjects have prerequisites or assumed knowledge which are determined to be necessary for suitable progress through the subject. Students should seek advice from subject coordinators if they are in doubt as to whether they are qualified to take a subject.

There is a very wide range of subjects offered by Schools across the entire University which are suitable for inclusion in the Master of Environmental Studies program.

Students may choose to take electives that:

- reinforce their own areas of expertise; or
- extend their knowledge and skills into new areas.

By carefully combining the choice of subjects, it is possible to create programs which are tailored to the needs of individual students. The Elective Subjects listed below are not exhaustive, and students may choose elective studies...
from all graduate programs available in the Faculty of Applied Science, provided that they meet or can satisfy any necessary prerequisites to enrol. These programs include:

<table>
<thead>
<tr>
<th>Core subjects</th>
<th>CP</th>
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<tbody>
<tr>
<td>SAFE9271 Environmental Planning and Assessment</td>
<td>8</td>
</tr>
<tr>
<td>SAFE9272 Environment and Medicine</td>
<td>12</td>
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<tr>
<td>SAFE9273 Environment and Law</td>
<td>12</td>
</tr>
<tr>
<td>SAFE9612 Project (Environmental Studies) or CP</td>
<td>48</td>
</tr>
<tr>
<td>SAFE9606 Project (Environmental Studies)</td>
<td>24</td>
</tr>
</tbody>
</table>

Possible elective subjects

| BIO7081 Environmental Biotechnology                | 20 |
| CEIC5630 Industrial Water and Wastewater Engineering | 12 |
| CHEM7325 Toxicology, Occupational and Public Health | 28 |
| CIVL9402 Transport, Environment, Community CP     | 24 |
| CIVL9403 Theory of Land Use Transportation CP     | 12 |
| CIVL9405 Urban Transport Planning Practice CP     | 12 |
| CIVL9408 Transport Systems Design (Urban) CP      | 12 |
| CIVL9710 Engineering Risk Management CP           | 10 |
| CIVL9788 Site Investigations CP                    | 12 |
| CIVL9790 Slope Instability CP                     | 12 |
| CIVL9799 Environmental Geomechanics CP            | 12 |
| CIVL9851 Unit Operations in Public Health CP      | 12 |
| CIVL9855 Water and Wastewater Analysis and Quality Requirements | 12 |
| CIVL9856 Water Treatment CP                        | 12 |
| CIVL9857 Wastewater/Treatment and Disposal CP     | 12 |
| CIVL9858 Water Quality Management CP              | 12 |
| CIVL9859 Environmental Hydrology CP               | 12 |
| CIVL9860 Investigation of Groundwater Resources CP| 12 |
| CIVL9861 Environmental and Engineering Geophysics | 12 |
| CIVL9862 Fluvial Hydraulics CP                    | 12 |
| CIVL9872 Solid Waste Management CP                 | 12 |
| CIVL9875 Hydrological Processes CP                | 12 |
| CIVL9876 Water Resource Modelling CP              | 12 |
| CIVL9880 Groundwater Modelling CP                 | 12 |
| CIVL9881 Hazardous Waste Management CP            | 12 |
| CIVL9884 Environmental Engineering Science 1 CP   | 12 |
| CIVL9885 Environmental Engineering Science 2 CP   | 12 |
| CIVL9888 Environmental Management CP              | 12 |
| CIVL9889 Environmental Economics and Law CP       | 12 |
| CIVL9891 Groundwater Contamination and Remediation| 12 |
| CMED9500 Epidemiology CP                           | 15 |
| GEOG9150 Remote Sensing Applications CP            | 12 |
| GEOG9160 Directed Problems in Remote Sensing CP   | 12 |
| GEOG9240 Principles of Geographical Information Systems CP | 12 |
| GEOG9241 Advanced Geographical Information Systems CP | 12 |
| GEOG9280 Application and Management of Geophysical Systems CP | 12 |
| GEOG9290 Image Analysis in Remote Sensing CP      | 1 |
| GEOG9300 Vegetation Management CP                  | 12 |
| GEOG9310 River Management CP                       | 12 |
| GEOG9320 Soil Degradation and Conservation CP     | 12 |
| GEOL6231 Coastal Environment Assessment CP        | 15 |
| GEOL9010 Groundwater Environments CP              | 12 |
| GEOL9011 Hydrogeology CP                          | 12 |
| GEOL9030 Geological Engineering CP                 | 12 |
| GEOL9051 Hydrogeochemistry CP                      | 12 |
| GEOL9060 Environmental Geology CP                  | 12 |
| GMAT6532 Spatial Information Systems 1 CP         | 7.5 |
| GMAT7532 Spatial Information Systems 2 CP         | 5  |
| GMAT9211 Introduction to Geodesy CP               | 12 |
| GMAT9212 GPS Satellite Mapping CP                 | 12 |
| GMAT9532 Data Acquisitions and Terrain Modelling CP | 12 |
| GMAT9600 Principles of Remote Sensing CP          | 12 |
| GMAT9604 Land Information Systems CP              | 12 |
| GMAT9606 Microwave Remote Sensing CP              | 12 |
| GSBE0503 Postgraduate Design and Methodology 15    | 12 |
|HEAL9371 Research and Evaluation Methods CP        | 15 |
|HEAL9421 Public Health CP                          | 15 |
| INDC4120 Chemistry of the Industrial Environment CP | 7.5 |
| KCME4301 Environmental Management for the Mining Industry CP | 12 |
| LAND9010 Environmental Heritage Studies CP         | 15 |
| LAND9111 Landscape Planning CP                     | 15 |
| LAND9212 Landscape Planning Methods CP             | 15 |
| LAND9213 Land Systems and Management CP           | 15 |
| LAND9214 Visual Landscape Assessment CP           | 15 |
| LAND9215 GIS in Landscape Architecture CP         | 15 |
| LAWS3409 Environmental Law and Policy CP          | 30 |
| LAWS3410 Environmental Law CP                     | 15 |
| MANF9410 Total Quality Management CP              | 12 |
| MINE1524 Mining Conservation CP                    | 12 |
| PROF0003 Qualitative Research Methodology CP      | 15 |
| SAFE9211 Introduction to Safety Engineering CP    | 12 |
| SAFE9232 Introduction to OHS Law CP               | 12 |
| SAFE9242 Effective Behaviour in Organisations CP  | 12 |
| SAFE9260 Introduction to Occupational Health CP   | 12 |
| SAFE9261 Occupational Hygiene CP                  | 12 |
| SAFE9262 Occupational Medicine CP                  | 12 |
| SAFE9263 Chemical Safety and Toxicology CP        | 12 |
| SAFE9350 Risk Management CP                        | 12 |
| SAFE9531 Industrial and Environmental Noise CP    | 12 |
| SAFE9543 Management of Dangerous Materials CP     | 12 |
| SAFE9544 Traffic Safety CP                         | 12 |
| SAFE9553 Radiation Protection CP                   | 12 |
| SAFE9573 Fire and Explosion CP                    | 12 |
| SAFE9601 Report (Environmental Studies) CP        | 4  |
| SAFE9602 Report (Environmental Studies) CP        | 8  |
| SAFE9603 Special Project (Environmental Studies) CP | 12 |
| SCTS3106 Technology, Sustainable Development and the Third World CP | 15 |


Subject Descriptions

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

### SAFE9011

**Physical Principles of Safety**

*Staff Contact: Prof Jean Cross*

CP12


### SAFE9012

**Statistics for Health and Safety Scientists**

*Staff Contact: Ms Dianne Gardner*

CP12

The subject is designed to provide an introduction to the theory of statistics and to those statistical techniques which are relevant to planning and management of health and safety.

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Other subjects may be taken on the approval of the Course Coordinator:

All students must undertake an investigative project of 24 or 48 credit points. This project is expected to be complete within one University session (that is, six months). Students will require an academic supervisor for the duration of the project. Projects normally require the collection and analysis of data, leading to the preparation of a report of about 10,000 words (5,000-6,000 words in the case of a 24 credit point project). The project can be based on studies carried out at the student's place of work, or at some other suitable location.

The objective of the Project is for the student to demonstrate skills in research design, data acquisition and analysis, critical synthesis, and presentation of findings.

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**5488 Graduate Diploma in Environmental Studies**

**GradDip**

The Graduate Diploma in Environmental Studies is similar to the Masters Program in Environmental Studies 8045, in that it is a faculty-wide, interdisciplinary course, administered by the Department of Safety Science. The course draws from schools, departments, and centres throughout the University.

The overall objective of the Graduate Diploma in Environmental Studies course is to provide students and graduates with:

- A conceptual framework for the study of environmental issues and problems, including:
- an understanding of natural systems and processes;
- an appreciation of how human activities impact on the environment;
- the ways in which these areas interact, including understanding of scientific, social, philosophical, economic, ethical, legislative and political concepts.
- knowledge and skills in a range of environmental subject areas, including environmental assessment, environmental planning, environmentally oriented decision-making and the ways in which various disciplines may be integrated together.

The course is designed to study the nature of environmental problems and the methodology of evaluation. Emphasis is placed on the development of relevant skills in environmental analysis and planning.

One further objective of the course is to provide opportunities for students to increase their skills in environmental management by extending their knowledge of environmental systems and processes. The course is one that has practical value which will help the careers of graduates.

**Entry qualifications**

A three year honours degree or equivalent, in a field relevant to environmental studies, or a four year degree in another field. Under exceptional circumstances, and at the discretion of the head of school, applicants with extensive experience in the environmental field, or with other professional or academic attainments, may also enrol in the Graduate Diploma program.

**Course Requirements**

Students enrolled on the Graduate Diploma in Environmental Studies are required to complete a course totalling 96 credit points made up of compulsory Core Subjects (24 credit points) and Elective Subjects (72 credit points). The structure of the course allows students to pursue specialised interests through the electives, or to develop new areas of expertise. Students may upgrade to the Masters in Environmental Studies upon completion of satisfactory progress. In such cases, students will be required to complete 144 credit points.

Core (minus the research project) and elective subjects are the same as those listed under the entry for the Master of Environmental Studies (8045).
safety services. The subject covers statistical methods which are a prerequisite to the study of epidemiology, risk management, ergonomics and behavioural studies. Topics include analysis of frequency distributions elementary probability theory, Binomial, Normal and Poisson distributions, elementary sampling theory, statistical decision theory and Hypothesis testing, t test, Chisquare test and elementary correlation theory. Illustrative data is drawn from statistics relevant to health and safety.

SAFE9210
Research Methods (Project Students)
Staff Contact: Ms Dianne Gardner
CP12
This subject covers issues in research methodology including research problem formulation, null and alternative hypotheses, qualitative and quantitative research designs, statistical inference and the analysis of quantitative data. Students will be expected to be able to recognise and avoid common methodological problems in research. The subject will not provide a detailed coverage of statistical theory but a basic understanding of statistics is required.

SAFE9211
Introduction to Safety Engineering
Staff Contact: Dr Tony Green
CP12
Assumed knowledge: SAFE9011 or PHYS1022
The engineering improvement of potentially hazardous workplace situations with reference to the following: safety management, safety audits, basic safety practice, management of dangerous materials; fire and explosion; ventilation; radiation protection; electrical safety; machine dangers and machine guarding; construction safety; transport safety; environmental safety; plant safety assessment; safety issues in different industries.

SAFE9213
Introduction to Safety Engineering M
Staff Contact: Dr Tony Green
CP12
Assumed knowledge: SAFE9011 or PHYS1022
Note/s: This a modified version of SAFE9211 which is designed principally for engineers.

The following workplace topics are considered; safety management, ergonomics, equipment design and task consideration, machine guarding, electrical safety, fire and explosion, management of dangerous materials, ventilation, radiation protection, noise and vibration control, environmental safety, transport safety, safety issues in different industries.

SAFE9224
Principles of Ergonomics
Staff Contact: Mr Roger Hall
CP12
Assumed knowledge: Basic statistics and mechanics

The subject will give an introduction to ergonomics, emphasizing the principles of designing user-centred, human-machine-environment systems. Topics include: definition of and justification for ergonomics, design and human error, human capabilities and limitations, controls and displays, design of human-machine- environment systems, job design and work organisation, introduction to anthropometry, design of workplaces, introduction to manual handling and the physical environment, and, introduction to product design and human-computer interaction.

SAFE9232
Introduction to Occupational Health and Safety Law
Staff Contact: Head of School
CP12

SAFE9242
Effective Behaviour in Organisations
Staff Contact: Ms Dianne Gardner
CP12

SAFE9260
Introduction to Occupational Health
Staff Contact: A/Prof Chris Winder
CP12
This subject provides an outline of the inter-relationships between the roles of some of the occupational health and safety disciplines (notably occupational hygiene, occupational medicine, epidemiology and toxicology) as well as studies of some common occupational hazards, their outcomes on health and possible options for workplace control.

SAFE9261
Occupational Hygiene
Staff Contact: A/Prof Chris Winder
CP12
Assumed knowledge: SAFE9260
This subject deals with practical considerations of recognising, evaluating and controlling workplace hazards. Topics include the role of the occupational hygienist; types of workplace hazards (such as particulates, gases and vapours, chemicals, noise, radiation, temperature, biohazards); workplace assessment and monitoring; and methods for the control of hazards (such as ventilation and personal protection).

SAFE9262
Occupational Medicine
Staff Contact: A/Prof Chris Winder
CP12
Assumed knowledge: SAFE9260
This subject provides sessions on significant occupational diseases of the respiratory system, skin, eye, musculo-skeletal system and reproductive system, as well as occupational cancer and infectious diseases. The subject also covers other occupational medicine principles
and activities, including assessing risks to worker health, health surveillance, health promotion and rehabilitation.

SAFE9263
Chemical Safety and Toxicology
Staff Contact: A/Prof Chris Winder
CP12
Assumed knowledge: SAFE9260

This subject provides an outline of the toxicological, occupational hygiene and environmental aspects of chemical hazards and exposures.

SAFE9264
Assessment of the Workplace Environment
Staff Contact: Dr Kamal Kothiyal
CP12
Assumed knowledge: SAFE9261

An experimental and workplace assessment based subject, where students will be required to assess physical and chemical hazards encountered in the occupational environment.

SAFE9265
Occupational Health Practice
Staff Contact: A/Prof Chris Winder
CP12
Assumed knowledge: SAFE9262

A workplace assessment based subject, where students will be required to report on occupational health problems following visits to a number of diverse industrial sites.

SAFE9267
Research Methods In Laboratory Science
Staff Contact: Dr Boban Markovic
CP12
Assumed knowledge: SAFE9263

A laboratory based subject which will provide the basic requirements of laboratory based research, especially in chemical safety and applied toxicology. The subject covers literature review, methodology, experimental design, data collection and analysis, discussion and presentation skills. Assessment will be made through preparation of a major project report.

SAFE9271
Environmental Planning and Assessment
Staff Contact: Dr Boban Markovic
CP8

This subject is a core element for the Graduate Diploma and Masters of Environmental Studies courses and provides the conceptual framework for understanding interactions between humans, nature, philosophy, law, politics, ethics and decision making and how this related to environmental planning and assessment. Also available as SAFE8271 (distance learning).

SAFE9272
Environment and Medicine
Staff Contact: A/Prof Chris Winder
CP8

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.

SAFE9273
Environment and Law
Staff Contact: A/Prof Chris Winder
CP8

Resources in law for the preservation of the environment. Types of legislation: local government, town planning, environmental and common law; administrative infrastructure, problems and actions. The North American experience. Economic and sociological factors.

SAFE9274
Environmental Management Systems
Staff Contact: Dr Boban Markovic
CP12
Assumed knowledge: SAFE9271

This subject is designed to define the central role of environment in management strategies. 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. Available as a short course.

SAFE9343
Innovation, Productivity and Safety
Staff Contact: Ms Dianne Gardner
CP12

Behaviour of people in organisation, Individuals, groups and organisations: Planning for innovation and change; Dealing with human problems, including resistance to change; Human capabilities and limitations in the physical, perceptual and cognitive reactions with the operating system. The cost benefit of failsafe design (in relation to human operators) vs post design training. Operator efficiency and operator safety. The human barriers to designing and operating the system with these joint priorities. Recent advances in defining and controlling human error and their implications for equipment design and for management and training systems.

SAFE9350
Risk Management
Staff Contact: Prof Jean Cross
CP12

This subject gives an overview of Risk Management following the format of the Draft Australian Standard in Risk Management. 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 very 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 and applications.
SAFE9354
Issues in Safety Management
Staff Contact: Ms Dianne Gardner
CP12

This subject covers a range of issues in the management of risks in industry. It covers the planning, implementation and evaluation of risk management programs. Theoretical issues and practical applications in areas such as decision making, best practice, cost-benefit analysis, program implementation and program evaluation are covered and applied to health and safety, project management and other industrial risks. Case studies, discussion and other interactive approaches ensure active participation of class members. Students are expected to play an active role in class, to participate in discussions, to question and to share their own experiences and insights with others. From time to time, guest lecturers will be invited to present subject material. Also available as SAFE8354 (distance learning).

SAFE9424
Applied Ergonomics
Staff Contact: Mr Roger Hall
CP12
Prerequisite: SAFE9224 or equivalent

Decision making, vigilance, effects of workload and stress, applications to screen-based equipment. Human error in relation to human/system interaction. Work systems: the systems approach, practical evaluation and redesign of work systems. Experimental methodology, experimental design in ergonomics, critical evaluation of the literature.

SAFE9425
Physical Ergonomics
Staff Contact: Dr Kamal Kothiyal
CP12
Assumed knowledge: SAFE9224 or equivalent

The focus of this subject is on the physical capabilities of humans at work and the effect of the physical environment on human performance. Measurement of relevant physical parameters and design and evaluation by computer. Topics include: applied anthropometry, workspace and workstation design, biomechanical models, emg measurement, manual materials handling, work physiology, fatigue, the visual, auditory and thermal environments, and the effect of vibration.

SAFE9426
Ergonomics and New Technology
Staff Contact: Mr Roger Hall
CP12
Assumed knowledge: SAFE9224 or equivalent

The focus of this subject is on ergonomic issues related to the design and implementation of new technology. 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.

SAFE9523
Plant and Construction Safety
Staff Contact: Dr Kamal Kothiyal
CP12
Assumed knowledge: SAFE9011 or PHYS1022

Strength of materials, materials failure. Machinery contact dangers; machine guarding; safety during maintenance. Materials handling safety; cranes, slings, forklift trucks, conveyors. Construction safety; ladders, scaffolds, formwork, excavations. Structural failures, fracture, pressure vessels, non-destructive testing.

SAFE9531
Industrial and Environmental Noise
Staff Contact: Head of School
CP12

The course covers the physical, perceptual and legislative aspects of noise in an industrial and environmental context. Descriptive properties, propagation, loudness and frequency: Measurement, decibels, Hertz, octaves, time and frequency weighting, spectral analysis; Perception, loudness, annoyance, phones dB(A) Leq Lbg: Anatomy and function of the ear; Industrial deafness, Audiometry exercise in measuring hearing levels. Instrumentation, meters, filters, analysers and sound sources; Propagation in different environments, reverberent, free field, behaviour in different medium. Reflection, absorption, transmission, barriers and enclosures; Industrial Noise NSW Hearing Conservation regulations, measurement and assessment of risk and control of industrial noise. Environmental Noise, NSW Noise Control Act. Exercise in the measurement and control of environmental noise. Effects of aircraft and traffic noise and policy directions. Components of an environmental impact statement.

SAFE9543
Management of Dangerous Materials
Staff Contact: A/Prof Chris Winder
CP12
Assumed knowledge: 1st year Chemistry

This subject covers chemicals legislation, regulatory assessment of chemicals, chemical information (labels/MSDS), workplace management of chemical safety (Workplace assessment, exposure control, storage of chemicals, personal protection, monitoring), emergency preparedness, pollution, management of hazardous wastes and disposal.

SAFE9544
Traffic Safety
Staff Contact: Dr Andrew McIntosh
CP12

This subject aims to provide students with an introduction to nature and scope of road safety and provide an understanding of the interdisciplinary and integrated approach required to implement improvements in roads and traffic safety. Subject areas include identification of road safety problems, strategic planning, road and road environment safety, ergonomics, signals, signs, lighting, road user safety, knowledge, attitudes, compliance and practices, vehicle and equipment safety, road safety school education, road safety campaigns and program evaluation.

SAFE9551
Experimental Biomechanics
Staff Contact: Prof Noel Svensson
CP12

Objectives and ethics of biomechanical experimentation, statistical evaluation of results. Experimentation involving movement analysis, exercise physiology, muscular activity, mechanical properties of skeletal materials, anthropometric surrogates.
SAFE9553
Radiation Protection
Staff Contact: Dr Ronald Rosen
CP12
Assumed knowledge: SAFE9211 or SAFE9213
Principles and practices of radiation protection for both ionising and non ionising radiation. Radiation physics, detection and measurement; background radiation; biological effects of radiation; dose limits; technical controls for radioactive sources and irradiating apparatus. Codes of safe practice; radiological monitoring and personal dosimetry; storage, transport and disposal of sources; environmental impact; administrative controls; emergency procedures; control of nonionising radiation. Practical work and site visit.

SAFE9573
Fire and Explosion
Staff Contact: Dr Tony Green
CP12
This subject introduces students to the principles of combustion associated with fire and explosion hazards. The first section covers gas and liquid fires including the importance of the environment, control and regulation. The second section covers building fires and is mainly about solid combustibles, their control and regulation. The third section cover consequence analysis, risk analysis for major hazards and emergency and recover planning. All three workshops have case studies and group sessions on specific problems.

SAFE9601
Report
Staff Contact: Course Coordinator
CP4
A four credit point report on a topic in safety science.

SAFE9602
Report
Staff Contact: Course Coordinator
CP8
A eight credit point report on a topic in safety science.

SAFE9603
Special Report
Staff Contact: Course Coordinator
CP12
Only for students enrolled in the Graduate Diploma courses.

SAFE9606
Minor Report
Staff Contact: Course Coordinator
CP24

SAFE9609
Project
Staff Contact: Dr Ronald Rosen
CP36

SAFE9612
Project
Staff Contact: Professor Jean Cross (Safety Science)
Staff Contact: AProf Chris Winder (Environmental Studies)
Staff Contact: Mr Roger Hall (Ergonomics)
CP48

SAFE9618
Major Report
Staff Contact: Professor Jean Cross
CP72
The University has established Centres to encourage research and teaching in areas not readily covered by the established programs in Schools and Faculties. Most Centres have concentrated on multidisciplinary fields and have focussed on new initiatives in the expansion of teaching, research and professional services in specialised areas. The majority of Centres are formed within a School or Faculty or groups thereof although some operate as autonomous units.

The Faculty of Applied Science has nine Centres either located within relevant Schools or in association with other Faculties.

Bioengineering Centre
Centre for Applied Polymer Science
Centre for Minerals Engineering
Centre for Particle and Catalyst Technologies
Centre for Remote Sensing and Geographic Information Systems
Energy Research, Development and Information Centre (ERDIC)
Key Centre for Mines
UNESCO Centre for Membrane and Separation Technology
UNSW Groundwater Centre

Three Centres offer programs which have their own subject identifier. They are the Centre for Minerals Engineering (MINP), the Centre for Petroleum Engineering Studies (PRTL), and the Key Centre for Mines (KCME). The subjects for the Centre for Minerals Engineering are located with the subjects for the School of Chemical Engineering and Industrial Chemistry, those for the Key Centre for Mines are located with the School of Mines.

In addition the Faculty of Applied Science is actively involved with eight Co-operative Research Centres (CRCs) established under the Commonwealth Government’s program of CRCs announced in 1991. These are:

- Australian Maritime Engineering CRC
- Australian Petroleum CRC
- CRC for Aerospace Structures
- CRC for Biopharmaceutical Research
- CRC for Black Coal Utilisation
- CRC for Waste Management and Pollution Control
- CRC for Food Industry Innovation
- CRC for Premium Quality Wool
Bioengineering Centre

Director:
Professor P Gray

The Bioengineering Centre, within the Department of Biotechnology, aims to develop and coordinate research and continuing education activities in the multidisciplinary areas of bioengineering and recombinant-DNA technology.

Recent scientific advances and the ability to manipulate DNA in animal, plant and microbial cells are having far-reaching implications. The commercial applications of these scientific advances involve research and development work in a number of multidisciplinary fields. The Bioengineering Centre provides the mechanism to facilitate this multidisciplinary research.

The Centre assists in technology transfer to Australian industry and contributes to the education program of the University by providing short courses and symposia both in Australia and overseas.

Research programs range from microbial genetics to microbial mineral processing. Extensive facilities for animal and plant cell culture and for the production of recombinant-DNA derived products are utilised. Many of the Centre's research programs are collaborative, involving researchers from other areas of the University, industry and other organisations.

Centre for Applied Polymer Science

Director:
Associate 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 are drawn from ten Departments and Centres at UNSW with interests spanning biomaterials, textiles, packaging and industrial manufacture of resins. A priority in the establishment of this Centre therefore, is to bring together appropriate expertise to tackle multifaceted problems, rather than focus upon a single discipline.

The University is well equipped with major items of equipment for the study of polymer structures and morphology. High resolution surface analysers, electron microscopes, thermal analysers and other sophisticated facilities are able to be accessed by members of the Centre.

An example of interdisciplinary collaboration relates to recycling and waste minimisation. A program entailing aspects of design, polymer durability and selection is being mounted. New developments in polymeric packaging are also being investigated by the interaction of Food Technologists, Polymer Chemists and Engineers.

Centre for Minerals Engineering

Co-Directors:
Dr AC Partridge
Dr T Tran

The Centre for Minerals Engineering (CME) coordinates and conducts teaching and research activities of relevance and concern to the minerals industry. The Centre is jointly run by the School of Chemical Engineering and Industrial Chemistry, the School of Mines and the School of Materials Science and Engineering.

Since the Centre started in 1991, it has established close links with industry and other research institutions. In 1992, the Centre commenced research in areas related to alumina and metallurgical waste processing.

Major research areas include processing of precious metals, treatment of mineral processing wastes, fundamental aspects of flotation, permeability, shear strength and particle segregation in stock-piles, coal preparation including effects of mining methods, numerical computational modelling of mineral slurry systems, distributors, and spiral concentrators.

