The University of New South Wales

Applied Science

1986 Faculty Handbook
How to use this Handbook

The information in this book has been divided into nine parts.

**General Information** (pages 1-24) lists what you need to know about the University as a whole, introduces some of the services available and notes the most important rules and procedures. You should read this