Staff associated with the Centre participate in various training programs overseas and have organised workshops and short courses in collaboration with the Key Centre for Mines.

The Minerals Engineering elective is offered to students in Course 3040 who wish to obtain a basic training in preparation for a career in the mineral industry.

Students wishing to specialise in Minerals Engineering enrol in the BE course in Chemical Engineering in Years 1 and 2, and undertake studies in Minerals Engineering in Years 3 and 4 as professional electives in this degree.

For details of subjects offered see the course outline for Course 3040 in the undergraduate section for the School of Chemical Engineering and Industrial Chemistry in this handbook.

Centre for Particle and Catalyst Technologies

Director:
Associate Professor J Raper

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 heterogenous catalysis undertaken within the University, and to promote unique University facilities as services available to industry and government bodies.

Special objectives of the Centre include promotion of testing facilities available within the University. Some 120 companies have sent samples for particle characterisation over the last two years. This has been achieved in conjunction with Unisearch (UNSW's corporate research arm), by the establishment of a centralised organisation for the allocation, review and management of short-term consultancy projects in particle and catalyst characterisation.
In addition to short-term projects, the Centre has been successful in attracting long-term industrial research contracts and research grants, resulting in improved transfer of technology to Australian industry in the areas of catalyst development, instrumental methods for particle and catalyst characterisation, and particulate systems.

The Centre also plays an important role in offering continuing education courses and conferences in areas relevant to industry.

The Centre houses much state-of-the-art equipment. These instruments allow staff and students to characterise particulate material in terms of size, surface area and other physical and chemical properties. The characteristics of particulate material influence its behaviour both as raw material and products in many industries.

Many of the measurement techniques have been developed within the Centre allowing the UNSW team to maintain its international reputation for expertise in particulate systems.

Centre for Remote Sensing and Geographic Information Systems

Director: Professor BC Forster

The Centre is a joint multidisciplinary enterprise of the Faculty of Applied Science and the Faculty of Engineering 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.

Research interests include applications of artificial intelligence in remote sensing, neural networks in remote sensing, satellite mapping of bushfires, and vegetation mapping from remote sensing images. Other interests include monitoring urban areas using high resolution satellite remotely sensed data and spatial information systems for road based transport planning, evaluation and design. Applications using 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 America, China and Europe.

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.

Graduate Programs in Geographic Information Systems

Master of Applied Science in Geographic Information Systems Course 8027.1000

The Masters degree program in Geographic Information Systems is offered in both Geography and Geology within the Faculty of Applied Science. 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 this handbook.

The Masters degree program is also offered in the Faculty of Engineering as a Master of Engineering Science Course 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 Applied Science 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 leading to the award of:

Master of Applied Science in Remote Sensing Course 8047.2000

Graduate Diploma in Remote Sensing Course 5047.2000

Detailed information on these courses is listed under the School of Geography and the School of Geology Sections in this handbook.

Energy Research, Development and Information Centre (ERDIC)

Director: Associate Professor GD Sergeant

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 enquires 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.
Key Centre for Mines

Director:
Dr MB Kat

The Centre has the prime objective of providing appropriate postgraduate education and training for professionals within the mining industry who work in remote locations.

The Key Centre currently delivers a postgraduate program leading to either a Graduate Diploma or a Masters in Mining Management. The program is delivered by residential short courses and assignments and makes significant use of industry based presenters. The Key Centre also manages the presentation of a similar program in Geological Data Processing. In addition to the postgraduate programs, the Key Centre runs individual short courses on a commercial basis. It also offers customised short courses for companies and special purpose training programs, mostly for overseas professionals.

The Key Centre’s main research role is to promote technology transfer through its short course program. To achieve this, it presents between 20 and 25 short courses each year and five special purpose seminars.

Information on the Centre’s courses is detailed under the School of Mines section in this handbook.

UNESCO Centre for Membrane Science and Technology

Directors:
Professor HGL Coster (Biophysics Group)
Professor AG Fane (Chemical Engineering Group)

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 (in the Faculty of Science). In 1988 it was granted Commonwealth Special Research Centre status and funding, and in 1992 it became one of only four UNESCO Science Centres worldwide.

Research programs include fundamental research on both biomembranes, and membrane processes, as well as synthetic (industrial) membranes; membrane based manufacturing processes (chemical and biological reactor systems); product purification; purification of water; treatment and safe disposal of wastes, including sewage; biomedical applications; and membrane based biosensor technology. Other activities include the development of novel conducting membranes, membrane biophysics, membrane pervaporation and supported liquid membranes, and membrane-based systems using metal binding liquids to remove heavy metals.

The Membrane Centre maintains connections with membrane groups in China, Indonesia, Japan, Korea, Thailand, Indonesia, Malaysia and Singapore. It also has close links and collaborative projects operating with research institutes in Italy, France, Germany, Denmark, Finland, The Netherlands, the United Kingdom, the United States and Canada.

The Centre organises postgraduate study programs, with up to half of its 25 students coming from countries other than Australia. It also offers shorter-term training programs for overseas trainees in aspects of membrane science and technology and runs specialist workshops on a diverse range of membrane related subjects.

UNSW Groundwater Centre

Director:
Dr JA Jankowski

The UNSW Groundwater Centre was created in 1987 and is a joint enterprise of the Faculties of Engineering and Applied Science. The Centre's facilities are based at the Water Research Laboratory in Manly Vale and in the Department of Applied Geology.

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, and Botswana 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.

Several recent research projects have been targeted at understanding the movement of contaminants in the Botany Sands aquifer in Sydney. A number of deep multilevel piezometers have been installed in the Botany Basin in conjunction with a comprehensive test facility at East Lakes where 815 mini-piezometers allow the accurate tracking of contaminant plumes.

The Centre offers specialised graduate courses in Groundwater Studies and carries out general teaching in Hydrogeology to Applied Science and Engineering postgraduate students.

Information on the Centre's courses is detailed under the Department of Applied Geology, School of Mines, section in this handbook.
The Australian Petroleum Cooperative Research Centre

Director
Professor WV Pinczewski

The Australian Petroleum Cooperative Research Centre (APCRC) was established in 1991 to bring together Australia's four main oil and gas research groups. These groups are the CSIRO Divisions of Exploration Geoscience and Geomechanics (now amalgamated into a new Division of Petroleum Resources), the Centre for Petroleum Engineering at UNSW, and the National Centre for Petroleum Geology and Geophysics at the University of Adelaide. Subsequently the Departments of Geophysics and Geochemistry at Curtin University have also joined. The Centre provides industry with a wide range of research, research and development, consulting and specialised laboratory services.

The focus of the APCRC's research and training scheme has been on upstream activities exploration and production to the well-head, with an emphasis on problems unique to the Australian environment. The Centre is currently running eight research programs. The Improved Oil and Gas Recovery Research Program aims to increase Australia's output of oil and gas by recovering oil from existing fields more efficiently, and by developing new technologies such as injecting carbon dioxide and methane into oil reservoirs which will no longer produce through more conventional methods. A more recent focus has been on the recovery of gas from low permeability reservoirs.

In addition the Centre for Petroleum Engineering provides major scientific input for the development of improved technology in the following programs:

For students, the APCRC offers the opportunity of entering the field with marketable skills. By working side-by-side with researchers from the CSIRO, UNSW, the Adelaide and Curtin University Centres and experts from the petroleum industry, students gain practical experience and expertise.

CRC for Biopharmaceuticals

University Contact:
Professor PP Gray

The Cooperative Research Centre for Biopharmaceutical Research was incorporated in 1992. The partners in the Centre include UNSW's Department of Biotechnology, School of Physiology and Pharmacology, and Biomedical Mass Spectrophotometry Unit; the Garvan Institute of Medical Research, St Vincent's Hospital, Sydney; the Biomolecular Research Institute, Peptide Technology Ltd; CSL Ltd; and Johnson and Johnson Research Pty Ltd.

The primary aim of the Biopharmaceutical Research CRC is to provide a coordinated research base to aid the development of the Australian biopharmaceutical industry. To achieve this goal, the Centre functions as a national centre for both the development of new internationally competitive biopharmaceutical products, and the education of researchers in the combination of biopharmaceutical research techniques and their integration with the industrial goals necessary to develop products for the world market. The partners of the Cooperative Research Centre have all the necessary expertise for the discovery, design and development of novel biopharmaceutical products resulting from the recent rapid advances in the fields of genetic engineering and biotechnology.

The CRC provides a fertile environment for postgraduate study, as students can see the results of their research being developed into useful products.

CRC for Black Coal Utilisation

University Contact
Dr Veena Sahajwalla

The Centre was established in 1994. Research participants involved are the School of Materials Science and Engineering, CSIRO Division of Coal and Energy Technology, the University of Newcastle, the University of Queensland and the Australian Coal Industry Research Laboratories. Industry participants involved are ARCO Coal Australia, BHP Australia Coal, CRA Group, Oakbridge, Pacific Power Group and Peabody Resources.

The Centre's research objectives are to maximise the value and environmental performance of Australian coals –

- Generate new knowledge to improve the competitiveness of Australian coals; and
- Understand the performance of Australian coals in new technologies.

Research being undertaken at UNSW includes:

- Development of XRD technique to evaluate coal/gas reaction performance.
- Coal structure and its influence on coal/gas high temperature reactions.
- Slag surface tension determination and its modification to control slag/char interfacial phenomena.
- Fundamental investigation of slag/char/gas interactions and char reaction kinetics during pulverised coal injection in blast furnace.

CRC for Food Industry Innovation

Director:
Professor NW Dunn

The Centre was established in 1993 and involves the School of Applied Bioscience (Faculty of Applied Science), the Schools of Biochemistry and Molecular Genetics and Microbiology and Immunology (Faculty of Biological and Behavioural Sciences), CSIRO, and three industry partners to provide a coordinated research and educational base to generate development of improved and novel natural food ingredients, principally through the use of microorganisms.

The five partners in the CRC have the combined expertise in research and commercialisation to market the first ingredients within four years. The ingredients that the
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.

ACCT5915
Individual Judgement and Choice
Staff Contact: School Office
S1 L3 CP20
This subject focuses on behavioural decision theory in the context of judgements made by users of accounting information, managers and auditors. Topics include: introduction to the fields of behavioural decision theory and decision analysis; limitations of human ability to process information; descriptive models of individual choice behaviour; other factors affecting judgement and choice; structuring of a problem; assessing consequences measurement and weighting of dimensions; assessing uncertainties probability assessment, confidence, group decision making; evaluation of alternatives choice of criterion; decision making; evaluation of alternatives choice of criterion; decision analysis involving multiple objectives and choice under uncertainty; ambiguity and choice; relationship between individual choice and organisational choice.

ACCT5917
Strategic Management: Systems and Processes
Staff Contact: School Office
S1 L3 CP20
This subject explores the process and practice of strategic management - the constitution of an organisation's competitive positioning in its environment. Topics to be covered include: strategic thinking and analysis; the formulation and choice of strategic alternatives; managing extended strategic change; and the embedding of organisation strategy in everyday activities. These topics are explored through a critical examination of relevant literatures, documented case studies and contemporary business practices.

ACCT5931
Strategic Management Accounting
Staff Contact: School Office
S1 L3 CP20
Prerequisite: ACCT5901 or ACCT5930 or equivalent.
This subject investigates various ways to allocate and manage organisational resources in a competitive environment. The focus is on value creation and cases are used to examine contemporary Australian and international best practice. Topics include value chain analysis; shareholder and customer value; strategic partnering and alliances; and selected topics from strategic management accounting such as benchmarking, the Du Pont methodology and product life cycle profitability.

ACCT5932
Public Sector Accounting and Financial Reporting
Staff Contact: School Office
S1 L3 CP20
Prerequisite: ACCT5901 or ACCT5930 or equivalent

ACCT5949
Managerial Dynamics
Staff Contact: School Office
S2 L3 CP20
This subject examines the management of a technical specialty or specialist function (for example, the provision of accounting services) in an organisation. Topics include: service provision in 'intelligent enterprises'; technical specialists as managers; the nature of managerial work; managing patterns of interaction, discourse politics, commitment, ambiguity and change. Numerous case studies are used to examine issues.

ACCT5956
Management Planning and Control
Staff Contact: School Office
S2 L3 CP20
Planning and control processes in organisations, and the involvement of management and management support personnel with them. Topics include: 'formal' and 'organisational' perspectives on management planning and control; planning and decision-making in organisations - some alternative perspectives and descriptions; planning and budgeting - theoretical perspectives and organisational descriptions; organisation structures and structuration; control processes in organisations some alternative perspectives; participation as a mode of organisational control; accounting control systems some alternative perspectives; designing management accounting systems - prescription or organisational choice; categorizing and evaluating the literatures on management planning and control.

ACCT5996
Management Accounting Control Systems
Staff Contact: School Office
S2 L3 CP20
Prerequisite: ACCT5901 or ACCT5930 or equivalent
This subject examines the design and operation of management accounting systems in organisational settings. Topics include: the function of management accounting systems in organisations; design and organisational choice; design and operation of activity based costing systems; budgetary systems outcomes and processes; design and operation of accounting control systems responsibility accounting systems; standard costing and flexible budgets; relationships among accounting systems and administrative, social and personal control systems, divisional performance evaluation, transfer pricing.
ACCT9002
Introduction to Accounting B
Staff Contact: School Office
S2 L1.5 CP7.5
Prerequisite: ACCT9001
This subject introduces non-commerce students to managerial accounting: long-range planning, budgeting and responsibility accounting; cost determination, cost control and relevant cost analyses.

ANAT6151
Introductory Functional Anatomy
Staff Contact: Dr E Tancred
An overview of basic human anatomy and physiology with an emphasis on structures and systems which are most vulnerable to chemical and physical trauma under industrial conditions, such as the eye, ear and skin. Other systems studied include the musculo-skeletal system, central and peripheral nervous systems, circulatory, respiratory, gastrointestinal, endocrine and urogenital systems.

BIOC2101
Principles of Biochemistry
Staff Contact: Dr K Moon, Dr G King
CP15 S1 HPW6
Prerequisites: BIOS1101 and BIOS1201, CHEM1101 and CHEM1201 or CHEM1002
Note/s: Excluded BIOC2312, BIOC2372, CHEM2929. Enrolment in this subject may be subject to quota restrictions. Such restrictions will only apply to students taking this subject as an elective part of their program.

An introduction to modern biochemistry covering fundamental aspects of the structure-function relationships of proteins and an overall coverage of intermediary metabolism. Major topics to be covered will include: the nature and function of enzymes; the metabolic working of cells, tissues and organs; the interrelationships between the pathways of carbohydrate, lipid and amino acid metabolism; the vital role of enzymes and hormones in catalysis and metabolic regulation; the energy-trapping mechanisms of animals and plants; interesting variations on the central metabolic pathways in various life forms. Practical work to complement the lectures and to introduce the principles of biochemical analysis.

BIOC2201
Principles of Molecular Biology
Staff Contact: Dr T Stewart, Mr H Shoory
CP15 S2 HPW6
Prerequisite: BIOC2101
Note/s: Excluded BIOC2312, BIOC2372.
Enrolment in this subject may be subject to quota restrictions. Such restrictions will only apply to students taking this subject as an elective part of their program.

This subject provides an introduction to modern molecular biology and covers the molecular mechanisms of gene expression and the fundamental aspects of recombinant DNA technology. The major topics to be covered include: the structure and function of DNA and RNA; the replication and transcription of DNA; translation of genetic code into an amino acid sequence during protein synthesis; regulation of gene expression. Manipulation of DNA including: fragmentation by restriction enzymes; cloning of DNA fragments into vectors; hybridization analysis and principles of DNA sequencing. Protein structure and function. Amplification of DNA by the polymerase chain reaction (PCR). Practical work to complement the lectures.

BIOC2291
An Introduction to Molecular Biology
Staff Contact: School Office
CP15 S2 HPW6
Prerequisites: BIOS1101 and BIOS1201, CHEM1101 and CHEM1201 or CHEM1002
Note/s: Excluded BIOC1319, BIOC2201, BIOC2312, BIOC2372, CHEM2929.
This subject provides a comprehensive introduction to Molecular Biology as an alternative to BIOC2201 for students who do not intend to proceed to level III Biochemistry. It does not fulfill the prerequisite requirements for level III Biochemistry but the Head of School may give approval for students with a grade of credit to enrol in level III subjects.

This subject provides an introduction to modern molecular biology and covers the molecular mechanisms of gene expression and the fundamental aspects of recombinant DNA technology. The major topics to be covered include: the structure and function of DNA and RNA; the replication and transcription of DNA; translation of genetic code into an amino acid sequence during protein synthesis; regulation of gene expression. Manipulation of DNA including: fragmentation by restriction enzymes; cloning of DNA fragments into vectors; hybridization analysis and principles of DNA sequencing. Protein structure and function. Amplification of DNA by the polymerase chain reaction (PCR). Practical work to complement the lectures.

This subject covers the same material as in BIOC2201 Principles of Molecular Biology, but in less detail and with more emphasis on the general applications and less emphasis on some of the underlying mechanisms.

BIOC3111
Molecular Biology of Proteins
Staff Contact: Dr G King
CP15 S1 HPW6
Prerequisites: BIOC2312 or BIOC2372 or BIOC2101 and BIOC2201, CHEM2021 or CHEM2041
Note/s: Excluded 41.102, 41.102A.
Modern aspects of the structure function relationships of proteins including discussion of the latest techniques of protein characterisation. Topics include: separation and analytical procedures; determination of amino acid sequence data; the nature of protein and protein ligand interactions including aspects of substrate binding, enzyme kinetics and enzyme mechanisms; the molecular architecture of proteins from the standpoint of the relationships among primary, secondary, tertiary and quaternary structures; aspects of protein engineering. Practical work illustrates and complements the lectures and provides experience with modern techniques of protein molecular biology.
Detailed analysis of gene structure and function including: structure and properties of polynucleotides such as DNA and RNA; structure of chromatin; mechanisms and regulation of gene replication, transcription and translation; recombinant DNA technology, nucleic acid sequencing, DNA-DNA and DNA-RNA hybridisation as important tools of modern molecular biology; protein production using recombinant DNA systems. Practical work illustrates and complements the lectures and provides experience with contemporary biochemical techniques.

The organisation of the genomes of higher organisms derived mainly from the application of recombinant DNA technology and related techniques. Methods used for the isolation, identification and characterisation of eukaryotic genomes in terms of the organisation of single copy and repeated sequences and of coding and non-coding sequences and of several gene clusters, eg the alpha and beta globin gene cluster. Mechanisms known to operate in the control of eukaryotic gene expression, both at the DNA level and at the level of RNA processing. Review of several specialised genetic systems in plants and animals such as mitochondria, chloroplasts and RNA and DNA tumour viruses. Practical work provides training in the use of sterile techniques and in working with polynucleotides under nuclease-free conditions, using basic techniques such as hybridisation and DNA sequencing.

Current concepts and theories in genetics concentrating on Eucaryotes including humans. The generation of variation examined at the molecular level for fundamental genetic process of mutation, recombination and repair. The evolution of the genome, maintenance of variation, the effects of mutations and their relevance to disease. Ecological genetics and molecular evolution, genetics of cellular division process and developmental genetics. Practical uses of genetics including the use of transposable elements to manipulate genetic stock, transgenesis, genetics of cancer, pedigree analysis, disease gene mapping, gene therapy, cytogenetics. Unusual genetic mechanisms.
BIOM9410
Regulatory Requirements of Biomedical Technology.
Staff Contact: Dr L Poole-Warren
CP12 S2 L2 T1
The regulatory requirements of medical devices in Australia, Japan, North America and Europe will be examined, case studies of medical device registration will be presented.

BIOM9430
Electromedical Standards
Staff Contact: Dr AP Avolio
CP12 S2 L2 T1

BIOM9510
Introductory Biomechanics
Staff Contact: Prof K Schindhelm
CP12 S1 L2 T1
The principles of the mechanics of solid bodies, force systems, kinematics and kinetics of rigid bodies, stress-strain relationships, stress analysis of simple elements application to musculoskeletal system.

BIOM9541
Mechanics of the Human Body
Staff Contact: School Office
CP12 SS L2 T1
Prerequisites: BIOM9510 and ANAT2111
Statics and dynamics of the musculoskeletal system: mathematical modelling and computer simulation, analysis of pathological situations.

BIOM9621
Biological Signal Analysis
Staff Contact: A/Prof CD Bertram
CP12 S1 L1 T2
Note/s: Basic electronics and mathematics background required.
Use of digital computers to extract information from biological signals. Signal processing using filtering, averaging, curve-fitting and related techniques, and analysis using model simulations, correlation, spectral analysis etc.

BIOM9701
Dynamics of the Cardiovascular System
Staff Contact: A/Prof CD Bertram
CP12 S1 L2 T1
Note/s: Some mathematics background desirable.
Structure of the heart; organisation of the mammalian vasculature; mechanical, electrical and metabolic aspects of cardiac pumping; the solid and fluid mechanics of blood vessels; rheology of blood.

BIOS1011, 1021, 2011, 2021, 2031, 2051, 2061, 3014, 3061, 3071
Registration for these subjects will be held at the Biological Registration Centre in Biology Lab A (room G20, Biological Science building) as follows:
17-21 Feb 10.00-17.00
24-28 Feb 10.00-17.00
Students must obtain practical slots at that time for:
- BIOS2011 Evolutionary and Physiological Ecology
- BIOS2021 Introductory Genetics
- BIOS2051 Flowering Plants
- BIOS2061 Vertebrate Zoology
- BIOS3071 Conservation Biology and Biodiversity

Pre-enrolment in another faculty does NOT automatically entitle you to a place in your chosen practical time. You must obtain a seat from the Biological Science Registration Centre.

Students enrolling in other subjects do not need to sign on at the Biological Science Registration Centre but only need to attend the first lecture of the relevant course for practical assignments and further details. The location and timetable of lectures and practicals for all subjects in the School of Biological Science (Botany and Zoology) can be obtained from the Biological Science Registration Centre, Room G27 or from the notice boards on the fifth floor of the Biological Sciences Building

Note: Some subjects that appear in this section may be restricted to students for whom the subject comprises a compulsory part of their program.

BIOS1101
Evolutionary and Functional Biology
Staff Contact: Dr ML Augee
CP15 S2 HPW6
Note/s: Excluded: BIOS1301 and BIOS1021.

The subject examines the evolutionary history of life on earth and the relationship between environment, adaptation and function. Animal and plant physiology are covered with an emphasis on adaptation to Australian environmental conditions.

Practical and tutorial seat assignments must be obtained at the Biology Enrolment Centre on the day of enrolment. The course guide is available for purchase during enrolment week. Equipment required for practical classes is listed in the Course Guide and must be purchased before session starts. Students must consult if for details of the course and assessments.

BIOS1201
Molecules, Cells and Genes
Staff Contact: Dr ML Augee
CP15 S1 HPW6
Prerequisites: HSC Exam Score Required: 2 unit Science (Physics) 53-100, or 2 unit Science (Chemistry) 53-100, or 2 unit Science (Geology) 53-100, or 2 unit Science (Biology) 53-100, or 3 unit Science 90-150, or 4 unit Science 1-50.
Excluded: BIOS1011 and BIOS1301.
Note/s: Prerequisites for BIOS1201 are minimal (and may be waived on application to 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 if for details of the course and assessments.

The subject is concerned with the basic characteristics of life. The chemistry of life is covered with emphasis on the way in which living things construct and break down macromolecules. The way 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 subject. The final topic is genetics, the way in which the genetic code is inherited and the ways in which it can be modified.

BIOS2011
Evolutionary and Physiological Ecology
Staff Contact: Dr P Steinberg
CP15 S1 HPW6
Prerequisites: BIOS1011 and BIOS1021 or BIOS1101 and BIOS1201
Note/s: Students must enrol at the Biological Sciences Building. For further details, see Faculty timetable.

Introduction to functional relationships between living organisms and environments in which they live. Emphasis on interactions within and between populations, ecological energies, ecophysiology, and the theory of evolution by natural selection. Plants, animals and microbes are covered. Also serves content as an introduction to the process of scientific enquiry.

BIOS2021
Introductory Genetics
Staff Contact: Dr W Sherwin, Dr A Wilton
CP15 S2 HPW6
Prerequisites: BIOS1011 and BIOS1021 or BIOS1101 and BIOS1201, CHEM110
Corequisite: CHEM1201
Note/s: Enrolment in this subject may be subject to quota restrictions. Such restrictions will only apply to students taking this subject as an elective part of their program. Students must enrol at the Biological Science Registration Centre, Room G27, Biological Sciences Building. For further details, see Faculty timetable.


BIOS2051
Flowering Plants
Staff Contact: Prof A Ashford
CP15 S2 HPW6
Prerequisites: BIOS1011 and BIOS1021 or BIOS1101 and BIOS1201
Note/s: Enrolment in this subject may be subject to quota restrictions. Such restrictions will only apply to students taking this subject as an elective part of their program. Students must enrol at the Biology enrolment Centre, Room G27, Biological Sciences Building. For further details, see Faculty timetable.

Basic plant biology including cell structure, plant morphology and anatomy, water and sugar transport, seed structure and physiology, plant growth and development arborescence, leaves and photosynthesis, roots, micro-organisms and nutrition, evolution of land plants and plant taxonomy. Practical work: plant anatomy and light microscopy; collection of numerical data and a statistical analysis, plant identification.

BIOS3014
Ecological Studies in Arid Lands Management
Staff Contact: Dr D Croft
CP15 S2 L2 T4
Techniques in ecological studies of animal communities. Adaptations to an arid environment, environmental and social determinants. Behaviour, diet and condition of native and feral animals. Competition between native and introduced herbivores. Strategies in the management of arid zone wildlife. Concurrent studies in relevant units in the School of Biological Science are prescribed to cover aspects of vegetation description and plant environment interactions.

BIOS3051
Insect Diversity and Management
Staff Contact: Dr C Orton
CP15 S1 HPW6
Prerequisite: BIOS2031
Note/s: Not offered in 1997.

Insect diversity, classification and identification, internal and external anatomy. Insect ecology, physiology and behaviour, including pheromones. Management of urban and agricultural insect pests, insecticides and their action, resistance, advantages and disadvantages of pest control methods. Practical classes to illustrate lectures. Students must present insect collection for assessment.

BIOS3061
Plant Ecosystem Processes
Staff Contact: A/Prof R McMurtrie
CP15 S1 HPW6
Prerequisite: Any 2 Level II Science subjects


BIOS3071
Conservation Biology and Biodiversity
Staff Contact: Dr W Sherwin
CP15 S1 HPW6
Prerequisites: BIOS1011 and BIOS1021 or BIOS1101 and BIOS1201, plus any 2 Level II Biological Science subjects (the latter may be waived upon application to the subject coordinator)
Note/s: Students must enrol at the Biology Enrolment Centre, Room G27, Biological Sciences Building. For further details, see Faculty timetable.

Applications of community biology, population ecology and genetics to management of environmental problems in nature and artificial ecosystems, including Australian examples. Nature and importance of global diversity, Management and design of programs for the conservation of species and ecosystems, including reserves, off site

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conservation, and computer simulations. Field excursions compulsory.

BIOS3111
Population and Community Ecology
Staff Contact: A/Prof B Fox
CP15 S2 HPW6
Prerequisites: BIOS1021 and MATH1032 or MATH1231 or MATH1042 or MATH1241 or MATH1021
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, island biogeography, ecological gradients. Succession following disturbance (fire, mining, or logging). Participation in fieldwork is essential.

CHEM1101
Chemistry 1A
Staff Contact: Dr P Chia
CP15 S1 or S2 HPW6
Prerequisites: HSC Mark Range Required: 2 unit Mathematics 60-100, or 3 unit Mathematics 1-50, or 4 unit Mathematics 1-100 and 2 unit Chemistry 65-100, or 3 unit Science 90-150, or 4 unit Science 1-200, or 2 unit Physics 75-100, CHEM1401 60 or higher.

CHEM1201
Chemistry 1B
Staff Contact: Dr P Chia
CP15 S2 or Summer Session HPW6
Prerequisite: CHEM1101
Note/s: Students who require CHEM1101 and CHEM1201 but have not undertaken chemistry at HSC Level should take CHEM1401 before proceeding to CHEM1101. However, no more than 30 Credit Points of Chemistry at Level I may be counted towards a Science degree.
Molecular Geometry, hybridization of Orbitals. Periodicity of Physical and Chemical Properties of Chemical compounds.
Organic Chemistry including Stereoisomerism.

CHEM1401
Introductory Chemistry A
Staff Contact: Dr P Chia
CP15 S1 HPW6
Prerequisites: HSC Mark Range Required: 2 unit Mathematics 60-100, or 3 unit Mathematics 1-50, or 4 unit Mathematics 1-100.<R>Note/s: This subject is only for students who do not have the prerequisite for CHEM1101. Students proceeding to CHEM1101 must attain a mark of 60 or higher.

CHEM1807
Chemistry 1ME
Staff Contact: Dr P Chia
CP15 S1 HPW6
Note/s: excluded CHEM1101, CHEM1201, CHEM1002
Restricted to Course 3681

CHEM2021
Organic Chemistry
Staff Contact: Dr R Read
CP15 F or S2 HPW6
Prerequisites: CHEM1101, CHEM1201
Discussion of the major types of organic reaction mechanisms, eg addition, substitution, elimination, free radical, molecular rearrangement within context of important functional groups. Introduction to the application of spectroscopic methods to structure determination.

CHEM2031
Inorganic Chemistry and Structure
Staff Contact: Dr N Duffy
CP15 S1 or S2 HPW6
Prerequisites: CHEM1101, CHEM1201

CHEM2041
Chemical and Spectroscopic Analysis
Staff Contact: Dr M Mulholland
CP15 S1 or S2 HPW6
Prerequisites: CHEM1101, CHEM1201, MATH1032 or MATH1231 or MATH1042 or MATH1241 or MATH1021

CHEM2818
Physical Chemistry for Materials Science and Engineering
Staff Contact: Prof RF Howe
S1 or S2 HPW5
Prerequisites: CHEM1002 or CHEM1101 and CHEM1201 and MATH1042 or MATH1241 or MATH1032 or MATH1231 or MATH1021
Note/s: Excluded 02.022A.
CHEM2819
Physical Chemistry for Food and Fibre Science and Technology
Staff Contact: Prof RF Rowe
S1 or S2 HPW6
Prerequisites: CHEM1002 or CHEM1101 and CHEM1201 and MATH1042 or MATH1241 or MATH1032 or MATH1231 or MATH1021
Note/s: Excluded 02.002A.


CHEM2828
Organic and Inorganic Chemistry for Chemical Engineers
Staff Contact: Dr D Phillips

Discussion of selected types of organic reactions to provide a broad cover of the chemistry of aliphatic and aromatic compounds. Survey of the structures, energetics, bonding, reactions and physical properties, and applications, of selected compounds of main group elements and of lanthanide and d-block transition elements.

CHEM2929
Fundamentals of Biological and Agricultural Chemistry
Staff Contact: Dr P Southwell-Keely


CHEM3021
Organic Chemistry
Staff Contact: A/Prof R Bishop
CP15 S1 HPW6
Prerequisite: CHEM2021


CHEM3121
Synthetic Organic Chemistry
Staff Contact: Prof M Paddon-Row
CP15 S2 HPW6
Prerequisite: CHEM3021


CHEM3321
Applied Organic Chemistry
Staff Contact: A/Prof N Cheetham
CP15 S1 HPW6
Corequisite: CHEM3021

Polymerisation processes and synthetic polymers; initiators, chain transfer agents, retarders. Pigments and dyestuffs; Basis of colour in organic compounds. Oxidation and reduction processes; theory and industrial importance.

CHEM3829
Organic Chemistry
Staff Contact: Prof D Black

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.

CHEM3926
Instrumental Methods of Food Analysis
Staff Contact: A/Prof N Cheetham

Treatment of theory and practice of modern instrumental methods of analysis, with strong emphasis on the analysis of food constituents. Variety of spectroscopic and chromatographic techniques.

CHEM3929
Food Chemistry
Staff Contact: A/Prof N Cheetham

Treatment of the chemistry of important food constituents. Topics include: proteins, carbohydrates, fats and oils, vitamins, natural and synthetic pigments essential oils and flavours, importance of water in foods.

CHEM7325
Toxicology, Occupational and Public Health
F L1 T3

Student enquiries should initially be directed to the Course Coordinator A/Prof P Southwell-Keely.

Important classes of toxic materials found in the environment; treatment of pesticide residues, industrial chemicals of various types, toxic gases, mould metabolites and bacterial toxins occurring in food, carcinogenic substances, toxic metals etc. Effects of these substances on living organisms, particularly people. Practical work: pesticide residue analysis, blood and urine analysis, gas sampling and analysis, trace metal determination and experiments on the animal metabolism of toxic substances.

CIVL0616
Structures
Staff Contact: A/Prof VA Puimano
CP7.5 S1 L1 T2

Note/s: This is a servicing subject for courses offered by other schools and faculties. This subject is not offered every year.


CIVL4306
Engineering and the Environment
Staff Contact: Mr GR Mostyn
CP10 S1 L2 T2
Prerequisite: CIVL3601


CIVL8701
Financial Management
Staff Contact: Dr RR Wakefield
CP12 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; optimization; applications; multiple objective planning; project delivery systems; financial planning, accounting.

CIVL8702
Project Time Management
Staff Contact: Dr RR Wakefield
CP12 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.

CIVL8703
Quality and Quality Systems
Staff Contact: Dr PR Gibson
CP12 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.

CIVL8706
Human Resources Management
Staff Contact: Mr JB O'Brien
CP12 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.

CIVL8707
Contracts Management
Staff Contact: Prof DG Carmichael
CP12 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.

CIVL8710
Management of Risk
Staff Contact: Mr G Nawar
CP12 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.

CIVL8726
Legal Studies and Professional Practice
Staff Contact: Prof DG Carmichael
CP12 SS
Note/s: This subject is not offered every year.

Nature and sources of law, court procedures, interpretation of documents, evidence, technical opinions, expert witness; company law; duties of an engineer; tort, professional liability; trade practices and consumer legislation; ethics.

CIVL8731
Project Management Framework
Staff Contact: Mr JB O'Brien
CP12 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.
CIVL8872
Solid Waste Management
Staff Contact: Mr SJ Moore
CP12 SS
Note/s: This subject is not offered every year.
Characterisation of municipal solid waste; collection; transfer stations; waste minimization 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.

CIVL8881
Hazardous Waste Management
Staff Contact: Mr SJ Moore
CP12 SS
Note/s: This subject is not offered every year.
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.).

CIVL9402
Transport, Environment, Community
Staff Contact: Dr SE Samuels
CP24 F
Note/s: This subject is not offered every year.

CIVL9403
Theory of Land Use Transport Interaction
Staff Contact: Dr SE Samuels
CP12 SS
Note/s: This subject is not offered every year.
Theoretical aspects of land use transport planning. Basic concepts, data collection methods, systems models and equation of state function (behavioural, optimizing). Introduction to land use-transport modelling (land use, generation, distribution, modal assignment, network assignment, evaluation). Planning methodologies (short-, medium-, long-term; action planning, strategic planning; local, urban, regional, national).

CIVL9405
Urban Transport Planning Practice
Staff Contact: Dr SE Samuels
CP12 SS
Note/s: This subject is not offered every year.

CIVL9408
Transport Systems Design (Urban)
Staff Contact: Dr SE Samuels
CP12 SS
Note/s: This subject is not offered every year.
Types of urban transport facilities. Distributors, streets, bicycle routes, walk-oriented areas, bus lanes and rapid transit lanes, stops and change terminals, noise control. Minimum geometric form; speed range controls, provision for surface water on urban roads, landscape. Design of intersection and parking areas.

CIVL9726
Legal Studies and Professional Practice
Staff Contact: Prof DG Carmichael
CP12 SS
Note/s: This subject is not offered every year.
Nature and sources of law, court procedures, interpretation of documents, evidence, technical opinions, expert witness; company law; duties of an engineer; tort, professional liability; trade practices and consumer legislation; ethics.

CIVL9788
Site Investigations
Staff Contact: Prof R Fell
CP12 SS
Note/s: This subject is not offered every year.
Engineering geology mapping and terrain classification. Drilling, trenching and sampling of rock and soil. In-situ testing of soil and rock. Laboratory testing of soil and rock. Assessment of design parameters. Instrumentation to measure pore pressure, stress, displacement.

CIVL9790
Stability of Slopes
Staff Contact: Prof R Fell
CP12 S2
Note/s: Short course format in 1997.
Stability of natural and constructed slopes in civil and mining engineering. Stability analysis; stabilization methods and design; monitoring. Design of slopes in soft ground, soil and rock, and in partially saturated slopes; design of open cut mines. Probabilistic methods.

CIVL9799
Environmental Geomechanics
Staff Contact: Dr GE Swarbrick
CP12 S2
Dispersive soils, hydrological cycle, partly saturated flow through soils, advective-dispersive transport, acid mine drainage, leachate plumes, design and construction of waste dump covers and liners, site remediation and leachate collection and treatment.

CIVL9851
Unit Operations in Public Health Engineering
Staff Contact: Mr PJ Bliss
CP12 S1
Theory of physical, chemical, biological, and hydraulic processes used in both water and wastewater treatment. Applications where these are common to both water and wastewater treatment.
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 control.

Application of processes and process variations used to upgrade the quality of water for specified uses, with particular reference to the treatment of water for municipal use.

Application of processes and process variations used to improve the quality of wastewaters and of sewage effluent, and the disposal of the effluent. Re-use of effluents where applicable. Sludge treatment and disposal.

Fundamental concepts; systems approach to quality aspects of water resource systems; quality interchange systems; quality changes in estuarine, surface, and ground water. Quality management by engineered systems. Economic and regulatory criteria relating to water use and re-use systems.

Physical properties of groundwater. Darcy flow; porosity, hydraulic conductivity and intrinsic permeability field and laboratory tests. Principles of groundwater flow. Storage and transmissivity. Groundwater in the hydrological cycle; flow nets; local and regional flow systems; springs; interactions with surface water. Drilling methods; well design and completion. Borehole geophysical methods. Solutions to the radial flow equation; pumping test interpretation. Groundwater modelling; finite difference methods. Program of field work and data analysis.


Unsteady and varied flow in non-uniform channels, secondary currents, sediment transport, channel morphology, scour and shoaling, river control works, modelling of fluvial processes.

Characterisation of municipal solid waste; collection; transfer stations; waste minimization 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.

Introduction to hydrological cycle and energy balance: meteorology; precipitation processes, interception and infiltration, storm runoff processes, groundwater flow, E-T.

Water resources data sources, errors, corrections; introduction to storage-yield relationships for reservoir design; extension of records; stochastic models; stochastic reservoir analysis; deterministic catchment models; model calibration and verification; application of conjunctive use systems; social interactions—economics, politics, public participation.

Groundwater modelling of porous media, fractured rock and low permeability material. Numerical modelling, including finite difference and finite element methods. Regional groundwater and multi phase fluid flow modelling. Software packages and applications to borefield management, saltwater intrusion, mine dewatering and site contamination.
CIVL9881
Hazardous Waste Management
Staff Contact: Mr SJ Moore
CP12 SS
Note/s: This subject is not offered every year.
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.).

CIVL9885
Environmental Engineering Science 2
Staff Contact: Prof TD Waite
CP12 S2

CIVL9888
Environmental Management
Staff Contact: Mr SJ Moore
CP12 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.

CIVL9889
Environmental Economics and Law
Staff Contact: Mr SJ Moore
CP12 S2
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.

CIVL9890
Spatial Decision Support Systems in Water Resources
Staff Contact: Dr JE Ball
CP12 SS
Note/s: This subject is not offered every year.
Principles of spatial decision support systems as used in hydrology, water resources and catchment management. Expert systems methods for decision modelling. Use of geographic information systems in surface and subsurface data analysis, model integration and presentation. Development and use of databases for water resources applications. Review of techniques for spatial data collection including remote sensing and global positioning systems.

CIVL9891
Groundwater Contamination and Remediation
Staff Contact: Dr RL Acworth
CP12 S1
Description of types of groundwater contaminants, sources of groundwater contamination, review of transport equations, mass transport in saturated media, advection and dispersion, biological and chemical transformation of groundwater contaminants, multiphase flow, migration of nonaqueous phase liquids. Groundwater sampling and analysis, monitoring well design and installation, soil-water and soil-gas monitoring. Treatment and prevention of groundwater contamination. Site investigation methods at contaminated sites. Site remediation: source control, pump and treat, soil vapour extraction, bioremediation.

CMED9500
Epidemiology
Staff Contact: A/Prof J Kaldor
CP15 S1 HPW3
This subject provides students with an understanding of the role of epidemiology as the quantitative science underpinning much of public health practice. Students will learn the basic methodological tools of epidemiology, such as statistics to measure disease frequency, skills to critically review literature and interpret epidemiological studies, and their application in a variety of research and public health contexts. Skills for measuring frequency of disease and testing for evidence of association between risk factors and disease in this subject will build on statistics learnt in HEAL9061 Statistics for Public Health. This subject will cover topics pertaining to study design, basic statistical tests and interpretation of results. Application of these topics in areas such as questionnaire design, conducting and managing studies, problems relating to research grants will be covered in CMED9513 Applied Epidemiology.

CMED9519
Demography
Staff Contact: A/Prof I Burnley
CP10 S2 HPW2
Introduction to demography; sources and processing of data, principles and applications. Life tables, mortality, marriage and divorce, natality, reproductivity. Martial characteristics and family groups. Migration. Distribution by area, sex, age, race; educational and economic characteristics. Population estimates and projections. Computer techniques.

CMED9600
Disability
Staff Contact: Dr H Dickson
CP10 S1 HPW2
Epidemiology of disabling physical and mental conditions; the nature of disability and handicap (including developmental disability); perceptions of handicap; disabled persons' consumer movement and organisation; sociology of disability; social inequality and disability; rehabilitation; community and specialist rehabilitation services; relevant legislation, government services, special needs of disabled persons health accommodation and the physical environment, transport, work, income support, legal rights and public policy.
Tobacco, Alcohol and Other Drug Issues

CMED9604

Staff Contact: A/Prof R Richmond

CP10 S1 HPW2

Concepts of drug dependence, including pharmacological aspects; management of these problems in primary care; rehabilitation programs, smoking cessation; weight control; social and psychological factors and their impact on the family; drug problems and their impact on the community; public health aspects; media; specific intervention techniques for users of tobacco, alcohol and other drug use.

Community Genetics

CMED9609

Staff Contact: Dr L Lai

CP10 SS HPW2

Brief discussion of essentials of human genetics and new development; role of genetics in community health; individuals at risk; genetic disorders including congenital, chromosomal and single-gene defects; their causes and distribution in different populations; health services comprising genetic counselling, screening, carrier detection, pre-symptomatic diagnosis, prenatal diagnosis, and laboratory investigation, and their planning and funding; support groups as related to types of genetic disorder; basic training of genetics in medicine; education and prevention; social, moral and ethical issues involved in the provision of genetic services.

Community Nutrition and Food Policy Studies

CMED9610

Staff Contact: Ms L Bloomfield and Ms P Craig

CP10 S1 S2 HPW2

Introduction to nutrition and health; increasing interest in nutrition by population in general, epidemiological evidence of nutrition-related diseases and the increasing cost of treating these diseases, and common nutrition-related health disorders in the Australian community; various nutritional assessment techniques; nutrition information versus misinformation; location and utilisation of nutrition resources; recommendations about nutrition by instrumentalities such as the Health For All Taskforce and the Better Health Commission.

Environmental Health

CMED9612

Staff Contact: Dr J Frith

CP10 S2 HPW2 External mode also available

Prerequisites: HEAL9061 Statistics for Public Health

To introduce the principles of epidemiology, particularly in reference to environmental risk factors of disease and in reference to such principles as incidence and prevalence, aetiology and risk factors, epidemics and endemics, and primary, secondary and tertiary prevention of disease. In particular, it deals with environment and disease, radiation, chemical, hazards, air and water pollution, biological hazards, urban environment, ecology, ecosystems and interdependence and how these factors affect health, public health issues related to sustainable development.

Software Engineering

COMP9008

Staff Contact: Mr K Robinson

CP15 S1 HPW4

Assumed knowledge: COMP9024

Note/s: Excluded COMP3111.

Informal specification: Data flow diagram methodology, analysis, design, testing, management and documentation of software. Formal specification: set theory, logic, schema calculus, case studies. The Z specification notation. Managing the project lifecycle. CASE tools. A major group project is undertaken.

Issues In Computing

COMP9015

Staff Contact: School Office

CP15 S2 HPW3

A review of issues that affect the use of Computer Systems. Topics that may be covered include: the human implications of computing systems, the effect of computing operations on organisational structure, software copyright, privacy, the role of computing systems and information systems in decision making, the significance of the timeliness of information and its implication on the value of decision making and the requirements for a computing system.

Data Base Systems

COMP9311

Staff Contact: Prof J Miller

CP15 S1 or S2 HPW3

Assumed knowledge: Familiarity with storage structures

A first subject on data base management systems to be presented at a level appropriate for a graduate subject. The material to be covered will include a selection from: the relational, hierarchical/network, and inverted file data models; normalisation and the problems of redundancies; views and their updates; high level query languages; distributed systems; deductive data bases; object data bases; data definitions; application generators.

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Management and Business Development

ECOH2301

Staff Contact: Dr D Meredith

S1 HPW3 CP15

Prerequisite: EC0N1102

Note/s: Not offered 1997.
This subject introduces economics as a social science: scarcity, resource allocation and opportunity cost; an introductory analysis of consumer behaviour; the economics of firms and markets; production and costs; the classification and analysis of markets; efficiency concepts and market failure; the gains from international trade and the impact of trade restrictions; economic growth and structural change.

ECON1102
Macroeconomics 1
Staff Contact: Dr M Monadjemi
S1 or S2 HPW3 CP15
Prerequisite: ECON1101

This subject provides an introduction to the analysis of aggregate output, employment and economic growth and their relationship to the policy issues of unemployment, inflation and the balance of payments. Other topics include: social accounting and aggregate income and expenditure analysis; macroeconomic models of income determination; consumption and investment functions; the role of money and financial institutions; interactions between goods and money markets in equilibrium and disequilibrium situations; and an analysis of recent Australian macroeconomic experience.

ECON2101
Microeconomics 2
Staff Contact: Dr P Kriesler
S1 HPW3 CP15
Prerequisite: ECON1101

This subject covers: choice theory, including intertemporal choice, and labour supply; extensions of price theory; the theory of production, costs and supply; market structures including oligopoly models; externalities; and provides an introduction to general equilibrium and welfare analysis.

ECON2102
Macroeconomics 2
Staff Contact: Dr G Otto
S2 HPW3 CP15
Prerequisite: ECON1102

This subject covers models of aggregate income determination in open economies; theories of aggregate economic behaviour with respect to consumption and investment expenditures and financial transactions; balance of payments and exchange rate analysis; theories of inflation and unemployment; introductory dynamic analysis; and theories of growth and cycles.

ECON2103
Business and Government
Staff Contact: A/Prof R Conlon
S2 HPW3 CP15
Prerequisites: ECON1101 or ECON1103

This subject examines how government affects the business environment at the microeconomic level. The case for intervention and the benefits of deregulation and privatization are analyzed, with reference to particular industries. The effects on business of government instrumentalities such as the Industries Commission, Prices Surveillance Authority, Trade Practices Commission and Foreign Investment Review Board are examined. Issues relating to microeconomic reform, economic rationalism, market failure and government business enterprises are explored.

ECON2104
Australian Macroeconomic Policy
Staff Contact: Prof R Milbourne
S1 HPW3 CP15
Prerequisites: ECON1102 or ECON1104

This subject examines economic growth and fluctuations and the effect this has on the business environment and the community. Explains the main macroeconomic tools and techniques used by governments and the Reserve Bank to implement fiscal, monetary and incomes policies. The implications for inflation, unemployment, interest rates and exchange rates, and foreign debt are discussed.

ECON2106
Economics of Natural Resources
Staff Contact: Dr C Alaouze
S1 HPW3 CP15
Prerequisite: ECON2101 or ECON2103

This subject provides an introduction to the exploitation of natural resource systems examined within an economic framework, particularly forestry, fisheries, water, oil and other minerals. It also looks at policies required to ensure improved management without overexploitation of these renewable and non-renewable resources under different property-right regimes.

ECON2111
The Economics of Global Interdependence
Staff Contact: Dr P Robertson
S2 HPW3 CP15
Prerequisite: ECON1102 or ECON1104

This subject looks at Australia in an interdependent world; direction and composition of world trade; trade in services; trade theory and trade policy; strategic trade policy and imperfect competition; international competitiveness; barriers to trade and trading blocs; international institutions and policy; NAFTA, GATT and EU; World Bank and IMF; foreign currency markets; and international policy coordination.

ECON2115
Japanese International Economic Relations
Staff Contact: Dr K Fox
S2 HPW3 CP15
Prerequisite: ECON1102 or ECON1104

This subject considers: Japan's international trade, investment and balance of payments policies; globalisation of Japanese economic interests; problems relating to external economic policies including alternative strategies for international economic relations; impact of yen appreciation; trade friction; bilateral relations with focus on Australia, USA, China and South East Asia.
ECON2116
Japanese Economic Policy
Staff Contact: Dr K Fox
S1 HPW3 CP15
Prerequisite: ECON1102 or ECON1104
This subject provides an analysis and evaluation of postwar economic policy: issues relating to policy determination including role of institutions and interest groups; critical examination of 'Japan Inc.' model; industrial policy and role of 'genkyoku' system; Japanese long term economic planning; nature of principle economic policies such as agricultural, monetary and fiscal; anti-trust and competition policies.

ECON2117
Economics of Tourism
Staff Contact: Dr G Waugh
S1 HPW3 CP15
Prerequisite: ECON1102 or ECON1104
Topics include: macro and micro economic environments; factors affecting international and domestic tourism; tourism forecasting models; economic analysis of projects; cost/benefit and related procedures; and the implications of tourism developments for the community in general.

ECON2127
Environmental Economics and Cost-Benefit Analysis
Staff Contact: Dr G Waugh
S2 HPW3 CP15
Prerequisite: ECON1101 or ECON1103
This subject 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.

ECON3115
Economics of Developing Countries
Staff Contact: Dr J Lodewijks
S1 HPW3 CP15
Prerequisite: ECON1102 or ECON1104
Note/s: Not offered 1997.

ECON1104
Macroeconomic Principles
Staff Contact: Dr J Lodewijks
S2 HPW3 CP15
Prerequisite: ECON1103
Note/s: Excluded ECON1102.
This subject provides and introduction to the analysis of aggregate output, employment and economic growth and their relationship to the policy issues of unemployment, inflation and the balance of payments. Also covered are models of the determination of equilibrium income; an analysis of the role of financial institutions; and an introduction to the analysis of macroeconomic policy.

ECONS103
Business Economics
Staff Contact: A/Prof G Kingston
S1 or S2 L3 CP20
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 subject is to improve the economic literacy of students.

ECON5116
Environmental Economics
Staff Contact: Dr G Waugh
S2 L3 CP20
Prerequisite or Corequisite: ECON5100
Main elements of environmental economics and cost benefit analysis as it relates to the assessment of environmental issues. Topics will 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.

ECON5124
Public Enterprise Economics And Cost-Benefit Analysis
Staff Contact: Dr T Truong
S1 HPW3 CP20
Prerequisite or Corequisite: ECON5100
Note/s: Not offered 1997.

ECON5248
Business Forecasting
Staff Contact: Dr J Murray
S1 L3 CP20
Prerequisite: ECON5203
This subject 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,
FINS5513
Security Valuation and Portfolio Selection

Staff Contact: School Office
S1 or S2 L3 CP20

Prerequisites: ECON5103 and ECON5203

The aim of this subject is twofold: (i) to introduce students to theoretical building blocks in the theory of finance; and (ii) to illustrate these by means of a combination of tutorial problems and case studies. Topics include: investment decisions under uncertainty; 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, marketings.

GMAT0441
Surveying for Engineers

Staff Contact: A/Prof A Stolz, Dr BR Harvey
CP11.5 S2 L2 T2.5

Note/s: This is a servicing subject taught within courses offered by other schools and faculties.


GMAT5122
Spatial Information Systems 1

Staff Contact: Dr EG Masters
CP7.5 S2 L2 T1
Corequisite: GMAT5122

Overview and background of Spatial Information Systems. Explanation of definitions and terminology. Theory and application of SIS technology; digital maps and data base management; data acquisition; data storage, editing, raster and vector representations; topology. Modelling and analysis. Design and development of spatial databases. Use of GIS packages.

GMAT9211
Introduction to Geodesy

Staff Contact: A/Prof A Stolz
CP12 S2 L2 T1


GMAT9212
GPS Surveying

Staff Contact: A/Prof C Rizos
CP12 S1 L2 T1

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.
GMAT9530
Analytical Photogrammetry
Staff Contact: Prof JC Trinder
CP12 SS L2 T1

Fundamental relationship, image and object space. Interior orientation, deviations from collinearity. General orientation of one and two images by collinearity. Simultaneous block adjustment by bundles. Additional parameters. Calibration of metric and non-metric cameras. Control requirements in analytical photogrammetry.

GMAT9532
Data Acquisition and Terrain Modelling
Staff Contact: Prof JC Trinder


GMAT9600
Principles of Remote Sensing
Staff Contact: Prof BC Forster
CP12 S1 L2 T1


GMAT9604
Land Information Systems
Staff Contact: Dr EG Masters
CP12 SS L2 T1


GMAT9605
Field Data Collection and Integration
Staff Contact: Prof BC Forster
CP12 S1 HPW3

The spectral, temporal and spatial characteristics of various surfaces, and the available sensors to effect maximum differentiation. Ground and image comparisons. Instruments available for field measurements. Field investigation procedures including positioning and sampling considerations.

GMAT9606
Microwave Remote Sensing
Staff Contact: Prof BC Forster
CP12 S1 HPW3

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.

HEAL9371
Research and Evaluation Methods
Staff Contact: Dr Mary-Louise McLaws
CP15 S1 (HK only) S2 L2
Prerequisite: HEAL9411 Epidemiology for Health Administrators and Planners

Special problems of health services research and evaluation; identifying research areas; reviewing the literature; statements of objectives and formulation of hypotheses; experimental and quasieperimental designs; nonexperimental models; sample selection; questionnaire design and problems of measurement; introduction to analysis of data; methods of presenting findings; reliability of research evidence; research ethics; research and decision making; policy issues.

HEAL9411
Epidemiology for Health Administrators and Planners
Staff Contact: Dr Mary-Louise McLaws
CP15 S1 L2

Principles and methods of epidemiologic investigation of both communicable and noncommunicable diseases including descriptive, analytic and experimental epidemiology. The epidemiology of acute chronic diseases, demography, determination of health status of a defined population, measurement of disease rates & interpretation. The uses of epidemiology in planning, operation and evaluation of interventions. Epidemiology of staff, hospital services, diagnostic & treatment services.

HEAL9421
Public Health
Staff Contact: Prof James Lawson
CP15 S1 L2

Distribution patterns and determinants of disease and disability with particular reference to diseases of major Australian concern. Preventive, treatment and rehabilitation strategies. The uses of epidemiology in the planning, operation and evaluation of health services.

INFS1602
Computer Information Systems 1
Staff Contact: School Office
S1 or S2 HPW 3 CP15

This subject develops an understanding of the content of information systems, the types of information systems and the position of information systems in society; information systems at an organisational level, typical commercial applications, the systems life cycle, design concepts, data analysis and models and an introduction to data communications.

INFS2603
Systems Analysis and Design
Staff Contact: School Office
S2 HPW 3 CP15
Prerequisites: INFS1603

This subject examines system analysis and design: requirements analysis and specification; logical and physical design of business systems; students compare
INFS2607  
Business Data Networks  
Staff Contact: School Office  
S2 HPW 3 CP15  
Prerequisite: INFS1602  
Data communication concepts and computer networks, reference to international standards and common industry communications software packages; local/metropolitan/wide area networks; network management; Telstra services and other options; data security.

INFS3603  
Executive Support Systems  
Staff Contact: School Office  
S1 HPW 3 CP15  
Prerequisites: INFS2603  
This subject examines the process of decision making and work group activity by professional and managerial people; the tools and techniques available in information technology to support these processes; the cultural and organisational issues involved in formalizing support; and management issues related to support.

INFS3604  
Information Function Management  
Staff Contact: School Office  
S2 HPW 3 CP15  
Prerequisite: INFS2603  
This subject introduces the strategic and operational management issues involving information systems and software. Consideration is given to both quantitative management techniques, including 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  
S1 HPW 3 CP15  
Prerequisites: INFS1602 and INFS1603  
Topics include: advanced data analysis and modelling techniques; database management system architectures including hierarchical, network and relational approaches; database reliability, security and integrity issues; and data description and manipulation languages.

INFS5988  
Information Systems Project Management  
Staff Contact: School Office  
S2 L3 CP20  
Prerequisite: 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 customization, 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  
S1 L3 CP20  
Prerequisite: INFS5988  
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. The teaching mode is a mix of formal lectures, seminars and workshops with an emphasis on co-operative discussions.

INFS5953  
Information Systems Management  
Staff Contact: School Office  
S2 L3 CP20  
Prerequisites: INFS5988 and INFS5992  
This subject aims to assist students to develop their knowledge and understanding of important issues involved in the management of information systems in organisations and their ability to critically analyse these issues. Management of information systems will be considered at strategic, tactical and operational levels. Particular emphasis will be given to the management of enterprise-wide and inter-organisational systems and planning for their strategic use. Students without knowledge of and experience in management or the use of IS in organisations may wish to take the subject INFS4848/INFS5848 before this subjects.

INFS5957  
Information and Decision Technology  
Staff Contact: School Office  
S1 L3 CP20  
The role of information and models in managerial decision making and prediction. The role of information systems in decision making. Assessing the value of information systems and the contribution of information in decision making under uncertainty. The role of information in managerial prediction and forecasting. The development of computer based models to support tactical management.

INFS5983  
Business Data Communications  
Staff Contact: School Office  
S2 L3 CP20  
Prerequisite: INFS5988  
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  
S1 L3 CP20  
This subject aims to provide an introduction to the use and management of information systems in business. This subject will assist students to develop their knowledge and understanding of the role of information systems in business organisations, and components and disciplines...
which comprise information systems. This subject will also assist students to develop their capabilities to critically apply the disciplines of information systems and to use application software in support of typical managerial tasks. Application software will include word processing, spreadsheets and personal databases.

INFS5989
Information Systems Design
Staff Contact: School Office
S2 L3 CP20
Prerequisite: 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 subjects and student experiences.

INFS5991
Decision Support Systems
Staff Contact: School Office
S1 L3 CP20
Prerequisite: INFS5988

Information used for decision making and the application of information technology to assist or support the decision making process. Topics include decision making models, the impact of different management styles, the use of decision tools and the development of decision support systems including issues of model management and interface design. Practical examples of decision support systems are examined as are executive information systems and computer mediated communications within an organisation.

INFS5992
Data Management
Staff Contact: School Office
S1 L3 CP20

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.

IROB2721
Managing People
Staff Contact: Dr A Donovan
S1 L2 T2 CP15

This subject focuses on managing in a rapidly changing environment. Topics include: leadership, decision-making and innovation; power, legitimacy, and the socialization process; the structure and design of organisations, organisation and domination, the evolution of ethical awareness; intergroup conflict and conflict resolution; skills of managing communication, negotiation, coaching and objectives setting; organisational culture and transformation.

IROB5701
Australian Industrial Relations
Staff Contact: A/Prof B Dabscheck
S1 L3 CP20

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 industrialization 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.

IROB5702
Industrial Relations in the Global Economy
Staff Contact: Dr I Hampson
S2 L3 CP20
Prerequisite: IROB5701

This subject focuses on the 'global shifts' in economics and industry that are driving transformations in many national IR systems. As such the subject shares many of the objectives of comparative IR, namely to foster an appreciation of the merits of comparing IR systems, and the use of comparative method. Since one of the major uses of comparative arguments is in the sphere of industrial relations policy, the subject also aims to review debates about the links between IR systems on the one hand, and national competitiveness and social protection on the other.

IROB5711
Employment and Industrial Law
Staff Contact: School Office
S1 L3 CP20
Prerequisite: IROB5701 or equivalent

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
Negotiations, Bargaining and Advocacy
Staff Contact: Ms S Hammond
S2 L3 CP20
Prerequisite: IROB5701 or equivalent

This subject aims to give students studying industrial relations and/or human resource management practical skills in the areas of industrial and workplace negotiation, bargaining and advocacy. The subject examines the content, character and making of industrial awards and agreements, with special emphasis on tribunal processes and negotiation and advocacy in relation to paid employment. Students also receive a practical grounding in the requirements of particular policies and regulations governing employment relations, including Enterprise Bargaining, Equal Opportunity and Affirmative Action, Occupational Health and Safety, and Termination of Employment. In addition, the subject provides appropriate theoretical perspectives on these and related employment issues.
IROB5713
Public Policy and Employment
Staff Contact: A/Prof B Dabscheck
S2 L3 CP20
Prerequisite: IROB5701 or equivalent
The formulation and implementation of public policy impacting upon industrial relations and employment. Theories of the state; public policy models. Current policy issues and options. The interaction between tribunals, parties and public policy evaluation of policy process in Australian and comparative terms. Case studies.

IROB5900
Social and Organisational Analysis
Staff Contact: School Office
SS L3
This subject examines the core concepts and theories underlying modern organisational practice, drawing principally from the discipline of sociology. Topics covered include the evolution and development of social and organisational theory, sociological paradigms and implications for organisational analysis, bureaucracy, organisational design and development, and current topics such as regulation and privatisation, participative democracy and the future of Australian manufacturing industry. A practical focus is maintained through the use of Australian case studies.

IROB5901
Organisational Behaviour
Staff Contact: Mr J Holt
S1 or S2 L3 CP20
Note/s: Excluded PSYC7100.
This subject seeks to explain human behaviour within organisations. It draws predominantly from the behavioural science disciplines of psychology and social psychology. Its foci are the individual, the group, and the behavioural processes involved in organisation integration, change and development. Topics covered include personality, attitudes and values, motivation and learning, interpersonal behaviour, group dynamics, leadership and teamwork, decision-making, power and control.

IROB5903
Organisational Change and Development
Staff Contact: Dr A Bordow
S1 L3 CP20
Prerequisite: IROB5901 or IROB5701
The theory and practice of change in organisations with special attention to applied behavioural science methods for achieving sustained improvement in performance at the individual, group and system levels. Methods and topics examined include: diagnostic approaches, organisational culture and change, action research, organisational learning, strategic planning for change, organisational transitions, structural redesign, teambuilding and skills of change agent intervention.

IROB5904
Corporate, Management and Union Strategy
Staff Contact: School Office
S2 L3 CP20
Prerequisite: IROB5901 or equivalent
This subject deals with theories of strategy, strategic planning and implementation, and the concept and exercise of strategic choice. It is distinguished from conventional managerial approaches to strategic planning by its application to labour-management-relations and by its inclusion of trade union strategies. For both organised labour and for management, the management of strategy is a particular focus of the subject.

IROB5906
Human Resource Management in Context
Staff Contact: Dr L Taksa
S1 L3 CP20
Theories of organisational behaviour and management will be examined in order to locate Human Resource Management in historical, conceptual and practical contexts. Changing factors that shape the organisation of work, worker and managerial responses and action will be considered with specific focus on their relationship to power, conflict, control, motivation, group interaction and culture. The role of Human Resource Management in the implementation of organisational change will be included.

IROB5907
Human Resource Management Processes
Staff Contact: Dr L Taksa
S2 L3 CP20
Prerequisite: IROB5906 or IROB5701 or IROB5901 or equivalent
Theoretical foundations of Human Resource Management; power and authority of HRM function. Examination of policies and strategies developed by employers to organise and reward their employees. Values underlying such policies; controversies surrounding their development and implementation; the way in which organisational dynamics influence their operation. The interface between HRM policies and the regulatory, social and organisational contexts; the operation of HRM policies in different business sectors and countries.

IROB5912
International Dimensions of Organisational Behaviour
Staff Contact: Mr J Holt
S2 L3 CP20
Prerequisite: IROB5901 or equivalent
This subject provides a comparative focus to the study of organisations in global context by exploring how organisation, management and employment systems differ across cultural frameworks. The effects of culture on the structure of national organisational systems, corporate transnational systems, and international HRM are also examined. Other topics include the transferability of management systems and techno-cultures across cultural boundaries, and the 'convergence versus divergence' thesis. Where possible, case studies contrasting Asian with Australian perspectives are used.

IROB5914
Employee Communications
Staff Contact: Dr A Bordow
S1 L3 CP20
Prerequisite: IROB5901 or equivalent
This subject provides for an understanding of how human communication works within organisational domains and especially examines communication as an influence process. The basics of interpersonal, organisational and mass communication together with public relations will be reviewed in order to proceed to the study of such
applications as communicating to employees en masse, effecting appropriate media choice, informing stakeholders and interested publics, and developing a corporate information policy. All students will take part in a learning augmentation, called a virtual classroom, to enhance their awareness of a new communications technology and will carry out a field investigation within an ongoing organisation.

IROB5915
Human Potentialities
Staff Contact: Dr A Donovan
S2 L3 CP20
Prerequisite or Corequisite: IROB5901 or equivalent
This subject follows an empirical and experiential approach to the study of human potentialities. Issues explored include: human dominance and destructiveness; the dynamics of awareness; intentionality and holonomy; skilled performance; human creativity; the individuation process; methods of realizing potential, perennial and modern.

IROB5920
Men and Women in Organisations
Staff Contact: Dr L Taksa
S2 L3 CP20
This subject presents a multi-disciplinary overview of the issues and problems pertaining to gender relations in organisations. It evaluates a range of concepts and methods necessary for understanding the processes and structures responsible for the current position of men and women as employees and managers in both the public and private sectors. Topics covered from the perspective of gender relations include: labour market segmentation, industrial relations theory and practice, the role of the state, organisational power and politics, Equal Employment Opportunities and the functioning of the merit principle and the use of post-modernist theory for understanding the operation of human resource management and organisational culture.

IROB5921
Management in Cross-Cultural Contexts
Staff Contact: School Office
SS L3 CP20
This subject examines how the dynamics of culture impact on the process of managing organisations in culturally diverse settings. Topics include: conceptual and methodological issues related to the study of culture; the psychological and sociological basis of cultural variation; the role of culture in shaping work-related cognitions; the problematics and implications of cultural variation for the functions of cross-cultural management such as inter-cultural communication; cross-cultural leadership; cross-cultural negotiation; and cross-cultural awareness. Other issues such as transferability and the convergence and divergence thesis are also addressed.

IROB5947
Performance Management
Staff Contact: School Office
SS L3 CP20
Prerequisite: IROB5900
The subject focuses on the coordination and execution of organisational work tasks. It covers the relation between organisational strategy and the purposes of separate units, setting objectives, formal monitoring and performance evaluation; appraisal systems and job design, performance related pay and remuneration. Critical issues centred on managing equity, affirmation action and equal opportunity and the role of social and work norms in performance are covered.

IROB5948
Human Resources Development
Staff Contact: School Office
SS L3 CP20
Prerequisite: IROB5900
This subject focuses on the skills, career and occupational development of people in organisations. Human resource planning, gap analysis of supply and demand, training, needs analysis, learning systems, program development, internal and external training policy, career planning and internal labour markets are key topics in the subject. Recruitment and selection, management development, employee contribution and trade union involvement are among other areas addressed.

LAND9111
Landscape Planning
Staff Contact: Mr D Crawford
CP12 S1 L2 T1
Introduction to the discipline of landscape planning. Explores a range of basic methods and techniques for the collection, analysis, and valuation of landscape resource data. Application of this knowledge in the development of simple landscape planning models. Participation in planning exercises applying these skills and knowledge using simple computing techniques.

LAND9212
Landscape Planning Methods
Staff Contact: Mr D Crawford
CP12 S2 L2 T1
Examination and comparison of a range of landscape planning methods using examples from Australia and overseas. Students conduct research relating to the physical parameters of models for land use evaluation and environmental impact assessment. Participation in planning exercises involving the application of these models using advanced computing techniques.

LAND9213
Land Systems and Management
Staff Contact: Ms A Todd
CP12 S2 L1 T2
An investigation of resources and their management in relation to a range of land use types with an emphasis on an ecological approach. Subject material includes consideration of management of cultural as well as natural landscapes. Studies of specific examples relating to the effects of human impacts are included. Methods of conservation and rehabilitation are considered. Field excursions are included.

LAND9214
Visual Landscape Assessment
Staff Contact: A/Prof F Thorvaldson
CP12 S2 L2 T1
Examination of visual analysis, assessment and evaluation techniques and their incorporation into landscape planning models. Research and study of recent Australian and
overseas examples of visual resource management programs. Students will undertake visual planning exercises using relevant computer software.

**LAND9215**
**GIS in Landscape Architecture**
*Staff Contact: Mr D Crawford*
*CP15 S1 L2T1*

Principles of geographic information systems, techniques of data collection, storage analysis, modelling and display. Applications and procedures specific to Landscape Architecture and Landscape Planning. Laboratory exercises using the IDRISI GIS.

**LAWS3409**
**Environmental Law and Policy**
*Staff Contact: School Office*
*CP30 F HPW2*

This subject examines environmental law in Australia in a policy setting. Environmental law is interpreted broadly to refer to all relevant regulatory frameworks, including both statutory and common law ones, as well as relevant international administrative and legal arrangements. The primary focus will be the NSW context, but environmental issues of a global, regional and national nature will also be addressed. The law will be examined in an inter-disciplinary way, referring to economic, sociological, historical and philosophical analysis, with reference being also made to comparative environmental law. Particular topics of a conceptual kind include: how environmental problems are defined and what form they take; competing values (e.g. anthropocentric versus ecocentric perspectives) and how such values are articulated (through, e.g., public participation) in order to develop public policy responses to environmental problems; and theoretical aspects of policy development and evaluation, referring to cost-benefit analysis and risk assessment, spillover effects, the nature of public goods, and issues of justice in the distribution of environmental costs and benefits. Consideration of legal techniques for giving effect to environmental policies will cover such matters as: property law, including private and common property rights, conservation covenants, heritage agreements; tort law; forward planning and the planmaking process; project control; environmental impact assessment; pollution control; self-regulatory measures; and issues of enforcement. Alternatives to legal regulation for the achievement of

**LAWS3410**
**Environmental Law Staff**
*Contact: School Office*
*CP15 SS HPW4*

This subject examines environmental law in both a theoretical and a practical sense. From the theoretical point of view, environmental law is considered through interdisciplinary perspectives in a policy setting. The non-legal perspectives in terms of which environmental law is considered include ecology, economics and philosophy. The practical orientation of the course is toward developing an understanding of the legal framework for environmental decision making in Australia, particularly in N.S.W. Topics to be covered include the relevance of ecology to environmental law, environmental ethics, international environmental law, Commonwealth powers with respect to the environment, a range of Commonwealth and NSW legislation relating to the environment, and different legal techniques for enhancing protection of the environment (eg. regulation through the criminal law, through traditional common law techniques such as nuisance and private covenants, through economic incentive schemes, and through systems of consents and licenses). Litigation and alternative dispute resolution techniques are examined. Attention is also given to: (1) the part played by political and administrative discretion in the field of environmental decision-making, with some emphasis on the tensions which exist between various levels and bodies of government; (2) the role of public participation in the decision making process; and (3) environmental law in other countries, particularly the U.S. Students are encouraged to take an interest in topical environmental issues.

**LAWS5020**
**Occupational Health and Safety Law**
*Staff Contact: Prof Adrian Brooks*
*CP15 SS HPW4*

The law relating to compensation for work-related injuries and disabilities and to the regulation of safety standards in workplaces. Topics include: the employer's common law duty of care; the common law duty of care of manufacturers of products for use at work; the development and application of workers' compensation schemes; existing protective legislation in Australia; individual rights under protective legislation.

**LEGT5511**
**Legal Foundations of Business**
*Staff Contact: School Office*
*S1 or S2 L3 CP20*

Law is an important foundation of modern business decisions. In any business decision fundamental legal questions may arise about the potential liabilities of the parties, the rights that the parties have and how the business or transaction should be organised. This subject introduces the Australian legal system; outlines alternative forms of business organisation; discusses the legal framework of business regulation; and examines areas of law particularly relevant to business such as the law of contract, law relating to specialised commercial transactions, the regulation of restrictive trade practices and sales promotion.

**LEGT5531**
**Legal Regulation of Business**
*Staff Contact: School Office*
*S2 L3 CP20*

*Prerequisite: LEGT5511 or equivalent or approval from the Head of School*

Trade practices and fair trading laws have assumed fundamental importance in the Australian market place. 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.
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, funding raising, enforcement of shareholders' rights, insolvency and liquidation.

The entire fabric of commerce is woven from a complex legal regime, judicial and statutory, which regulates all commercial activity. This subject deals with the Australian legal system; Commonwealth/State relations; Parliament and statute law; the courts and case law; the executive and administrative law; the legal process and its alternatives. This subject also introduces areas of substantive law relevant to commerce with particular reference to property law (with particular reference to intellectual property), torts law (with particular reference to negligence), contract law, criminal law, commercial entities and transactions, competition and consumer protection.

The marketing and distribution of goods and services operates within a comprehensive regulatory framework. This subject examines that framework. Topics include restrictive trade practices implications of distribution with special reference to collusive activity, exclusive dealing, resale price maintenance and abuse of market power; consumer protection and fair trading implications of sales promotion with particular reference to misleading or deceptive conduct and other unfair practices; advertising self regulation; product liability; protection of intellectual property; franchising, licensing and character merchandising.

Developments in technology, telecommunication and deregulation which have taken place in the latter part of this century have led to the creation of a global economy. This subject addresses the legal environment of this economy and aspects of its operation. Topics include the laws and practices relating to international sales agreements; arrangements for conducting business, including franchising; licensing, joint ventures and technology transfer; international financing arrangements; and the resolution of disputes.
MANF9400
Industrial Management
*Staff Contact: Dr B Kayis*
CP12 SS HPW3
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*
CP12 SS HPW3
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.

MANF9470
Production Management 1
*Staff Contact: A/Prof RM Kerr*
CP12 SS HPW3
Dynamics of industry competitiveness: Porter's Model; waste elimination and value adding management; material flow dynamics; production planning and control techniques including MRP, OPT and JIT; maintenance management; purchasing; physical distribution; manufacturing strategy and performance monitoring.

MANF9601
Economic Decisions in Industrial Management
*Staff Contact: Mr M Hasan*
CP12 SS HPW3
Concept of economic analyses. Cost concepts; interest and interest formulae. Methods for economy studies; present work, 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.

MARK2012
Marketing Fundamentals
*Staff Contact: School Office*
S1 or S2 L2 T2 CP15
**Prerequisites:** ACCT1511, ECON1102, ECON1203
**Corequisite:** MARK2032
This subject provides a conceptual framework for developing and understanding of marketing including the marketing process, marketing environment and marketing planning. It covers product, service, consumer, industrial, global and social aspects of marketing and introduces the marketing mix, market segmentation, positioning and product differentiation.

MARK2052
Marketing Research
*Staff Contact: School Office*
S1 or S2 L2 T2 CP15
**Prerequisite:** MARK2012, MARK2032
This subject examines the sources and types of marketing information relevant to marketing management. Topics include: problem definition and research design; questionnaire design; sampling; data collection; interpretation and reporting; management control of research including briefing, evaluation of proposals and distinction between research results and marketing implications; the use of continuous research; and new developments in market research.

MARK3043
International Marketing
*Staff Contact: School Office*
S2 L2 T1 CP15
**Prerequisites:** MARK2042 or MARK2052
Conceptual and environmental aspects of international marketing are dealt with. Using this knowledge, issues associated with developing practical marketing strategies appropriate to different world markets are then considered in detail.

MARK3073
Brand Management
*Staff Contact: School Office*
S1 L2 T2 CP15
**Prerequisite:** MARK2012, MARK2042
This subject provides an overview of marketing planning for products and services with a focus on planning at the brand level. Marketing concepts such as segmentation, differentiation, positioning and product lifecycle will be re-examined from a strategic perspective. The marketing mix will be expanded to address strategies of new product development, pricing, distribution and promotions management. Case analysis will be introduced to develop strategic thinking.

MARK3083
Strategic Marketing Management
*Staff Contact: School Office*
S2 L2 T2 CP15
**Prerequisite:** MARK3073
Concepts introduced in previous subjects will be broadened to address issues at the business unit level. Corporate mission, competitive stance of the organisation, pricing policies, trade relations, internal marketing and logistics will be addressed. The management of organisational resources such as financial and human resources are considered using, for example, portfolio analysis. Decision support systems are also examined.

MARK3093
Corporate Policy and Marketing Strategy
*Staff Contact: School Office*
S2 L2 T2 CP15
**Prerequisite:** MARK3073
The interface between marketing and other key functional areas within the organisation, such as finance, human resources and manufacturing are examined. Marketing's interface with areas outside the organisation, such as strategic alliances, joint ventures and partnership in global markets are also examined. Social, ethical, technological, legal and global issues are addressed. Case analysis will be used.
The central theme running throughout the teaching of the course is a blend of theory and practical application.

The central theme running throughout the teaching program is that marketing is not a fragmented assortment of actions and functions taking place among disconnected institutions operating in isolation. Rather it is a total system of business action. The task of managing a marketing operation involves strategic and tactical decision making. It also demands an understanding of the structure of the marketing system, the various institutions that make up that system, and the role of each institution that make up that system, and the role of each institution within the system.

Character and dimension of the political, economic, modernization (including administrative) and social aspects affecting international marketing; the dynamic relationship between the environmental aspects and international domestic marketing. Operational aspects of international marketing; nature of competition marketing structure and channels, trade barriers, etc., as well as international, regional, sub-regional economic groupings with emphasis on marketing in Asia, particularly Japan.

Exams the evolution of marketing systems and relation of the organisation to the social and economic environment. Key topics include growth options; developing competitive strategies and managing change. Central to the subject case analyses of marketing planning and policy, including environmental appraisal, organisational response, product policy, pricing, distribution, promotion and issues relating to consumerism and the development of legislation. Examples are drawn from the public and the private sectors.

Managerial elements of marketing is a unit that brings together a number of managerial components. While three dominant themes are usually present; sales planning and business-to-business negotiation, and legal aspects of marketing, other topics may be included, or may even replace one of the dominant themes completely to take advantage of the skills of visiting scholars. Students contemplating undertaking this subject should note that it includes a one-day negotiation workshop run on a weekend and is mandatory part of the course.
Complex numbers, vectors and vector geometry, linear equations, matrices and matrix algebra, determinants. Functions, limits, continuity and differentiability, integration, polar coordinates, logarithms and exponentials, hyperbolic functions, functions of several variables. Introduction to computing and the Maple symbolic algebra package.

MATH1141
Higher Mathematics 1A
Staff Contact: School of Mathematics First Year Office
CP15 S1 HPW6
Prerequisites: HSC mark range required: 2 and 3 unit Mathematics (145-150) or 3 and 4 unit Mathematics (180-200) (these ranges may vary from year to year.)
Note/s: Excluded MATH1011, MATH1032, MATH1042, MATH1131, ECON2200, ECON2201, ECON2202, ECON1202, ECON2290, ECON2291.

As for MATH1131 but in greater depth.

MATH1231
Mathematics 1B
Staff Contact: School of Mathematics First Year Office
CP15 S2 HPW6 or Summer Session HPW9
Prerequisite: MATH1131 or MATH1141
Note/s: Excluded MATH1021, MATH1032, MATH1042, MATH1241, ECON2200, ECON2201, ECON2202, ECON1202, ECON2290, ECON2291.


MATH1241
Higher Mathematics 1B
Staff Contact: School of Mathematics First Year Office
CP15 S2 HPW6
Prerequisite: MATH1131 or MATH1141, each with a mark of at least 70
Note/s: Excluded MATH1021, MATH1032, MATH1042, MATH1231, ECON2200, ECON2201, ECON2202, ECON1202, ECON2290, ECON2291.

As for MATH1231 but in greater depth.

MATH2009
Engineering Mathematics 2
Staff Contact: School of Mathematics Office
CP20 HPW4
Prerequisite: MATH1032 or MATH1231 or MATH1042 or MATH1241

Differential equations, use of Laplace transforms, solutions by series; partial differential equations and their solution for selected physical problems, use of Fourier series; introduction to numerical methods; matrices and their application to theory of linear equations, eigenvalues; introduction to vector field theory.

MATH2019
Engineering Mathematics 2CE
Staff Contact: School Office
CP15 F HPW3
Prerequisites: MATH1032 or MATH1231 or MATH1042 or MATH1241
Notes: Excluded MATH2009.

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.

MATH2021
Mathematics 2
Staff Contact: School of Mathematics Office
CP15 F HPW2
Prerequisite: MATH1021(CR) or MATH1032 or MATH1231 or MATH1042 or MATH1241
Note/s: Taught by the Keller plan self-paced learning method.

Differential equations, use of Laplace transforms, solutions by series; partial differential equations and their solution for selected physical problems, use of Fourier series; multiple integrals, matrices and their application to theory of linear equations, eigenvalues; introduction to numerical methods.

MATH2100
Vector Calculus
Staff Contact: School of Mathematics Office
CP7.5 S2 HPW2.5
Prerequisite: MATH1032 or MATH1231 or MATH1042 or MATH1241
Note/s: Excluded MATH2110, MATH2011.

Properties of vectors and vector fields; 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 of Mathematics Office
CP7.5 S1 or S2 HPW2.5
Prerequisite: MATH1032 or MATH1231 or MATH1042 or MATH1241
Note/s: 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.

MATH2819
Statistics SA
Staff Contact: School of Mathematics Office
CP10 F HPW2
Prerequisite: MATH1021 or MATH1032 or MATH1231 or MATH1042 or MATH1241
Note/s: Excluded MATH2130.

Probability, random variables, independence. Binomial, Poisson and normal distributions, transformations to normality, estimation of mean and variance, confidence intervals, tests of hypotheses, contingency tables, two sample tests of location, simple and multiple linear regression, analysis of variance for simple models.
Graphical data analysis, review of probability, random variables and their properties. The normal and binomial distributions, the central limit theorem, applications to quality control. Functions of random variables and their simulation using computers. One and two sample inference. Quality control. Functions of random variables and their distributions, the central limit theorem, applications to variables and their properties. The normal and binomial distribution.

Software subjects taught within courses offered by other schools and faculties.

**Applied Statistics SC**
Staff Contact: School of Mathematics Office
CP5 S1 HPW2
Prerequisite: MATH1032 or MATH1231 or MATH1042 or MATH1241

One and two sample inference. Quality control. Functions of random variables and their distributions, the central limit theorem, applications to variables and their properties. The normal and binomial distribution.

Vector calculus; special functions; convolution theorem and applications from fields of engineering will be investigated using computers. One and two sample inference. Quality control. Functions of random variables and their distributions, the central limit theorem, applications to variables and their properties. The normal and binomial distribution.

This subject is the first half of MATH3021. Students can make up for the lack of the prerequisite by work taken in Physics in Session 1 of Year 1 and enrol in the subject in Session 2.

Prerequisite: HSC mark range required Either 2 unit Science (Physics) 53-100, or 3 unit Science 90-150, or 4 unit Science multistrand 1-50 or 2 unit Industrial Arts (Engineering Science) 53-100, or 3 unit Industrial Arts (Engineering Science) 1-50

Corequisite: MATH1032 or MATH1131 or MATH1042 or MATH1141

This subject is the second half of MATH3021. The student must have been enrolled in MATH3030 previously and have a grade of EC in that subject. On completion of MATH3040 a grade will be returned for both MATH3030 and MATH3040.

Engineering Statics
Staff Contact: Dr CV Madhusudana
CP7.5 SS L2 T1
Prerequisites: As for MECH1300 Engineering Mechanics 1
Note/s: Excluded MECH0330, MECH0360, MECH1300.


Graphical Analysis and Communication
Staff Contact: Mr AJ Barratt
CP7.5 S2 L1 T2
Note/s: Excluded MECH0130.

Freehand sketching of machine components, standard drawing methods, orthogonal projections and sections for analysis and communication, dimensions, tolerances and conventional symbols. Computer graphics modelling of components, assembly and production of detail drawings.

This subject is the second half of MATH3021. No mark will be returned for this subject until MATH3040 is completed.

Note/s:

This subject is the first half of MATH3021. No mark will be returned for this subject until MATH3040 is completed.

Note/s:

This subject is the second half of MATH3021. The student must have been enrolled in MATH3030 previously and have a grade of EC in that subject. On completion of MATH3040 a grade will be returned for both MATH3030 and MATH3040.

Engineering Statics
Staff Contact: Dr CV Madhusudana
CP7.5 SS L2 T1
Prerequisites: As for MECH1300 Engineering Mechanics 1
Note/s: Excluded MECH0330, MECH0360, MECH1300.


Graphical Analysis and Communication
Staff Contact: Mr AJ Barratt
CP7.5 S2 L1 T2
Note/s: Excluded MECH0130.

Freehand sketching of machine components, standard drawing methods, orthogonal projections and sections for analysis and communication, dimensions, tolerances and conventional symbols. Computer graphics modelling of components, assembly and production of detail drawings.

This subject is the first half of MATH3021. No mark will be returned for this subject until MATH3040 is completed.

Note/s:

This subject is the second half of MATH3021. No mark will be returned for this subject until MATH3040 is completed.

Note/s:

This subject is the second half of MATH3021. The student must have been enrolled in MATH3030 previously and have a grade of EC in that subject. On completion of MATH3040 a grade will be returned for both MATH3030 and MATH3040.

MECH0440
Engineering Statics
Staff Contact: Dr CV Madhusudana
CP7.5 SS L2 T1
Prerequisites: As for MECH1300 Engineering Mechanics 1
Note/s: Excluded MECH0330, MECH0360, MECH1300.


MECH1110
Graphical Analysis and Communication
Staff Contact: Mr AJ Barratt
CP7.5 S2 L1 T2
Note/s: Excluded MECH0130.

Freehand sketching of machine components, standard drawing methods, orthogonal projections and sections for analysis and communication, dimensions, tolerances and conventional symbols. Computer graphics modelling of components, assembly and production of detail drawings.

This subject is the first half of MATH3021. No mark will be returned for this subject until MATH3040 is completed.

Note/s:

This subject is the second half of MATH3021. No mark will be returned for this subject until MATH3040 is completed.

Note/s:

This subject is the second half of MATH3021. The student must have been enrolled in MATH3030 previously and have a grade of EC in that subject. On completion of MATH3040 a grade will be returned for both MATH3030 and MATH3040.

**MECH0440**

**Engineering Statics**

Staff Contact: Dr CV Madhusudana
CP7.5 SS L2 T1

Prerequisites: As for MECH1300 Engineering Mechanics 1

Note/s: Excluded MECH0330, MECH0360, MECH1300.


**MECH1110**

**Graphical Analysis and Communication**

Staff Contact: Mr AJ Barratt
CP7.5 S2 L1 T2

Note/s: Excluded MECH0130.

Freehand sketching of machine components, standard drawing methods, orthogonal projections and sections for analysis and communication, dimensions, tolerances and conventional symbols. Computer graphics modelling of components, assembly and production of detail drawings.

**MECH1300**

**Engineering Mechanics 1**

Staff Contact: A/Prof RAJ Ford
CP10 S1 or S2 L2 T2

Prerequisite: HSC mark range required Either 2 unit Science (Physics) 53-100, or 3 unit Science 90-150, or 4 unit Science multistrand 1-50 or 2 unit Industrial Arts (Engineering Science) 53-100, or 3 unit Industrial Arts (Engineering Science) 1-50

Corequisite: MATH1032 or MATH1131 or MATH1042 or MATH1141

Note/s: Excluded MECH0330. Students can make up for the lack of the prerequisite by work taken in Physics in Session 1 of Year 1 and enrol in the subject in Session 2.


**MECH2300**

**Engineering Mechanics 2A**

Staff Contact: A/Prof KP Byrne
CP7.5 S1 or S2 L2 T1

Prerequisites: MATH1032 or MATH1231 or MATH1042 or MATH1241, MECH1300 or MECH0360

Note/s: Excluded MECH0430.

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.

**MECH2310**

**Engineering Mechanics 2B**

Staff Contact: Prof KP Byrne
CP5 S1 or S2 HPW2

Prerequisite: MECH2300

MECH2600
Fluid Mechanics 1
Staff Contact: Prof G.L. Morrison
CP10 F L1 T1
Prerequisites: MATH1032 or MATH1231 or MATH1042 or MATH1241, PHYS1919


MECH2700
Thermodynamics 1
Staff Contact: A/Prof E Leonardi
CP10 F L1 T1
Prerequisites: MATH1032 or MATH1231 or MATH1042 or MATH1241, PHYS1919


MECH9325
Fundamentals of Noise
Staff Contact: Dr JM Challen
CP12 SS HPW3
Note/s: Excluded MECH4321.


MECH9326
Advanced Noise
Staff Contact: Dr JM Challen
CP12 SS HPW3
Prerequisite: MECH4321 or MECH9325
Note/s: Excluded MECH4322.

The Helmholtz resonator. Transmission line formulae for one dimensional plane wave calculations. Development of the three dimensional acoustic wave equation. Applications of the three dimensional form of the acoustic wave equation in rectangular coordinates, including transmission of plane waves at oblique incidence between media, waves in rectangular ducts, standing waves in enclosures. Applications of the three dimensional wave equation in cylindrical and spherical coordinates. Basic structural-acoustic interaction.

MECH9400
Mechanics of Fracture and Fatigue
Staff Contact: Dr K Zarrabi
CP12 SS HPW3
Note/s: Excluded MECH4400.


MEED9102
Educational Process in Small Groups
Staff Contact: Mr A Hodgkinson
CP10 S1 HPW2

How people operate as members and leaders of groups; conditions underlying effective group work in educational planning, teaching and learning, and the provision of health care; basic concepts of group structure. Stress on experiential learning, observation of group process, improving skills in facilitating group learning and designing appropriate learning activities.

MEED9108
Program Evaluation and Planned Change
Staff Contact: Prof A Rotem
CP10 S2 HPW2

Designed to help participants develop skills in planning, conduct and evaluation of educational programs. Includes: preparation of a detailed proposal for evaluation of a program; various decisions and activities undertaken in program evaluation; processes of innovation and change.

MEED9125
Planning, Conducting and Evaluating Educational Workshops
Staff Contact: A/Prof R. Bandaranayake
CP10 S1 HPW2

In an attempt to develop their skills in all aspects of conducting workshops, participants are guided to formulate a plan for a workshop for their colleagues in an important educational area, with opportunity to practise various techniques for enhancing active participation, and subsequently to conduct the workshop, evaluate its process and outcomes, and report on it.

MICR2011
Microbiology 1
Staff Contact: Dr P March
CP15 S2 HPW6
Prerequisites: BIOS1101, BIOS1201, MICR2201
Corequisites: BIOC2201 and BIOS2201

This subject is for students majoring in microbiology and who wish to enlarge their knowledge and skills in microbiology beyond those obtained in Introductory Microbiology or equivalent subjects at other institutions.

MICR2201
Introductory Microbiology
*Staff Contact: Dr I Couperwhite*
CP15 S1 HPW6

This introduction to microbiology is offered as a single elective. However, the subject is mandatory for students wishing to major in program 4400 Microbiology and Immunology. Students with no previous knowledge of biology can do this subject.

MICR3041
Immunology I
*Staff Contact: Dr A Collins*
CP15 S2 HPW6
*Prerequisite: BI0C2201. Highly recommended: ANAT2211*

Basic immunology and immunological techniques. Topics include innate and adaptive immunity, development of the immune system, induction and expression of the immune response, structure and function of antibodies, antigen-antibody reactions, the major histocompatibility complex, aspects of immunity in disease.

MICR3051
Immunology 2
*Staff Contact: Dr A Collins*
CP15 S2 HPW6
*Prerequisite: MICR3041*

Advanced immunology. Major topics include antigen epitope analysis, processing and presentation, lymphocyte biology, immunogenetics of the molecules of recognition, cytokines, immune regulation, the mucosal immune system, immunity to infectious diseases, vaccine development and clinical immunology.

MICR3071
Environmental Microbiology
*Staff Contact: Prof S Kjelleberg*
CP15 S2 HPW6
*Prerequisite: MICR2201*

Highly recommended: MICR2011,BIOC2201, BIOS2021

The course consists of five major themes in basic and applied environmental microbiology: microbial ecology, genes and the environment, water and water pollution, biofilms, and environmental biotechnology. The main concepts include biodiversity, structures of microbial communities and microbial interactions. Specific topics in microbial ecology include biodiversity, microbial interactions and communities, biogeochemical cycling, adaptation to nutrient limitation, gene transfer and evolution and phylogeny. Specific topics in applied environmental microbiology include waste water treatment and water quality, biofouling, biological control, bioremediation, and the use of smart molecules produced by microorganisms.

MICR2218
Microbiology
*Staff Contact: Dr I Couperwhite*

Solely for students enrolled in the Food Technology courses in the Faculty of Applied Science.

MNGT0373
Organisational Design
CP10
*Prerequisite: MNGT0270 or consent of instructor*

Extends the structural analysis of organisations introduced in MNGT0270 or equivalent. Topics include power, informal organisation, management-by-objectives, entrepreneurship, compliance systems and structural change dynamics. Situational factors considered include the product life cycle and technology. Problems discussed include oligarchy, difficulties flowing from large size and from capital intensive, vertical integration.

PHPH5461
Principles of Pharmacology
*Staff Contact: Dr M Fryer*

This subject introduces the principles of pharmacology and also covers the systematic pharmacology of selected drug groups. It is designed for students with a background in biotechnology but with little or no knowledge of pharmacology. The subject covers topics such as dose response relationships, drug absorption, metabolism and elimination, autonomic pharmacology, autacoids, pharmacokinetics and toxicology.

PHPH5471
Advanced Pharmacology
*Staff Contact: Dr M Fryer*
CP24
*Prerequisites: PHPH3152, PHPH5461*

This subject is an advanced coverage of pharmacological topics including receptor binding, pharmacokinetics, drug assays, drug development, toxicology, autacoids and ion channels. The lecture material is supplemented by computerised analysis of data derived from experiments on receptor binding, dose response relationships and pharmacokinetics. Considerable emphasis is placed on the many aspects of drug development.

PHPH5481
Advanced Pharmacology Project Major
*Staff Contact: Dr M Fryer*
CP64

A laboratory or industry based project in the area of drug development.

PHPH5491
Advanced Pharmacology Project Minor
*Staff Contact: Dr M Fryer*
CP32

A small laboratory or industry based project or an extensive literature review or extensive data analysis in the area of drug development.

PROF0003
Qualitative Research Procedures
*Staff Contact: To be advised*
CP15 SS HPW2

This subject introduces students to the nature of, and methods for conducting naturalistic inquiry. Topics include the naturalistic research approach, naturalistic research questions, the naturalistic research process, qualitative data collection and analysis methods, qualitative program evaluation.
Physics Level I Subjects

Notes: Where mathematics subjects are specified as prerequisites or as corequisites, the higher levels of such subjects are acceptable and preferable. The total value of the combination of PHYS1022 and PHYS1002 is 45 Credit Points.

PHYS1002
Physics 1
Staff Contact: First Year Director
CP30 F HPW6
Prerequisites: HSC Exam Score Range Required: 2 unit Mathematics (90-100), or 2 and 3 unit Mathematics (100-150), or 3 and 4 unit Mathematics (100-200) or (for PHYS1002 only) MATH1011, and 2 unit Science (Physics) 57-100, or 2 unit Science (Chemistry) 60-100, or 3 unit Science 90-150, or 4 unit Science 1-50 or PHYS1022 (2 unit Mathematics in this instance refers to the 2 unit Mathematics subject which is related to the 3 unit Mathematics subject, and does not refer to the subjects Mathematics in Society or Mathematics in Practice).
Corequisite: MATH1021 or MATH1032 or MATH1131 and MATH1231.

Motion of particles under the influence of mechanical, electrical, magnetic and gravitational forces. Force, inertial mass, energy, momentum, charge, potential, fields. Conservation principles applied to problems involving charge, energy and momentum. Application of Kirchoff's laws to AC and DC circuits. Uniform circular motion, Kepler's laws and rotational mechanics. Properties of matter: solids, liquids, gases. Application of wave theories to optical and acoustical phenomena such as interference, diffraction and polarisation.

Mid-year Start

Students who fail Session 1 of PHYS1002 are strongly advised to discontinue the subject and enrol in Session 2 in PHYS1011 Physics I (FT1). This subject covers the Session 1 material of PHYS1002 during Session 2. Then PHYS1021 covers the rest of the syllabus over the Summer Session.

Note: The Session 2 syllabus of PHYS1002 is not repeated in Session 1 of the next year.

PHYS1022
Physics 1 For Health and Life Scientists
Staff Contact: First Year Director
CP30 F HPW6
Corequisites: MATH1021 or MATH1032 or MATH1131.

Principally for students majoring in the life and health sciences disciplines. Topics at an introductory level.

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, ions and ionic conduction, magnetism and electromagnetic induction, alternating current, atomic nature of matter, X-rays, the nucleus and radio-activity, geometrical optics, optical instruments, wave optics, microscopes and their uses.

PHYS1936
Physics 1 (Textile Management)
Staff Contact: First Year Director

Note/s: Not re-run in Summer Session.

Energy transfer: concepts of temperature and heat; calorimetry; gas laws; phase changes and humidity; heat transmission; refrigeration. Electrostatics and electromagnetism: electric and magnetic fields; DC circuits; electromagnetic induction. Sound: wave properties; absorption of sound. Properties of matter: atomic bond types and their relation to elasticity, plasticity and fracture; pressure in stationary and moving fluids.

PHYS2001
Mechanics, and Computational Physics
Staff Contact: Executive Assistant
CP15 S1 HPW4
Prerequisites: PHYS1002, MATH1032 or MATH1231.
Corequisite: MATH2011 or MATH2110
Note/s: Excluded PHYS2999.

Harmonic motion, systems of particles, central force problems, Lagrange's equations, coupled oscillations, travelling waves, pulses, energy and momentum transfer, computer operating systems, introduction to FORTRAN, libraries and software packages, use of computers to solve problems in physics.

PHYS2011
Electromagnetism and Thermal Physics
Staff Contact: Executive Assistant
CP15 S2 HPW4
Prerequisites: PHYS1002, MATH1032 or MATH1231
Corequisites: MATH2011 or MATH2110
Note/s: Excluded PHYS2999.

Electric field strength and potential, Gauss' law, Poisson's and Laplace's equations, capacitance, dielectrics and polarisation, magnetism, electro-magnetic induction, Maxwell's equations, electromagnetic waves. Laws of thermodynamics, kinetic theory, microscopic processes, entropy, solid state defects, Helmholtz and Gibbs functions, Maxwell's relations, phase diagrams, chemical and electrochemical potential.

PHYS2021
Quantum Physics and Relativity
Staff Contact: Executive Assistant
CP15 F HPW2
Prerequisites: PHYS1002, MATH1032 or MATH1231
Note/s: Excluded PHYS2989, PHYS2949.


PHYS2031
Laboratory
Staff Contact: Executive Assistant
CP15 F HPW3
Prerequisites: PHYS1002, MATH1032 or MATH1231
Note/s: Excluded PHYS2920.

Experimental investigations in a range of areas: x-ray diffraction, work function, semiconductor bandgap, Hall
effect, carrier lifetimes, nuclear magnetic resonance, magnetic properties and electrostatics. Electronics bench experiments and tutorials on diodes, transistors, operational amplifiers, power supplies and digital electronics.

Physics Level III Subjects
Note: See notes for Physics Level II subjects.

PHYS3021
Statistical Mechanics and Solid State Physics
Staff Contact: Executive Assistant
CP15 S1 HPW4
Prerequisites: MATH2120, PHYS2011, PHYS2021
Canonical distribution, paramagnetism, Einstein solid, ideal gas, equipartition, grand canonical ensemble, chemical potential, phase equilibria, Fermi and Bose statistics, Bose condensation, blackbody radiation. Crystal structure, bonding, lattice dynamics, phonons, free-electron models of metals, band theory, point defects, dislocations.

PHYS3060
Advanced Optics
Staff Contact: Executive Assistant
CP7.5 S2 HPW2
Prerequisite: PHYS1002
Corequisite: MATH2120
Review of geometrical optics, including ray tracing, aberrations and optical instruments: physical optics, including Fresnel and Fraunhofer diffraction, transfer functions, coherence, and auto and cross correlation: applications of optics, including fibre optics, lasers and holography.

PHYS3110
Experimental Physics B1
Staff Contact: Executive Assistant
CP7.5 S1 HPW4
Prerequisite: PHYS2031
Selected experiments and projects. Advanced experimental techniques and open ended projects in the areas covered in PHYS3041 Experimental Physics A together with projects involving electron and nuclear magnetic resonances, low temperature physics and super-conductivity. Fourier optics, holography.

PHYS3120
Experimental Physics B2
Staff Contact: Executive Assistant
CP7.5 S2 HPW4
Prerequisite: PHYS2031
As for PHYS3110 Experimental Physics B1.

PHYS3410
Biophysics
Staff Contact: Executive Assistant
CP7.5 S2 HPW2
Prerequisites: PHYS2011, PHYS2410

PHYS3710
Lasers and Applications
Staff Contact: Executive Assistant
CP7.5 S1 HPW2
Note/s: Offered in odd-numbered years only.
Interaction between light and matter, fundamental properties of laser amplifiers and oscillators, giant pulse generation, mode locking and Q switching, specific laser systems including gas lasers and semiconductor lasers, applications of lasers.

PHYS2920
Electronics (Applied Science)
Staff Contact: Executive Assistant
CP7.5 S1 HPW3
Prerequisite: PHYS1002 or PHYS1022
Note/s: Excluded PHYS2031, PHYS2630.
The application of electronics to other disciplines. Includes principles of circuit theory; amplifiers, their specification and application, transducers; electronic instrumentation; industrial data acquisition.

SCTS3106
Technology, Sustainable Development and the Third World
Staff Contact: John Merson
CP15 S1 HPW3
Prerequisite: As for SCTS2106
This subject is about sustainable development along with the technological and social changes that are involved in achieving it, both at a national and global level. It is divided into three parts: (1) the historical causes of the present global environmental and economic crisis; (2) possible solutions to problems of food production, environmental degradation, industrialisation, energy use, and population growth; (3) ideas for a New World Economic Order and the economic and technological changes required to bridge the ever increasing gap between rich and poor nations. Assessment: Essay, tutorials.

SCTS3116
The Political Economy of Energy and Sustainable Development
Staff Contact: Gavan McDonell
CP15 S2 HPW3
Prerequisite: As for SCTS2106
Assessment: Essays, tests, tutorials.
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 full list of undergraduate courses and degrees offered see Table of Courses by Faculty (Undergraduate Study) in the Calendar.

The following is the list of higher degrees, graduate diplomas and graduate certificates of the University, together with the publication in which the conditions for the award appear.

Higher Degrees

For details of graduate degrees by research and course work, arranged in faculty order, see UNSW Courses (by faculty) in the Calendar.

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**Graduate Diplomas**

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Doctor of Philosophy (PhD)

1. The degree of Doctor of Philosophy may be awarded by the Council on the recommendation of the Higher Degree Committee of the appropriate faculty or board (hereinafter referred to as the Committee) to a candidate who has made an original and significant contribution to knowledge.

Qualifications

2. (1) A candidate for the degree shall have been awarded an appropriate degree of Bachelor with Honours from the University of New South Wales or a qualification considered equivalent from another university or tertiary institution at a level acceptable to the Committee.

(2) In exceptional cases an applicant who submits evidence of such other academic and professional qualifications as may be approved by the Committee may be permitted to enrol for the degree.

(3) If the Committee is not satisfied with the qualifications submitted by an applicant the Committee may require the applicant to undergo such assessment or carry out such work as the Committee may prescribe, before permitting enrolment as a candidate for the degree.

Enrolment

3. (1) An application to enrol as a candidate for the degree shall be lodged with the Registrar at least one month prior to the date at which enrolment is to begin.

(2) In every case before making the offer of a place the Committee shall be satisfied that initial agreement has been reached between the School* and the applicant on the topic area, supervision arrangements, provision of adequate facilities and any coursework to be prescribed and that these are in accordance with the provisions of the guidelines for promoting postgraduate study within the University.

(3) The candidate shall be enrolled either as a full-time or a part-time student.

(4) A full-time candidate will present the thesis for examination no earlier than three years and no later than five years from the date of enrolment and a part-time candidate will present the thesis for examination no earlier than four years and no later than six years from the date of enrolment, except with the approval of the Committee.

(5) The candidate may undertake the research as an internal student i.e. at a campus, teaching hospital, or other research facility with which the University is associated, or as an external student not in attendance at the University except for periods as may be prescribed by the Committee.

(6) An internal candidate will normally carry out the research on a campus or at a teaching or research facility of the University except that the Committee may permit a candidate to spend a period in the field, within another institution or elsewhere away from the University provided that the work can be supervised in a manner satisfactory to the Committee. In such instances...
the Committee shall be satisfied that the location and period of time away from the University are necessary to the research program.

(7) The research shall be supervised by a supervisor and where possible a co-supervisor who are members of the academic staff of the School or under other appropriate supervision arrangements approved by the Committee. Normally an external candidate within another organisation or institution will have a co-supervisor at that institution.

Progression

4. The progress of the candidate shall be considered by the Committee following report from the School in accordance with the procedures established within the School and previously noted by the Committee.

(i) The research proposal will be reviewed as soon as feasible after enrolment. For a full-time student this will normally be during the first year of study, or immediately following a period of prescribed coursework. This review will focus on the viability of the research proposal.

(ii) Progress in the course will be reviewed within twelve months of the first review. As a result of either review the Committee may cancel enrolment or take such other action as it considers appropriate. Thereafter, the progress of the candidate will be reviewed annually.

Thesis

5. (1) On completing the program of study a candidate shall submit a thesis embodying the results of the investigation.

(2) The candidate shall give in writing to the Registrar two months notice of intention to submit the thesis.

(3) The thesis shall comply with the following requirements:

(a) it must be an original and significant contribution to knowledge of the subject;

(b) the greater proportion of the work described must have been completed subsequent to enrolment for the degree;

(c) it must be written in English except that a candidate in the Faculty of Arts and Social Sciences may be required by the Committee to write a thesis in an appropriate foreign language;

(d) it must reach a satisfactory standard of expression and presentation;

(e) it must consist of an account of the candidate's own research but in special cases work done conjointly with other persons may be accepted provided the Committee is satisfied about the extent of the candidate's part in the joint research.

(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.

Master of Applied Science (MAppSc) and Master of Environmental Studies (MEnvStudies)

1. The degree of Master of Applied Science or Master of Environmental Studies by formal course work may be awarded by the Council to a candidate who has satisfactorily complete a program of advanced study.

Qualifications

2. (1) A candidate of the degree shall:
   (a) have been awarded an appropriate degree of Bachelor of four full-time years duration (or the part-time equivalent) 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 Applied Science (hereinafter referred to as the Committee), or
   (b)(i) have been awarded an appropriate degree of Bachelor of three full-time years duration (or the part-time equivalent) 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 and
   (ii) have undertaken appropriate postgraduate studies of the full-time year's duration (or the part-time equivalent) at the University of New South Wales or studies 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 attainments 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 enrolment is to begin.

   (2) A candidate for the degree shall be required to undertake such formal subjects including the submission of a report on a project, and pass such assessment as prescribed. The project shall be under the supervision of an academic staff member and shall be assessed by two examiners (for a major project).

   (3) The progress of a candidate shall be reviewed at least once a year 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 two academic sessions from the date of enrolment in the case of a full-time candidate and 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, eight sessions for a part-time candidate, and ten sessions for an external 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.

"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.

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 the recommendation of the Higher Degree Committee of the appropriate faculty (hereinafter referred to as the Committee) to a candidate who as demonstrated ability to undertake research by the submission of a 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 attainments as may be approved by the Committee may be permitted to enrol for the degree.

(3) When the Committee is not satisfied with the qualifications submitted by an applicant the Committee may require the applicant, before being permitted to enrol, to undergo such examination or carry out such work as the Committee may prescribe.

Enrolment and Progression

3. (1) An application to enrol as a candidate for the degree shall be made on the prescribed form which shall be lodged with the Registrar at least one calendar month before the commencement of the session in which enrolment is to begin.

(2) In every case, before permitting a candidate to enrol, the head of the school in which the candidate intends to enrol shall be satisfied that adequate supervision and facilities are available.

(3) An approved candidate shall be enrolled in one of the following categories:

(a) Full-time attendance at the University;
(b) Part-time attendance at the University;
(c) external not in regular attendance at the University and using research facilities external to the University

(4) A candidate shall be required to undertake an original investigation on an approved topic. The candidate may also be required to undergo such examination and perform such other work as may be prescribed by the Committee.

(5) The work shall be carried out under the direction of a supervisor appointed from the full-time members of the University staff.

(6) The progress of a candidate shall be reviewed annually by the Committee following a report by the candidate, the supervisor and the head of the school (or department) 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 has 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 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 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.
(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 represent the same thesis and submit to a further oral, practical or written examination within a period specified by it but not exceeding eighteen months.
(4) The Committee shall, after consideration of the examiners' reports and the reports of any oral or written or practical examination, recommend whether or not the candidate may be awarded the degree. If it is decided that the candidate be not awarded the degree the Committee shall determine whether or not the candidate may resubmit the thesis after a further period of study and/or research.

Fees

6. A candidate shall pay such fees as may be determined from time to time by the Council.
Master of Engineering (ME), Master of Science (MSc) and Master of Surveying (MSurv) without supervision

1. The degree of Master of Engineering or Master of Science or Master of Surveying 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.

Qualifications

2. A candidate for the degree shall have been awarded an appropriate degree of Bachelor from 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 a candidate for the degree without supervision shall be made on 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. (a) A candidate shall submit a thesis embodying the results of the investigation.

(b) The candidate shall give in writing to the Registrar two months notice of intention to submit the thesis.

(c) 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.

(d) The candidate may also submit any work previously published whether or not such work is related to the thesis.

(e) 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 theses for higher degrees.

(f) 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 (or department) 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 a concise report on 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 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 represent 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.

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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 (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 subjects and pass such assessment as prescribed, or

(b) demonstrate ability to undertake research by the submission of a thesis embodying the results of an original investigation of an approved topic, or

(c) undertake an approved combination of the above in which case the thesis component shall be referred to as a project report.

(3) The program of advanced study shall total a minimum of 120 credit points. The number of credit points allocated for each subject 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 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.
36 to 48 Project Report

4. (1) A candidate who undertakes a 36 to 48 credit points project shall carry out the work on an approved topic under the direction of a supervisor appointed from the full-time academic members of the University staff.

(2) The candidate shall give in writing to the Registrar two months notice of intention to submit a project report.

(3) The project report or 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 project report or thesis shall be presented in a form which complies with the requirements of the University for the preparation and submission of project reports and theses for higher degrees.

(6) It shall be understood that the University retains the three copies of the project report or thesis submitted for examination and is free to allow the project report or thesis to be consulted or borrowed. Subject to the provisions of the Copyright Act, 1968, the University may issue the project report or thesis in whole or in part, in microfilm or other copying medium.

Examination of 36 to 48 Credit Point Project Report

5. (1) There shall be not fewer than two examiners of the project report, 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 project report and shall recommend to the Committee that:

(a) the project report be noted as satisfactory; or

(b) the project report be noted as satisfactory subject to minor corrections being made to the satisfaction of the head of the school; or

(c) the project report be noted as unsatisfactory but that the candidate be permitted to resubmit it in a revised form after a further period of study and/or research; or

(d) the project report be noted as unsatisfactory and that the candidate be not permitted to resubmit it.

(3) The Committee shall, after considering the examiners' reports and the candidate's results of assessment in the prescribed formal subjects, recommend whether or not the candidate may be awarded the degree. If it is decided that the project report is unsatisfactory the Committee shall determine whether or not the candidate may resubmit it 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 Environmental Studies (MEnvStudies)

See Master of Applied Science above.
Master of Safety Science (MSafetySc)

1. The degree of Master of Safety 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 (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 lodge 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 degree shall be required to undertake such formal subjects and pass such assessment as prescribed. The program of advanced study shall total a minimum of 45 credits. The number of credits allocate for each subject shall be determined by the Committee on the recommendation of the Course Director (hereinafter referred to as the head of the school).

(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 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 six academic sessions from the date of enrolment for a full-time candidate and ten sessions for a part-time candidate. In special cases an extension of these times may be granted by the Committee.

48 credit point Project Report

4. (1) The program of advanced study may include a 48 credit point project on an approved topic.

(2) The work shall be carried out under the direction of a supervisor appointed from the full-time academic members of the University staff.

(3) The candidate shall give in writing to the Registrar two months notice of intention to submit a report on the project.

(4) Three copies of the project report shall be presented in a form which complies with the requirements of the University for the preparation and submission of project reports for higher degrees.

(5) It shall be understood that the University retains the three copies of the project report submitted for examination and is free to allow the project report to be consulted or borrowed. Subject to the provisions of the Copyright Act, 1968, the University may issue the project report in whole or in part, in microfilm or other copying medium.

Examination of 48 credit point Project Report

5. (1) There shall be not fewer than two examiners of the project report, appointed by the Committee.

(2) At the conclusion of the examination each examiner shall submit to the Committee a concise report on the project and shall recommend to the Committee that:

(a) the project report be noted as satisfactory; or
(b) the project report be noted as satisfactory subject to minor corrections being made to the satisfaction of the head of the school; or
(c) the project report be noted as unsatisfactory but that the candidate be permitted to resubmit it in a revised form after a further period of study and/or research; or
(d) the project report be noted as unsatisfactory and that the candidate be not permitted to resubmit it.

(3) The Committee shall, after considering the examiners' reports and the candidate's results of assessment in the prescribed formal subject, recommend whether or not the candidate may be awarded the degree. If it is decided that the project report is unsatisfactory the Committee shall determine whether or not the candidate may resubmit it 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 Science (MSc)

See Master of Engineering above.

Master of Science (MSc) without supervision

See Master of Engineering without supervision above.

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 attainments 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 prescribed, 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 subjects 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.

Master of Technology Management MTM

1. The degree of Master of Technology Management by formal course work 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 considered acceptable to the Course Committee. This is normally either:
   (a) a four year degree, or,
   (b) a three year degree plus either another qualification at an acceptable level, or, other academic or professional attainments (including relevant work experience).

(2) An applicant who submits evidence of such other academic and professional qualifications as may be approved by the Committee may be permitted to enrol in the degree.

If the Committee is not satisfied with the qualifications submitted by an applicant the Committee may require that the applicant undergo such assessment, or carry out such work, as the Committee may prescribe before permitting enrolment.

Enrolment and Progression

3. An application to enrol as a candidate for a 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.

A candidate for the degree shall be required to undertake such formal subjects and pass such assessments 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 or take such other action as it considers appropriate.

No candidate shall be awarded the degree until the lapse of at least two academic sessions from the date of enrolment in the case of full time enrolment or four academic sessions in the case of part time enrolment. The maximum period of enrolment shall be 4 academic sessions for a full time candidate and 8 academic sessions for a part time candidate. In special cases variations to 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.
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 ‘Uniken/Focus’.

Students investigating study opportunities overseas should also consult Study Abroad which is published by UNESCO and is available in the University library. The British Council (02 9326 2365) may be of assistance for information about study in Britain. The Australian-American Education Foundation (06 247 9331) 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 Employment, Education, Training and Youth Affairs (DEETYA) can be obtained from the Awards and Exchanges Section, DEETYA, 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 Unit, c/- the Student Centre (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 or Engineering). If a scholarship is available to all students it will be listed in the General Scholarships section.

For further information contact:
The Scholarships Unit
The University of New South Wales
Sydney 2052 Australia
Tel (02) 9385 3100/3101/1462
Fax (02) 9662 1049
Email: R.Plain@unsw.edu.au

Scholarships for students entering the first year of an undergraduate course

General

The Alumni Association Scholarships (I,L)

- Up to $1,500 pa
- 1 year with the possibility of renewal

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 the University of New South Wales. Applications close mid-January.

The Australian Development Co-operation Scholarship (ADCOS) (I)

- Tuition fees. Some students may be eligible for airfares and a stipend
- Determined by normal course duration

This award is for international students from selected countries only. Information and application forms should be obtained from the Australian Education Centre or Diplomatic Post in the home country. The award conditions and entitlements vary depending on the home country. The closing date is normally early in the year before the year of study.

The Australian Vietnam Veterans Trust Education Assistance Scheme (L)

- $3,500 pa for the duration of the course

Applicants must be a child of a Vietnam veteran and under the age of 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 2000 (02 9281 7077). 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 should have an outstanding ability in a particular sport and are expected to be an active member of a UNSW Sports Club. Apply directly to the Manager, Sports Association, UNSW, Sydney 2052 Australia. Tel (02) 9385 6022, Fax (02) 9385 6180.

The UNSW Co-Op Program (L)

- $10,400 pa and between 9 and 20 months industry training
- The duration of the course subject to satisfactory progress

The scholarships are offered by industry groups through the University in the three faculties of Applied Science, 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 TER of around 90 is expected. The Co-op Application Form is available from school Careers Advisers or the Co-op Office on (02) 9385 5116. Applications close September 30 with interviews held at the end of November and beginning of December.

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 John Niland Scholarships (L)

- $5,000
- 1 year

The scholarship provides assistance to enhance the opportunity of students from country high schools in Australia to enrol in an undergraduate program of study at UNSW. Applicants will be students who complete the HSC (or its counterpart matriculation requirement) in the top five percent of their state-wide cohort, having been enrolled at a country high school in Australia. Selection will be based on academic merit, potential to contribute to the wider life of the University and consideration of social and/or economic circumstances which might otherwise hinder successful transition to UNSW. Applications close 30 October.

The National Health and Medical Research Council (NH&MRC) Aboriginal Health Research Scholarships (L)

- $22,250
- Up to 3 years

Applicants may be undertaking an undergraduate degree in order to pursue research relevant to Aboriginal health. Applications close mid-July.

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 Unit once known.

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 each year.

 Faculty of Applied Science

Students planning to undertake year one of a bachelors degree in any school of the Faculty of Applied Science can apply for the Malcolm Chaikin Foundation Scholarship.

The Malcolm Chaikin Foundation Scholarship (L)

- Up to $9,000 pa
- 1 year 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 Faculty of Applied Science. Applications close early January.

School of Materials Science and Engineering

Ceramic Engineering

The Australasian Ceramic Society Scholarship (L)

- Up to $400 pa
- 1 year renewable for the duration of the course subject to satisfactory progress

Applicants must be eligible for admission to year 1 of the full-time degree course in ceramic engineering. Applications normally close at the end of January.

The Clay Brick Association Scholarship (L)

- Up to $2,500 pa
- 1 year renewable for the duration of the course subject to satisfactory progress

Applications normally close at the end of January.

A new scholarship is only offered when the current scholarship recipient completes his/her course. It is expected that a new award will be available in 1997.

The CSR Building Scholarship (L)

- Up to $1,000 pa
- 1 year renewable for the duration of the course subject to satisfactory progress

Applications normally close at the end of January.
The Monier PGH Scholarship (L)
- Up to $1,000 pa
- 1 year renewable for the duration of the course subject to satisfactory progress
Applicants must be eligible for admission to year 1 of the full-time degree course in ceramic engineering. Applications normally close at the end of January.

The Thomson Family Scholarship (L)
- Up to $1,000 pa
- 1 year renewable for the duration of the course subject to satisfactory progress
Applicants must be eligible for admission to year 1 of the full-time degree course in ceramic engineering. Applications normally close at the end of January.

Metallurgy

The Sir Rupert Myers Scholarship (I,L)
- Up to $2,500 pa
- 1 year renewable for the duration of the course subject to satisfactory progress
The scholarship is available to students who are permanent residents of Australia or whose parents are permanent residents of Australia. Applicants must be eligible for admission to Year 1 of the full-time degree course in Metallurgy or Metallurgical Engineering. Applications normally close at the end of January.

The Coca-Cola South Pacific Export Corporation Scholarship (L)
- Up to $1,800 pa
- 1 year renewable for the duration of the course subject to satisfactory progress
Applicants must not be more than 22 years of age on 1 December of the year preceding the year in which the award commences. Applicants must be eligible for admission to year 1 of the full-time degree course in food science and technology. Applications normally close at the end of January.

The George Weston Foods 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 year 1 of the full-time degree course in Food Science and Technology. Applications normally close at the end of January.

School of Applied Bioscience

Food Science and Technology

The Alumni Association Scholarships (I,L)
- Up to $1,500 pa
- 1 year with the possibility of renewal
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 the University of New South Wales. Applications close early January.

The Australian Vietnam Veterans Trust Education Assistance Scheme (L)
- $3,500 pa for the duration of the course
Applicants must be a child of a Vietnam veteran and under the age of 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 2000 (tel 02 9281 7077). 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 should have an outstanding ability in a particular sport and are expected to be an active member of a UNSW Sports Club. Apply directly to the Manager, Sports Association, UNSW, Sydney 2052. Tel (02) 9385 6022, Fax (02) 9385 6180.

The Girls Realm Guild Scholarship (L)
- Up to $1,500 pa
- 1 year with the prospect of renewal subject to satisfactory progress and continued demonstration of need
The scholarships are available only to female students under 35 years of age who are enrolling in any year of a
full-time undergraduate course. Selection is based on academic merit and financial need. Applications close 25 March.

The Minproc Engineering Limited Scholarship (L)
- $6500 pa
- 1 year renewable for the duration of the course subject to satisfactory progress

The scholarship is available to a student entering either Year 3 or 4 of the Bachelor of Engineering Science course with subject content in the fields of Engineering or Mineral Chemistry, or a Bachelor of Engineering with majors in the fields of Chemical, Metallurgical or Mechanical Engineering, or related courses. Applications close early March.

The National Health and Medical Research Council (NH&MRC) Aboriginal Health Research Scholarships (L)
- $22,250
- Up to 3 years

Applicants may be undertaking an undergraduate degree in order to pursue research relevant to Aboriginal health. Applications close mid 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 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) Undergraduate Encouragement Award (L)
- $600 lump sum

Applicants must be in the later stage of an undergraduate degree and interested in undertaking a research project related to the Australian pig industry. Applications close 3 times a year (ie 1 March, 1 July, 1 October).

The Sam Cracknell Memorial Scholarships (L, L)
- Up to $1,500 pa
- 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 Telstra Education Fellowships (L)
- $7,500
- 1 year

Applicants must be in the final year of study in the disciplines of computer, electrical or electronic engineering or computer science. Applications normally close at the end of July.

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 and Science. A letter of application should be sent to Pasminco Mining, PO Box 460, Broken Hill, NSW 2880. Applications close 30 September.

Faculty of Applied Science

Students undertaking the final year of an undergraduate course in any school of the Faculty of Applied Science may be eligible to apply for the Spruson and Ferguson Scholarship for Innovation in Applied Science.

The Spruson and Ferguson (Patent Attorneys) Scholarship for Innovation in Applied Science (L)
- The value may vary each year
- 1 year

The scholarship is available to students undertaking the final year of an undergraduate course in any school of the Faculty of Applied Science. Applicants are required to submit an application and a 200 word outline of their proposed research topic. Applications close early March.

School of Fibre Science and Technology

Wool and Animal Science

NSW Farmers Association E.L. O’Brien Scholarship (L)
- Up to $2,000 pa
- 1 year

The NSW Farmers Association is offering a scholarship for a student entering Year 4 of the Wool and Pastoral Sciences course. Applicants must be a member, or child of a member of the Association. Applications close early March.
School of Materials Science and Engineering
Metallurgy

The Pasminco Scholarship (L)
• Up to $1,000 pa
• 1 year
One scholarship is available for a student entering Year 4 of the Bachelor of Metallurgical Engineering. A letter of application should be sent direct to the School of Materials Science and Engineering. Applications close early March.

School of Mines

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 the University of New South Wales. 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). Applications close 31 March.

The Dyno Wesfarmers Blasting Scholarship (L)
• Up to $7,000 pa
• 2 years
The scholarship is available for Years 3 and 4 of the Mining Engineering course, subject to satisfactory progress. The scholarship is offered every second year and will be offered again in 1998.

The Komatsu Scholarship (L)
• Up to $2,000 pa in two equal instalments
• 1 year
The scholarship is available to the student with the best performance in Year 3 and entering Year 4 of the Mining Engineering course. The student is nominated by the School there is no application.

The Mintech Scholarship (L)
• Up to $1,000 pa
• 1 year
The scholarship is to be awarded to a full-time student in the final year of the Mining Engineering degree at the University of New South Wales. 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 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, undertaking 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.

Shell Coal Undergraduate Scholarship
• $10,000 pa
• up to 3 years subject to satisfactory progress
The scholarship is available to students in the second year of the Mining Engineering degree at the University of New South Wales. Selection will be based on academic performance in the first year of the degree. 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.

Centre for Petroleum Engineering

The Society of Petroleum Engineers Pty Ltd (L)
• Up to $2,500
Applicants must have completed the first two years of any accredited Engineering program. Applications and enquiries should be directed to the Society of Petroleum Engineers in the student’s home state.
Honours Year Scholarships

General

The Alumni Association Scholarships (L,L)
• Up to $1,500 pa
• 1 year with the possibility of renewal
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 the University of New South Wales. Applications close 13 January.

The Apex Foundation for Research into Intellectual Disability Studentships (L,L)
• $1,000 paid in a lump sum
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 by 31 May.

The Australian and New Zealand Council for the Care of Animals in Research and Teaching (ANZCCART) Student Award (L,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 08 303 7325). Applications close in July.

The Australian Vietnam Veterans Trust Education Assistance Scheme (L)
• $3,500 pa for the duration of the course
Applicants must be a child of a Vietnam veteran and under the age of 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 Bachelor's course. Applications and further information are available from the Australian Vietnam Veterans Trust National Office, PO Box K978, Haymarket NSW 2000 (tel 02 9281 7077). 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 should have an outstanding ability in a particular sport and are expected to be an active member of a UNSW Sports Club. Apply directly to the Manager, Sports Association, UNSW, Sydney 2052. Tel (02) 9385 6022, Fax (02) 9385 6180.

The Girls Realm Guild Scholarships (L)
• Up to $1,500 pa
• 1 year with the prospect of renewal subject to satisfactory progress and continued demonstration of need
The scholarships are available only to female students under 35 years of age who are enrolling in any year of a full-time undergraduate course. Selection is based on academic merit and financial need. Applications close 25 March.

The Grains Research and Development Corporation (GRDC) Undergraduate Honours Scholarship (L,L)
• $6,000 (ie $5,000 to the student and $1,000 to the host School/Department).
• 1 year
Applicants must be undertaking a full-time Honours program. Study in an area of significance to the grains industry will be viewed favourably. A letter of application, including a curriculum vitae, academic record, letter of support from the Head of School/Department and 2 referees' supporting statements, should be sent to GRDC Undergraduate Honours Scholarship, PO Box E6, Queen Victoria Terrace, Canberra ACT 2600 (06 2725528). Applications close late November.

The Great Barrier Reef Marine Park Authority Research Support (L,L)
• $1,500
Applicants must be undertaking a full-time Honours year or PhD research project that could contribute to the planning and managing work undertaken by the Great Barrier Reef Marine Park Authority. Applications and further information may be obtained from the Executive Officer, Great Barrier Reef Marine Park Authority, PO Box 1379, Townsville QLD 4810 (tel 077 818811). Applications close mid-December.

The Mitsui Education Foundation Scholarship (L)
A one month 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 aged between 20-24 and preferably in their third or fourth year. The successful student will travel to Japan during November and December. Application forms become available in June and close mid-July.
The National Health and Medical Research Council (NH&MRC) Aboriginal Health Research Scholarships (L)

- $22,250
- Up to 3 years

Applicants may be undertaking an undergraduate degree in order to pursue research relevant to Aboriginal health. Applications close mid-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 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) Undergraduate Encouragement Award (L)

- $600 lump sum

Applicants must be in the later stage of an undergraduate degree and interested in undertaking a research project related to the Australian pig industry. Applications close 3 times a year (ie 1 March, 1 July, 1 October).

The River Basin Management Society Ernest Jackson Memorial Research Grants (I,L)

- Up to $2,000

The scholarship is available to assist students undertaking research in the field of River Basin Management. Applications close on 11 August.

The RSPCA Alan White Scholarship (I,L)

- $2,500

Applicants should be undertaking original research to improve the understanding and welfare of animals. A letter of application should be sent to the Executive Officer, RSPCA Australia, PO Box E369, Queen Victoria Terrace, Canberra ACT 2600 (tel 06 2311437) by 31 March.

The Sam Cracknell Memorial Scholarship (I,L)

- Up to $1,500 pa
- 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 University Honours Year Scholarships (I,L)

- $1,000
- 1 year

A number of scholarships will be awarded on the basis of academic merit for students entering an 'add-on' honours year, ie the honours year in a degree course which is normally a pass degree but which has the option of a further year of study at Honours level. Applications close 30 November.

The W.S. and L.B. Robinson Scholarship (L)

- Up to $6,500 pa
- 1 year renewable for the duration of the course subject to satisfactory progress

Applicants must have completed their schooling in Broken Hill or have parents who reside in Broken Hill. Applicants should be undertaking a course related to the mining industry, for example courses in Mining Engineering, Geology, Electrical and Mechanical Engineering, Metallurgical Process Engineering, Chemical Engineering and Science. A letter of application should be sent to Pasminco Mining, PO Box 460, Broken Hill, NSW 2880. Applications close 30 September.

Faculty of Applied Science

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 undertaking 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.
Travel Scholarships

General

The Arthur Anderson Study Abroad Scholarship (L)
- Up to $2,500
The scholarship is to provide financial assistance to students in their second or third year of full-time study who wish to study abroad for one semester at an approved Asian university. The overseas study must count towards their UNSW degree. Students must satisfy the language and literacy requirements of the approved university. Candidates will be required to complete an application form at least four months prior to the commencement of the scholarship. Further information is available from the International Student Centre. Tel (02) 9385 5333.

The Association of International Education Japan (AIEJ)
Short-Term Student Exchange Promotion Program (Inbound)
Peace and Friendship Scholarships (I,L)
- 50,000 yen (settling-in allowance), 100,000 yen per month, plus airfare
- Ten months to one year
Applicants must be accepted by a Japanese university under a student exchange program agreement with UNSW. Students must initially apply directly to a Japanese university through the 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 Association of International Education Japan (AIEJ)
Short-Term Student Exchange Promotion Program (inbound) Scholarships (I,L)
- 50,000 yen (settling-in allowance), 80,000 yen per month, plus airfare
- Six months to one year
Applicants must be accepted by a Japanese university under a student exchange program agreement with UNSW. Students must initially apply directly to a Japanese university through the 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.

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 (in January and February 1997) 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 International Exchange Travel Scholarships (L)
- Up to $1,500 pa
- 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. Interested students should contact the International Student Centre, tel (02) 9385 5333.

The Mitsui Education Foundation Scholarship (L)
A one month 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 aged between 20-24 and preferably in their third or fourth year. The successful student will travel to Japan during November and December. Application forms become available in June and close mid-July.
The National Asian Languages Scholarship (L)

Students who have completed two years of tertiary level language study can apply to undertake advanced language study in Asia for 6 to 12 months. Applications close 15 September.

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 NSW Ministry for the Arts, GPO Box 5341, Sydney 2001 (02 228 5533). Applications normally close in July.

The Robert Sutton/ Jardine Matheson Scholarship (L)

- Up to $1,000

This scholarship is available to provide an Honours year student, from either the Faculty of Commerce or from the Faculty of Arts, with assistance to undertake a semester of study in Asia which would count towards their degree. Further information is available from the International Student Centre.

The Swiss Confederation Scholarships (L)

One scholarship may be available from The Swiss Confederation for art studies (for example, painting, graphic design, sculpture, music) in the 1997/1998 academic year. The scholarship will be awarded on the basis of academic merit and the possibilities for study in Switzerland. Applicants must have been born after 1 January 1962. The scholarship can only be allocated after the candidate has been accepted by a Swiss art school or conservatory. Applicants will be required to pass a language test in German or French. Applications close 1 December 1996.

The STA Travel Grant (L,L)

- Up to $3,000

Applicants must be undertaking study leading to a degree or diploma of the University and be members of the University Union. The grant is awarded on the basis of significant contribution to the community life of the University involving a leadership role in student affairs and the University Union and the relevance and merit of the proposed travel to the student’s academic program or University Union activities. Applications close 30 April each year.
Graduate Scholarships

Following are details of scholarships available to postgraduate students at UNSW.

The scholarships are listed by Faculty and course (eg scholarships in Science or Engineering) or whether they are available to undertake travel. If a scholarship is available to all students it will be listed in the General Scholarships section.

For further information contact:
The Scholarships Unit
The University of New South Wales
Sydney 2052 Australia
Tel (02) 9385 3100/3101/1462
Fax (02) 9662 1049
E-mail: R.Plain@unsw.edu.au

General Scholarships

Main programs of assistance for postgraduate study

The Australian Postgraduate Awards (APA) (L, R)

- $15,364 pa (1996 rate). Other allowances may also be paid
- Up to 2 years for a Masters, 3 years for a PhD degree. PhD students may apply for up to 6 months extension in certain circumstances

Applicants must have graduated, or be proposing to graduate in the current academic year, with Honours 1 or equivalent. The scholarships are available to undertake a Masters by Research or PhD. Students with Permanent Resident status must have lived in Australia continuously for 12 months. Applications close in late October.

The Australian Development Co-operation Scholarship (ADCOS) (I, R, C)

- Tuition fees. Some students may be eligible for air fares and a stipend
- Determined by normal course duration

This award is for international students from selected countries only. Information should be obtained from Australian Diplomatic Posts or Australian Education Centres in the home country. Conditions and entitlements vary depending on the home country.

The Overseas Postgraduate Research Scholarships (OPRS) (I, R)

- Tuition fees and medical cover only
- 2 years for a Masters, 3 years for a PhD

Eligibility is confined to postgraduate research students who are citizens of countries other than Australia or New Zealand. Applications close in late September.

Other General Scholarships

The Arthritis Foundation Research Scholarships (L, R)

- $8,000 $22,000 pa
- 1 year with a possible 2 year extension

Applicants must be enrolled in studies leading to a PhD or MD. Awards are offered for clinical, scientific and allied health professional research and professional education projects. Specific awards relate to studies of rheumatoid arthritis, osteoporosis, ankylosing spondylitis, lupus, scleroderma, fibromyalgia and Paget's Disease. Applications close with the Foundation in early June.

The Australian Brewers Foundation Alcohol Related Medical Research Postgraduate Scholarships (I, L, R)

- Similar to the NH&MRC (see NH&MRC entry)
- 1 year

Similar to the NH&MRC. The scholarships are available to support research into the medical, social and public health aspects of moderate, hazardous or harmful alcohol consumption. Applications close in mid-September.

The Australian Coral Reef Society (ACRS) Inc Student Grants (L, I, R, C)

- $1,000 (plus $1,500 Walker prize for the best proposal)

The grant is open to students at any Australian University who are enrolled in a PhD or MSc involving research on coral reefs. Recipients must be a member of, or be willing to join the ACRS. Applications normally close in late November.

The Australian Federation of University Women (L, I, 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, 8th Floor,
The Australian Institute of Nuclear Science and Engineering (AINSE) Postgraduate Research Awards (L, I, R)
- $7,500 supplement to an APA or equivalent scholarship (see APA entry under General), plus allowances
- Up to 3 years

Applicants must be in receipt of an APA or equivalent scholarship and have completed (or expect to complete) a Bachelor of Engineering or Bachelor of Science with Honours. At least one quarter of the period of tenure must be spent at the Institute at Lucas Heights, NSW. Applications close in early December.

The Australian and New Zealand Council for the Care of Animals in Research and Teaching (ANZCCART) Student Award (L, I, 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 08 303 7325). Applications close in July.

The Australian Pain Relief Association and Australian Pain Society PhD Scholarship (L, R)
- $16,750 pa plus allowances
- Up to 3 years (subject to satisfactory progress)

Applicants must hold an Honours 1 degree and be proposing to undertake a PhD in the mechanism, diagnosis, treatment or epidemiological features of acute or chronic (including cancer) pain. Further information and applications are available from the Australian Pain Society Secretariat, PO Box 629, Willoughby NSW 2068 (tel 02 9439 6744). Applications close in early November.

The Australian Telecommunications and Electronics Research Board (ATERB) Postgraduate Scholarships (L, R)
- $9,000 intended as a supplement to other awards
- 1 year with the possibility of renewal

Applications are available from the Secretary, ATERB, PO Box 93, North Ryde, NSW 2113 (02 9887 6221). Applications normally close in late October.

The BHP Asia Pac Scholarship at UNSW (I, C)
- $10,000
- 1 year

The scholarship is open to citizens or permanent residents of Indonesia only. Applicants must be graduates of a recognised university who are eligible to enrol in a Master's by coursework degree at UNSW. The scholarship may be restricted to a particular coursework degree, to be determined. Selection will be based on academic merit, and the reasons for the proposed course of study, and may consider financial need. Applications close 31 October.

The Community Health and Anti-Tuberculosis Association The Harry Windsor Biomedical and Medical Research Scholarship (L, R)
- $22,250 pa (Medical postgraduates), $15,364 $19,827 pa (Biomedical Science graduates) plus allowances
- Up to 3 years

Applicants must be proposing to undertake medical research in the areas of tuberculosis, respiratory disease (particularly community aspects) or community health. Applications close in early August.

The Cooperative Research Centre for Eye Research and Technology (CRCERT) Postgraduate Research Scholarship (L, I, R)
- $15,321 $19,827 pa (depending on the type of research)
- 3 years

The scholarship is available for full-time PhD studies in subjects such as optometry, microbiology, biochemistry, optics, materials science, polymer chemistry and immunology. Applicants should initially contact Dr Mark Wilcox, CRCERT, University of New South Wales, Sydney 2052 (02 9385 0222) for information about application procedures.

The Clean Air Society of Australia and New Zealand Inc Postgraduate Research Award (L, I, 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 in early February.

The CSIRO Division of Fisheries Supplementary PhD Awards (L, R)
- $10,000 pa
- Up to 3 years

This scholarship is a supplement to any primary scholarship (eg APA) for PhD study in marine studies, environmental studies, zoology, botany, broadly-based life sciences, economics and mathematics. Applications close in early March.
The Dairy Research and Development Corporation (DRDC) Postgraduate Education Program (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 Unit or DRDC, PO Box 8000, Glen Iris VIC 3146 (03 9889 0577). Applications close 31 October.

The Energy Research and Development Corporation (ERDC) Postgraduate Awards (L, R, C)

• $21,000 pa plus $3,000 operating expenses to the supporting institution
• Up to 3 years
ERDC awards are based on academic excellence or a proven track record of excellence in research which indicates potential to contribute to the energy industry. Projects should be relevant to ERDC's objectives for its investments. Applications close in late September.

The Garnett Passe and Rodney Williams Memorial Foundation Research Scholarships in Otolaryngology (L, I, 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 late July.

The Gerontology Foundation Grant-In-Aid (L, I, R, C)

• Up to $5,000 for a specific research project
A Grant-In-Aid is 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 in late July.

The Gowrie Scholarship Trust Fund (L, R, C)

• $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 in 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 in mid-October.

The Great Barrier Reef Marine Park Authority Research Support (L, I, R)

• $1,000
Applicants must be enrolled in a full-time PhD with a research project that could contribute to the planning and managing work undertaken by the Great Barrier Reef Marine Park Authority, and to the Reef's ecologically sustainable development. Studies may be in a variety of areas and can involve any aspect of the physical, biological, social, cultural, and economic environments of the Great Barrier Reef. Students proposing communication and extension-related studies can also apply. Applications and further information may be obtained from the Director, Research and Monitoring Section, Great Barrier Reef Marine Park Authority, PO Box 1379, Townsville QLD 4810 (07 7818811). Applications close in early December.

The Harold G. Conde Memorial Fellowship (L, R, C)

• $5,000 pa, subject to the availability of funds
• Up to 3 years
Applicants should be honours graduates. The Fellowship is a supplementary award to be held in conjunction with another scholarship and is for postgraduate study or research in a field related to the electricity industry. Applications close in early April.

The International Wool Secretariat Postgraduate Scholarships (L, I, R)

• $21,362 pa plus allowances
• Up to 3 years
The scholarships are tenable in Australian tertiary institutions or, in exceptional circumstances, overseas. The major areas of research are soils and pastures-production and utilisation, sheep breeding, sheep parasites and diseases, wool harvesting, processing and product development, raw wool marketing, economic research and technology transfer in all of these areas. Applications close in mid-October.
The June Opie Fellowship (L, I, R, C)
- NZD$10,000
- 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 early October.

Land and Water Resources Research and Development Corporation (LWRRDC)
Postgraduate Research Scholarships (L, I, 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 within the irrigation industries. Applications are available from the Scholarships Unit or LWRRDC, GPO Box 2182, Canberra ACT 2601 (tel 06 2573379). Applications close in early October.

The Meat Research Corporation (MRC)
Studentships and Junior Research Fellowships (L, R, C)
- $14,961 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 and training in “off-farm” disciplines of practical value to the Australian beef, sheep meat, goat meat and buffalo industries. Applications normally close in mid-August.

The Minerals Council of Australia Student Research Award (L, I, 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 related to mining. The award will be judged on a paper written for and presented at the Minerals Council of Australia’s Environmental Workshop. Nominations usually close in early May.

The National Drug Strategy (NDS)
Postgraduate Research Scholarship (L, I, R)
- $23,204 pa
- 1 year, with a possible 2 year extension
Scholarships are available to students undertaking PhD studies and aim to develop expertise in researching and evaluating non-biomedical approaches to the prevention and treatment of drug misuse. Selection is based on academic merit, work experience and the potential of the project. Applications close in mid-July.

The National Health and Medical Research Council (NH&MRC) Aboriginal Health Research Scholarships (L, R)
- $15,364 $22,850 pa (depending on qualifications)
- Up to 3 years
Applicants must be undertaking a course which includes, or leads to, research relevant to Aboriginal health. Applications close in mid-July.

The National Health and Medical Research Council (NH&MRC) Dora Lush Postgraduate Scholarships (L, R)
- $15,364 pa (or $19,307 for AIDS research, $17,364 for special initiative scholars) plus allowances
- Up to 3 years
Applicants should have completed a Science degree with Honours, or equivalent, at the time of submission of the application. Students enrolled in the Honours year at the time of application are not eligible. Applications close mid-July.

The National Health and Medical Research Council (NH&MRC) Medical and Dental Postgraduate Scholarships (L, R)
- $22,850 pa plus allowances
- Up to 3 years
The scholarships are open to medical and dental graduates. Applications are particularly encouraged for postgraduate research in the following fields: alcohol and substance abuse, prostate cancer, nursing and allied health services, breast cancer, dementia, schizophrenia, dentistry and dental services, injury and HIV/AIDS. Applications close in mid-June.
The National Health and Medical Research Council (NH&MRC) Public Health Postgraduate Scholarships (L, R)

- $22,000 pa (medical postgraduates), $19,500 pa (other postgraduates), plus allowances
- Up to 2 years for Masters, and up to 3 years for a PhD

The scholarship is designed to enable postgraduate students to obtain formal academic training in public health research. Applications close in mid-June.

The National Heart Foundation of Australia Postgraduate Medical and Science Research Scholarships (L, R)

- $16,364 (science), $22,250 (medical) plus $1,200 departmental allowance
- 1 year, renewable up to 3 years

The scholarship is available for research in cardiovascular function, disease or related problems. Applicants must usually reside in Australia. Medical applications close in mid-May and Science applications close in early October.

The National Tertiary Education Union (NTEU) Scholarship for the Study of Industrial Relations and Unionism in Australian Tertiary Education (L, I, 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. Applications close in early November.

The National Multiple Sclerosis Society of Australia Postgraduate Research Scholarships (L, R)

- Same as NH&MRC 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 in mid-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 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 Research Fellowship (L, R)

- $25,000 pa plus allowances
- Up to 3 years

Applicants must be undertaking a PhD relevant to the increased competitiveness of the Australian pig industry. Applications close in mid-December.

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 in mid-December.

The Re-Entry Scholarship for Women (L, I, R, C)

- $15,364 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 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 written application and curriculum vitae should be forwarded to the Scholarships Unit, UNSW. Applications close 31 October.

The River Basin Management Society Ernest Jackson Memorial Research Grants (L, I, R)

- Up to $2,000

The scholarship assists PhD and Masters students undertaking research in the field of river basin management. Applications usually close in May and November each year.

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 Australian Postgraduate Award or equivalent university postgraduate awards. Applicants may be enrolled in economics, commerce or arts degrees. 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)
Applications close in late October.

**The RSPCA Alan White Scholarship (L, I, R)**
- $2,500
Applications should be undertaking original research to improve the understanding and welfare of animals. Applications close in mid-March.

**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. The scholarships are available to foster research in disciplines compatible with the SRDC’s research priorities. Applications close in mid-September.

**The Shell Postgraduate Scholarship (L, R)**
- $20,000 pa
- Up to 3 years
Applicants should intend to study a PhD in science, engineering, economics/commerce, computer science, or a closely related discipline. Applications close in mid-October.

**The Social Policy Research Centre (SPRC) Postgraduate Research Scholarship (L, I, R)**
- $15,364 pa (equivalent to the APA), plus allowances
- 3 years for a PhD
Applicants should have 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. Applications close in mid-October.

**The Wenkart Foundation Grants (L, I, R)**
- Up to $22,000 pa
- 2 years but may be renewed
Applicants must be undertaking full-time research in clinical, biomedical or health related clinical sciences. Applications close in mid-May.

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**Faculty of Applied Science**

**School of Materials Science and Engineering**

**The Sir Rupert Myers Postgraduate Scholarship in Materials Science and Engineering (L, I, R, C)**
- $5,000 pa
- 1 year, renewable up to 3 years

Applicants must hold an Honours degree in materials science or engineering, or a related field. The scholarships are available for study towards a postgraduate degree in the School of Materials Science and Engineering. Information is available from the School of Materials Science and Engineering, University of New South Wales, 2052. Applications close in December.
### General Travel Scholarships

**AAUW Educational Foundation International Fellowships (L, I, R, C)**
- **US$15,065**
- **1 year**

The American Association of University Women (AAUW) offers Fellowships for full-time postgraduate study or research in the United States for one academic year. Applicants must be females who have earned the equivalent of a United States Bachelor's degree and who are not US citizens or permanent residents. Preference will be given to women who show prior commitment to the advancement of women and girls through civic, community or professional work. Members of the Australian Federation of University Women (AFUW) may also be eligible for AAUW-IFUW awards for advanced training at any overseas institution. Application packs are available from the Scholarships Unit or the AAUW Educational Foundation, 2201 N. Dodge St, Dept 67, Iowa City, IA 52243 USA. Applications close in late November.

**The ACSANZ Postgraduate Awards for Canadian Studies (L, I, R)**
- **$3,000 towards a research trip to Canada**

The Association for Canadian Studies in Australia and New Zealand will offer grants to postgraduate students wishing to undertake a short research trip to Canada. Applicants must be enrolled in Master's or Doctoral degrees at Australian or New Zealand universities, and grants will be for research into all areas of academic enquiry that have a distinctly Canadian orientation, for example in the humanities, social and political sciences and some branches of the health and environmental sciences. Enquiries and applications should be directed to the Academic and Cultural Relations Officer, Canadian High Commission, Commonwealth Avenue, Canberra, ACT 2600. Tel (06) 273 3844, Fax (06) 270 4083, E-mail: co.cnbra@cnbra01.x400.gc.ca

**The Asian Studies Library Awards (ASLA) (L, R)**
- **$250 to $800 in a lump sum**

Applicants must be undertaking a Masters by Research or PhD. The award provides a contribution towards the travel costs to centres with Asian collections to undertake library research. Further information and application forms are available from the Project Co-ordinator, Asian Studies Library Awards, Collection Management Division, Library ANU, Canberra ACT 2600. Applications close in mid June.

**The Association of International Education Japan (AIEJ) Short-Term Student Exchange Promotion Program (Inbound) Scholarships (L, I, 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.

**The Association of International Education Japan (AIEJ) Short-Term Student Exchange Promotion Program (Inbound) Peace and Friendship Scholarships (L, I, R, C)**
- **4,000 pounds sterling**
- **At least 3 months**

Applicants must be enrolled as postgraduate students at Australian higher education institutions and usually resident in Australia. Awards are available for study in the United Kingdom in any discipline. Applications close with the Executive Director, Australian Vice-Chancellors' Committee, GPO Box 1142, Canberra ACT 2601 in late October.

**The Australian Bicentennial Scholarships and Fellowships Scheme (L, R, C)**
- **$250 to $800 in a lump sum**

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, 8th Floor, Dymocks Building, 428 George Street, Sydney NSW 2000 (02 9232 5629).

**The British Aerospace Australia Chevening Scholarship (L, R, C)**
- **Tuition fees, maintenance allowance, airfare**
- **1 year**

The scholarship is available to undertake an approved one-year MSc course in aerospace engineering at a British university. Applicants must hold, or expect to complete before October 1996, 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 Scholarship (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.

The Cambridge Australia Scholarships (including Packer Scholarships) (L, R)

- Tuition fees, airfare, maintenance allowance
- Up to 3 years

The scholarships are open to postgraduate students who have an Honours 1 degree from an Australian university, who have gained admission to Cambridge and who are successful in winning an Overseas Research Student Award (ORS) awarded by Cambridge, for PhD studies in subjects relevant to Australia's needs. Scholarship application forms should be requested from Cambridge when applying for admission. Information on how to apply is available from the Honorary Secretary, Australian Committee of the Cambridge Commonwealth Trust, c/o Dept of Classics, ANU, Canberra ACT 0200. Tel (06) 249 2913/8830, Fax (06) 249 5039. Applications for admission to Cambridge close 31 December and scholarship applications close 30 April in the following year.

The Cancer Research Fellowship Programme (L, I, R)

- Travel expenses and living allowances
- 1 year

Applicants should be engaged in research in medical or 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.

The Commonwealth Scholarship and Fellowship Plan (CSFP) (L, R, C)

- Varies for each country. Generally covers travel, living, 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 are graduates. 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 ineligible). Applications are available from the Program and Development Officer, Australian-American Foundation, GPO Box 1559, Canberra City ACT 2601 (06 247 9331). E-mail: lindy@aaef.anu.edu.au. Applications close 30 September.

DAAD – The German Academic Exchange Service Scholarships (L, I, R, C)

Application forms and information (including closing dates) for the following scholarships are available from the Consulate General of the Federal Republic of Germany, PO Box 204, Woollahra NSW 2025.

One-Year Scholarships

- Monthly allowance between DM1,000 and DM1,600, 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 DM1,600, 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 30 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 1997)

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 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, I, R, C)

- Accommodation, monthly stipend of US$600, tuition fees, health insurance plus allowances
- 12 months with a possible 1 year extension

The Fellowships are available for postgraduate study at the University of Hawaii, preferably at Masters level. Citizens of countries in Asia, the Pacific and the United States 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. Information sheets only are available from the Scholarships Unit. Applications close in early October.

Frank Knox Memorial Fellowships (L, R, C)

- $US14,500 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 the graduate schools of Harvard University. Applications close in early October.

The Fulbright Postgraduate Student Awards (L, I, R)

- Up to $US24,000 depending on the type of award, with the possibility of other allowances (eg return airfares and tuition fees)
- 1 year

Applicants must be enrolled in a postgraduate degree at an Australian institution and wishing to undertake research at an American institution. Students planning to undertake an American higher degree in any field can apply for the Fulbright Student Awards. Students proposing to undertake study in engineering, visual and performing arts, statistics (and related disciplines) and the links between educational institutions, workplaces and communities or Aboriginal and Torres Strait Islander people can apply for the Privately Sponsored Postgraduate Student Awards. Students proposing study in an American Master of Business Administration can apply for the David O. Anderson Scholarship sponsored by the Chase Manhattan Bank Australia Ltd. Applicants for the David O. Anderson Scholarship should contact the Program Development Officer, AAEP, GPO Box 1559, Canberra ACT 2601 (06 2479331). Other applicants should contact the Honorary Secretary, Fulbright NSW State Selection Committee, Sydney University 2006 (02 93514464).

The Golda Meir Scholarship (L, I, R, C)

- Tuition (some allowances may be paid)
- 1 year

The Golda Meir scholarships are available to graduates, with a major field of study 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 Caulfield VIC 3162 (tel 03 9272 5511).

The Gowrie Scholarship Trust Fund (L, R, C)

- $4000 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. Applications close in early October.

The Harkness Academic Fellowships (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 studies in health care and related community issues. Applications are available on written request from the Harkness Fellowship, PO Box 836, Belconnen ACT 2606. Applications close in early September.

The Harkness Mid-Career Fellowships (L, R, C)

- Professional travel allowance
- 7-12 months

The Mid-career Fellowships are for study and practical experience. Applicants should be active in the public, business or voluntary sectors with an outstanding record of achievement. Special consideration may be given to studies in health care and related community issues. Applications are available on written request from the Harkness Fellowship, PO Box 836, Belconnen ACT 2606. Applications close in early September.

The International Wool Secretariat Postgraduate Scholarships (L, I, R)

- $21,362 pa plus allowances
- Up to 3 years

The scholarships are tenable in Australian tertiary educational institutions or, in exceptional circumstances, overseas. The major areas of research are soils and pastures-production.
and utilisation, sheep breeding, sheep parasites and diseases, wool harvesting, processing and product development, raw wool marketing, economic research and technology transfer in all of these areas. Applications close in mid-October.

Japanese Government (Monbusho) Research Scholarships (L, R)

- Monthly allowance, airfare, tuition fees plus other allowances may be payable
- Up to 2 years

The scholarships are tenable for research study at Japanese universities, in a field related to the applicants' first course of study. Applicants must be university graduates, under 35 years of age, who are willing to study the Japanese language. Applications normally close in late June.

The Kobe Steel Postgraduate Scholarship (L, R, C)

- Maintenance allowance of at least 7,000 pounds sterling plus tuition fees and travelling expenses.
- Up to 2 years with the possibility of extension.

The scholarship is tenable at St Catherine's College, Oxford University. The scholarship will be awarded to outstanding individuals who display qualities of leadership, excellence in sport as well as academic ability. Students should have a past or future interest in Japan. Applications normally close in late June.

The Lady Davis Fellowship Trust (L, I, R, C)

The Lady Davis Trust provides awards for study, research, or teaching at graduate, post-doctoral or professorial levels at the Hebrew University or the Technion (Israel Institute of Technology). Information is available from the Australian Friends of the Hebrew University, 36 Hawthorn Road, South Caulfield VIC 3162 (03 9272 5511). Applications normally close in November.

The Lloyd’s Register of Shipping Chevening Scholarship (L, R, C)

- Tuition fees, maintenance allowance, airfare
- 1 year

Two scholarships are available to graduates, of 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)

- $14,961 pa for study in a Masters or Diploma, $20,000 for a PhD in Australia or $US17,500 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 and training in "off-farm" disciplines of practical value to the Australian beef, sheep meat, goat meat and buffalo industries. Applications normally close in mid-August.

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 2001 (02 223 5244). Applications normally 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 New South Wales Ministry for the Arts, GPO Box 5341, Sydney NSW 2000. Tel (02) 9228 3533, Fax (02) 9228 4722.

The Oxford Nuffield Medical Fellowship (L, R)

- Between 27,525 and 31,945 pounds sterling pa (subject to tax), plus travel expenses
- 2 years with a possible 1 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 793, Canberra City ACT 2601. Tel (06) 247 5777, Fax (06) 257 4620. Applications close in mid-March.

Overseas Research Students Awards Scheme (United Kingdom) (L, I, 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 Rhodes Scholarship (L, R, C)
- Not less than 6,900 pounds sterling pa, tuition fees and assistance with travel expenses
- 2 years, with a possible 1 year extension
The scholarship is tenable 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, including community spirit. Applications close in late August.

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 graduate schools of Harvard University. Applicants must be postgraduates of an Australian tertiary institution who intend to return to Australia after studies at Harvard or to represent Australia overseas. The scholarships are awarded on the basis of academic excellence and personal qualities such as leadership and public duty. The successful applicant will be expected, when circumstances permit, to repay the scholarship in later years. Applications and additional information may be obtained from the Administrative Services Group, ANU, Canberra ACT 0200. Tel (06) 249 5444, E-mail: Jane.Sutton@anu.edu.au. Applications close at the end of December.

The STA Travel Grant (L, I, R, C)
- Up to $3,000
Applicants must be undertaking study leading to a degree or diploma of the University and a member of the University Union. The grant is awarded on the basis of significant contribution to the community life of the University involving a leadership role in student affairs and the University Union and the relevance and merit of the proposed travel to the student's academic program or University Union activities. Applications close in mid-April.

Yokahama Scholarship Awards (L, R, C)
- 120,000 yen per month undergraduate, 150,000 yen per month for postgraduate students, tuition fees, airfare plus allowances
- Up to 4 years (undergraduate), 1 year for Japanese language study, 2 years for a Masters, 3 years for a PhD
Applicants must have submitted their application to, or have been accepted by a Japanese university and be able to communicate in Japanese (or be willing to undertake intensive study of the Japanese language). Applicants in all disciplines are eligible except for medicine, veterinary science and dentistry. Scholarships will be granted subject to the applicant's final acceptance by the chosen Japanese university. Original application forms only will be accepted and are available from the Scholarships Unit or from the Yokahama Scholarship Foundation, tel (07) 5588 0880, fax (07) 5588 0842. Applications close with the Foundation in early October.
The following information summarises prizes awarded by the University. Prizes which are not specific to any School are listed under General. All other prizes are listed under the faculty, school or department in which they are awarded. Law prizes are awarded only for students enrolled in the LLB or Jurisprudence courses.

Information regarding the establishment of new prizes may be obtained from the Student Information and Systems Office located on the Ground Floor of the Chancellery.

The scholarship information is normally provided in the following format:

- Amount
- Conditions

### Undergraduate Prizes

**The University of New South Wales (General category for Prizes)**

**The Sydney Technical College Union Award**

- $400.00 and a bronze medal

Leadership in student affairs combined with marked academic proficiency by a graduand

**Human Rights Centre**

**The UNSW Human Rights Centre Essay Prize**

- $400.00

The best research essay on a Human Rights topic by a student enrolled at the University of New South Wales proceeding to the award of a Bachelor degree

**School of Chemical Engineering and Industrial Chemistry**

**The Abbott Laboratories Pty Limited Prize**

- $200.00

The best performance in Year 4 of the Bachelor of Engineering degree course in Chemical Engineering

**The Australasian Corrosion Association (NSW Branch) Award**

- $150.00 and a 1 year membership of the Association

The best performance in INDC3041 Corrosion in the Chemical Industry

**The Australian Institute of Energy (AIE) Prize**

- $150.00

The best performance in a subject selected by the Head of School

**The Australian Paper Manufacturers Limited Prize**

- $200.00

The best performance in INDC3070 Instrumentation and Process Control 1 in the Industrial Chemistry degree course
The Australian Paper Manufacturers Limited Prize
• $200.00
The best performance in CHEN3070 Process Control in the Chemical Engineering degree course

The BHP Engineering Prize
• $150.00
The best performance in Year 3 of the Bachelor of Engineering in Chemical Engineering course

The BOC Gases Prize
• $200.00
Meritorious performance in CHEN4081 Design Project

The Bristol-Myers Prize
• $150.00
Meritorious performance in CHEN4030 Safety and Environmental

The Cargill Australia Prize
• $500.00
The best performance in CHEN4120 Process Plant Management and Operation

The Carlton and United Breweries Prize
• $300.00
Meritorious performance in CHEN4120 Process Plant Management and Operation

The Comalco Aluminium (Bell Bay) Prize
• $250.00
Meritorious performance in CHEN4090 Research Project

The Comalco Aluminium (Bell Bay) Prize
• $250.00
The best performance in the Bachelor of Engineering in Chemical Engineering course

The Comalco Aluminium (Bell Bay) Prize
• $250.00
The best performance in CHEN4030 Safety and Environment

The Dorr-Oliver Prize
• $200.00
The best performance in CHEN3040 Separation Processes 1

The Dow Corning Prize
• $300.00
The best performance in CHEN4081 Design Project

The Dow Corning Prize
• $300.00
The best performance in CHEN4090 Research Project

The Dow Corning / SCM Chemicals Prize
• $500.00
The best performance in the Environmental Management component of CHEN4100 Professional Electives

The Du Pont / Waste Service NSW Prize
• $300.00
Meritorious performance in the Environmental Management component of CHEN4100 Professional Electives

The Fuel Technology Staff Prize
• $200.00
The best performance in FUEL4090 Fuel and Energy Research Project

The Goodman Fielder Ingredients Prize
• $250.00
The best performance in CHEN3090 Chemical Engineering Applications

The Hoechst Australia Prize
• $200.00
Meritorious performance in CHEN4120 Process Plant Management and Operation

The Johnson Matthey Prize
• $400.00
The best performance in the Industrial Chemistry degree course

The National Starch & Chemical Prize
• $500.00
The best performance in POLY3010 Polymer Science

The RGC Prize
• $200.00
The best performance in MINP4010 Hydrometallurgical Processes

The RGC Prize
• $200.00
The best performance in CEIC2010 Instrumental Analysis
The Shell Prize
• $100.00
The best performance by a student in Year 2 or equivalent part-time stage of the Chemical Engineering or Industrial Chemistry courses, including sporting and student activities

The Shell Prize
• $200.00
The best performance by a student in Year 3 or equivalent part-time stage of the Chemical Engineering or Industrial Chemistry courses, including sporting and student activities

The Shell Prize
• $200.00
The best performance by a student in Year 4 or equivalent part-time stage of the Chemical Engineering or Industrial Chemistry courses, including sporting and student activities

The Shell Prize
• $100.00
For a student who has, in the opinion of the Head of School, performed some meritorious activity of note either inside or outside the University

The Western Mining Corporation Limited Prize
• $150.00
The best performance in CHEN3080 Chemical Engineering Laboratory 2

School of Geography

The Jack Mabbutt Medal
• A bronze medal
The best performance in the Year 4 Project in Applied Geography by a student in the Bachelor of Science degree course

The Jack Mabbutt Prize
• $150.00
Best performance by a third year student proceeding to Geography at Honours level

School of Materials Science and Engineering

The ACI Glass Packaging Prize
• $200.00
Outstanding quality in an honours thesis in one of the areas of glass or glass-ceramics in the Bachelor of Engineering degree course in Ceramic Engineering

The ANSTO Prize
• $100.00
The best performance in year four in the Bachelor of Engineering degree course in Ceramic Engineering

The Austral Bricks Prize
• $100.00
The best performance in year three in the Bachelor of Engineering degree course in Ceramic Engineering

The Australasian Ceramic Society Prize
• $100.00
The highest overall course aggregate by a student completing the final year of the Bachelor of Engineering degree course in Ceramic Engineering

The Australasian Corrosion Association (NSW) Prize
• $150.00
The best performance in MATS1203 Materials and Design 2 by a student in the Bachelor of Metallurgical Engineering degree course
The Boral Bricks Prize
• $500.00
The best performance in MATS2273 Chemistry of Ceramic Processing, Unit 2, Technical and Non-Technical Ceramics in the Bachelor of Engineering degree course in Ceramic Engineering

The Broken Hill Proprietary Company Prize
• $1,000.00
The best performance in the Metallurgical Engineering degree course by a graduating student

The Capral Aluminium Limited Prize
• $200.00
The best performance in a subject selected by the Head of School

The Commercial Minerals Limited Prize
• $200.00
The best performance in MATS2133 Ceramic Raw Materials in the Bachelor of Engineering degree course in Ceramic Engineering

The Ferro Corporation (Australia) Prize
• $250.00
The best performance in MATS2123 Ceramic Process Principles 2 in the Bachelor of Engineering degree course in Ceramic Engineering

The Hugh Muir Prize
• $275.00
The best performance by a student in the final year seminar class, or who in the opinion of the Head of School has contributed most to the corporate life of the School of Materials Science and Engineering

The ICI Advanced Ceramics Prize
• $100.00
The best overall academic performance by a student in the second year of the Bachelor of Engineering degree course in Ceramic Engineering

The Institute of Metals and Materials Australasia Prize
• $200.00 and 1 year membership of the Institute
The best performance in a subject selected by the Head of School

The Laporte Minerals Prize
• $250.00
The most aptitude and technique shown in the combined laboratory subjects MATS2153 Ceramic Processing Laboratory and MATS2203 Physico-Chemical Ceramics Laboratory (with each subject receiving one half of the weighting for the average) by a student in the Bachelor of Engineering degree course in Ceramic Engineering

The Max Hatherly Prize
• $275.00
The best performance in MATS1002 Microstructural Analysis

The Monier PGH Prize
• $1,000.00
The best performance by a graduating student in the Bachelor of Engineering degree course in Ceramic Engineering

The Morganite Insulating Products Pty Limited Prize
• $200.00
The best performance in MATS2254 Ceramic Engineering Design by a student in the Bachelor of Engineering degree course in Ceramic Engineering

The Sialon Ceramics Prize
• $100.00
The best performance in an honours thesis that reflects an advancement in the technology and development of advanced ceramics by a student proceeding to the award of the degree of Bachelor of Engineering in Ceramic Engineering

The Taylor Ceramic Engineering Prize
• $150.00 and a plaque
The greatest overall amount of ingenuity shown in professional activities by a graduating student in the Bachelor of Engineering degree course in Ceramic Engineering

The Wallarah Minerals Prize
• $100.00
The best performance in an honours thesis by a student in the Bachelor of Engineering degree course in Ceramic Engineering

The Welding Technology Institute of Australia Prize
• Books from WTIA valued at $200.00 and a 1 year membership of the Institute
The best performance in MATS3484/MATS1164 Welding Science and Technology

The Western Mining Corporation Limited Prize
• $150.00
The best overall performance in Year 3 full-time (or its part-time equivalent) by a student in the Engineering or
Bachelor of Science (Technology) degree courses in Materials Science and Engineering

The Western Mining Corporation Limited Prize
• $150.00
The best overall performance in Year 4 full-time (or its part-time equivalent) by a student in the Bachelor of Metallurgical Engineering degree course in Process Metallurgy or the Bachelor of Science (Technology) degree course in Metallurgy

Department of Applied Geology

The CRAE Mapping Prize in Applied Geology
• $250.00
The best performance in GEOL3031 Stratigraphy and Basin Analysis Geological Field Mapping Tutorial by a student in the Bachelor of Science degree course

The CRAE Ore Deposits Prize
• $200.00
The best overall performance in the 3rd year Economic Geology subject (GEOL3101), or in any subject or subjects which may be substituted therefore, by a student proceeding to the award of the degree of Bachelor of Science

The F C Loughnan Prize in Applied Geology
• $340.00
The best performance in Year 3 of the Geology component of the Bachelor of Science degree course

The F C Loughnan Prize for First Year Geology
• $100.00
The best performance in Year 1 of the Geology component of the Bachelor of Science degree course

The Lorant Eotvos Prize
• $300.00 and a bronze medal
The best performance in GEOL4111 Advanced Geological Techniques by a student in the final year of the Bachelor of Science degree course in Applied Geology or the Bachelor of Science degree course in Applied Geology at Honours level

The Prospectors Supplies Prize
• A Brunton compass
Meritorious performance in the field work associated with the Second Year of course 3000 Applied Geology or course 2500 Geology

The Structural Geology Field Prize
• $100.00 and winner’s name engraved on Perpetual Trophy
The best performance in the Third Year Structural Geology Field Tutorial by a student proceeding to the degree of Bachelor of Science in either Applied Geology or the Board of Studies in Science and Mathematics (Geology Program)

Department of Biotechnology

The Amersham Modern Techniques in Biotechnology Prize
• $250.00
The best performance in BIOT3061 Modern Techniques in Biotechnology

The Burns Philp Foods Prize
• $300.00
The best overall performance in the Bachelor of Science degree course in Biotechnology at Honours level

The Burns Philp Foods Prize
• $300.00
The best performance in one of the Level 3 Biotechnology subjects BIOT3011 Biotechnology A BIOT3021 Biotechnology B BIOT3031 Microbial Genetics BIOT3061 Modern Techniques in Biotechnology by a student in the Bachelor of Science degree course

The Burns Philp Foods Prize
• $300.00
The best performance in BIOT3100 Fermentation Processes in the Bachelor of Science degree course

Department of Food Science and Technology

The Flavourfresh Food Prize
• $400.00
The best performance in FOOD1310 Food Preservation by a full-time student in the Bachelor of Science course in Food Science and Technology

The Nestle Australia Limited Prize
• $200.00
The best performance in FOOD1400 Project in the Bachelor of Science degree course in Food Science and Technology
The Wilfred B S Bishop Prize
- $75.00
The best overall performance in the Bachelor of Science degree course in Food Science and Technology by a student who has made a significant contribution to staff and student activities

Department of Mining Engineering

The Stan Sawyer Memorial Prize
- $400.00
The best performance in an Honours thesis on a topic relating to coal mining by a student in the Bachelor of Engineering degree course in Mining Engineering

The Western Mining Corporation Limited
Melbourne Prize
- $200.00
The best overall performance by a student in the Bachelor of Engineering degree course in Mining Engineering

The Western Mining Corporation Limited
Perth Prize
- $150.00
The best overall performance by a student in third year of the Bachelor of Engineering degree course in Mining Engineering

Department of Textile Technology

The Charles Parsons Prize (Year 2 Textile Management)
- $500.00
The best performance in Year 2 Textile subjects by a student proceeding to the degree of Bachelor of Science in Textile Management

The Charles Parsons Prize (Year 2 Textile Technology)
- $500.00
The best performance in Year 2 Textile subjects by a student proceeding to the degree of Bachelor of Science in Textile Technology

The Charles Parsons Prize (Year 3 Textile Technology)
- $500.00
The best performance in Year 3 Textile subjects by a student proceeding to the degree of Bachelor of Science in Textile Technology

The J B Speakman Prize
- $50.00
The best undergraduate thesis in the final year of the Bachelor of Science degree course in Textile Technology or Textile Management

The Merck Sharp & Dohme (Australia) Pty Limited Prize
- $150.00
The best performance in Level 3 Chemistry subjects in the Board of Studies in Science and Mathematics

The R J Webster Prize
- $250.00
The best performance throughout the Bachelor of Science degree course in Textile Technology or Textile Management

The Textile Institute Prize
- 2 years free membership of the Textile Institute
The best performance in Textile Technology by a student in the Bachelor of Science degree course in Textile Technology or Textile Management

Department of Wool and Animal Science

The Bayer Animal Health Prize
- $120.00
The best performance in Years 2 and 3 of the Bachelor of Science degree course in Wool and Pastoral Sciences

The C R Luckock Prize
- Voucher drawn on Uni Co-op Book Shop valued at $60.00
The best performance in Meat Science in the Department of Wool and Animal Sciences
The National Farmers' Federation Prize
• $150.00
Excellent academic attainment by a graduating student in the Bachelor of Science degree course in Wool and Pastoral Sciences

The P R McMahon Memorial Prize
• $100.00
Excellence in Wool Science in the Bachelor of Science degree course in Wool and Pastoral Science

The Parkes Wool Promotion Committee Prize
• Your name being added to a shield
The best performance in Practical Wool Studies in the Department of Wool and Animal Science

Centre for Petroleum Engineering

The AusIMM/Santos Prize
• $500.00
Best performance in Year 3 of the Bachelor of Engineering in Petroleum Engineering

The ESSO Australia Prize for an Outstanding Contribution in a Non-Technical Subject
• $500.00
Best performer in Year 4 in the subject PTRL4010 Communication Skills and Business Practices for Engineers in the Bachelor of Engineering in Petroleum Engineering degree course.

The ESSO Australia Prize for Excellence in a Core Technical Subject
• $500.00
Best performer in Year 3 in the subject PTRL3001 Reservoir Rock Properties and Fluid Flow in Porous Media

The Shell Development (Australia) Pty Ltd Prize
• $500.00
Best performance in the subject CHEN4030 Safety and Environment
Graduate Prizes

School of Chemical Engineering and Industrial Chemistry

The Clean Air Society of Australia and New Zealand Prize in Atmospheric Pollution Control
• $100.00
The highest aggregate in FUEL9810 Atmospheric Pollution Control and FUEL5920 Practical Aspects of Pollution Measurement and Control in a post graduate course in the School of Chemical Engineering and Industrial Chemistry

Department of Applied Geology

The Laric V Hawkins Prize
• $500.00
The best field project report involving a substantial component of geophysics in a postgraduate program, Year 4 of the Applied Geology course, or an equivalent Honours program in the Science or Advanced Science course

Department of Food Science and Technology

The Spruson and Ferguson Patent and Trade Mark Prize
• $250.00
The best performance in the Seminar presentation by a student proceeding to the degree of Master of Science or Doctor of Philosophy in the Department of Food Science and Technology

Department of Safety Science

The Blackmores Ltd Prize for In Vitro Toxicology Laboratory Science
• $250.00
Best performance in Chemical Safety and Toxicology (CSAT) laboratory based subject or project report on in vitro toxicology, by a student enrolled in a Diploma or Coursework Master's Degree in the Department of Safety Science.

The Ergonomics Society of Australia (NSW) Prize
• $100.00 and membership of the Society
The best overall performance in all prescribed Core subjects to all students who have completed the requirements to graduate with the award of either the Master of Applied Science (Ergonomics) or the Graduate Diploma in Ergonomics

The MMI Insurance Prize for Introduction to Occupational Health
• $250.00
The best performance in SAFE9260 Introduction to Occupational Health by a student in the Masters degree course or the Graduate Diploma degree course in Safety Science

The MMI Insurance Prize for Occupational Medicine
• $250.00
The best performance in SAFE9262 Occupational Medicine by a student proceeding to the award of the degree of Master of Safety Science, Graduate Diploma in Safety Science or Graduate Diploma in Ergonomics

The MMI Insurance Prize for Principles of Ergonomics
• $250.00
The best performance in SAFE9224 Principles of Ergonomics by a student who was enrolled in the Graduate Diploma or coursework Masters degree course offered by the Department of Safety Science

The National Safety Council Prize
• $100.00
The best performance in SAFE9211 Introduction to Safety Engineering in the Masters Degree or Graduate Diploma in Safety Science

The National Starch & Chemical Prize
• $200.00
The best performance in SAFE9543 Management of Dangerous Materials by a student enrolled in a Diploma or Coursework Masters degree in the Department of Safety Science

The Neil Adams Ergonomics Prize
• $250.00
To be awarded each year to the student enrolled in the Graduate Diploma in Ergonomics who achieved the best performance in the preceding calendar year considering the students best three subjects during that year, providing at least one of the three subjects was an Ergonomics subject
The Safety Institute of Australia (NSW Division)
Bill Lessels' Memorial Prize for Graduate Diploma in Safety Science

- Books to the value of $200.00
The best overall performance by a student in the Graduate Diploma of Safety Science course

The Safety Institute of Australia (NSW Division)
Bill Lessels' Memorial Prize for Master of Safety Science

- Books to the value of $200.00
The best overall performance by a student in the Master of Safety Science course

The Whiteley Industries Prize

- $200.00
The best performance in SAFE9263 Chemical Safety and Toxicology by a student proceeding to a Diploma or Master's degree in any postgraduate teaching program offered by the Department of Safety Science

Department of Textile Technology

The Malcolm Chaikin Prize

- $200.00 and a bronze medal
An outstanding PhD thesis in the Department of Textile Technology
The University of New South Wales • Kensington Campus

Theatres
Athol Lykke Theatre C27
Biomedical Theatres E27
Central Lecture Block E19
Chemistry Theatres
(Dwyer, Mellor, Murphy, Nyholm, Smith) E12
Classroom Block (Western Grounds) H3
Fig Tree Theatre B14
Io Myers Studio D9
Keith Burrows Theatre J14
MacAuley Theatre E15
Mathews Theatres D23
Parade Theatre E3
Physics Theatre K14
Quadangle Theatre E15
Rex Vowels Theatre F17
Science Theatre F13
Sir John Clancy Auditorium C24
Webster Theatre G15

Buildings
Applied Science F10
Arcade D24
Architecture H14
Barker Street Gatehouse N11
Basser College (Kensington) C18
Central Store B13
Chancellery C22
Dalton (Chemistry) F12
Goldstein College (Kensington) D16
Golf House A27
Gymnasium B5
Helfron, Robert (Chemistry) E12
International House C6
John Goodsell (Commerce and Economics) F20
Kensington Colleges (Office) C17
Library (University) E21
Link B6
Main, Old K15
Maintenance Workshop B13
Mathews F23
Menzies Library E21
Morven Brown (Arts) C20
New College L6
Newton J12
NIDA D2
Parking Station H25
Parking Station N18
Pavilions E24
Philip Baxter College (Kensington) D14
Quadrangle E15
Sam Cracknell Pavilion H8
Samuels Building F25
Shaom College N9
Webster, Sir Robert G14
Unisearch House L5
University Regiment J2
University University (Roundhouse) E6
University Union (Blackhouse) G6
University Union (Squarehouse) E4
Wallace Wurth School of Medicine C27
Warrane College M7

General
Aboriginal Resource & Research Centre E20
Aboriginal Student Centre A29
Accommodation (Housing Office) E15
Accounting E15
Admissions C22
Adviser for Prospective Students C22
Alumni Relations: Pindari, 76 Wentworth St, Randwick
Anatomy C27
Applied Bioscience D26
Applied Economic Research Centre F20
Applied Geology
Applied Science (Faculty Office) F10
Archives, University E21
Arts and Social Sciences (Faculty Office) C20
Asia-Australia Institute: 43 Beach Street Coogee
Audio Visual Unit F20
Australian Graduate School of Management G27
Banking and Finance E15
Biochemistry and Molecular Genetics D26
Biological and Behavioural Sciences (Faculty Office) D26
Biomedical Engineering F25
Biomedical Library F23
Biotechnology F25
Built Environment (Faculty Office) H14
Campus Services C22
Cashier’s Office C22
Centre for Membrane Science & Technology F10, K14
Chaplains E4
Chemical Engineering and Industrial Chemistry F10
Chemistry E12
Civil Engineering H20
Co-op Bookshop E15

Commerce and Economics (Faculty Office) F20
Communications Law Centre C15
Community Medicine D26
Computer Science and Engineering G17
Cornea and Contact Lens Research Unit
22-32 King St, Randwick
Economics F20
Education Studies G2
Educational Testing Centre E4
Electrical Engineering G17
Energy Research, Development & Information Centre F10
Engineering (Faculty Office) K17
English C20
Equal Employment Opportunity: 30 Botany Street
Randwick
Examinations C22
Facilities Department C22, B14A
Fees Office C22
Fibre Science and Technology G14
Food Science and Technology B8
French C20
Geography K17
Geomatic Engineering K17
German and Russian Studies C20
Graduate School of the Built Environment H14
Groundwater Management and Hydrogeology F10
Health Service, University E15
Health Services Management F25
History C20
Human Resources C22
Industrial Design G14
Industrial Relations and Organizational Behaviour F20
Information, Library & Archives Studies F23
Information Systems E15
Information Technology Unit F25
International Student Centre F9
IPACE Institute F23
Japanese Economic and Management Studies E15
Landscape Architecture K15
Law (Faculty Office) F21
Law Library F21
Legal Studies & Taxation F20
Liberal and General Studies C20
Library Lawn D21
Lost Property C22
Marine Science D26
Marketing F20
Materials Science and Engineering E8
Mathematics F23
Mechanical and Manufacturing Engineering J17
Media Liaison C22
Medical Education C27
Medicine (Faculty Office) B27
Microbiology and Immunology D26
Michael Birt Gardens C24
Miners K15
Music and Music Education B11
News Service C22
Optometry J12
Pathology C27
Performing Arts B10
Petroleum Engineering D12
Philosophy C20
Physics K15
Physiology and Pharmacology C27
Political Science C20
Printing Section C22
Professional Development Centre E15
Professional Studies (Faculty Office) G2
Psychology F23
Publications Section C22
Remote Sensing K17
Research Office: 34-36 Botany Street, Randwick
Safety Science B11a
Science (Faculty Office) E12
Science and Technology Studies C20
Social Science and Policy C20
Social Policy Research Centre F25
Social Work G2
Sociology C20
Spanish and Latin American Studies C20
Sport and Recreation Centre B6
Squash Courts B7
Student Centre (off Library Lawn) C22
Student Services:
Counselling E15

Students’ Guild E15
Swimming Pool B4
Textile Technology G14
Theatre and Film Studies B10
Town Planning K15
WHo Regional Training Centre C27
Wool and Animal Sciences G14
Works and Maintenance B14A
UNSW

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:
- Applied Science
- Arts and Social Sciences
- Built Environment
- Commerce and Economics
- Engineering
- Law
- Medicine
- Professional Studies
- Science
- Australian Graduate School of Management (AGSM)
- Australian Taxation Studies Program (ATAX)
- College of Fine Arts (COFA)
- University College,
- Australian Defence Force Academy (ADFA)
- General Education

For fuller details 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.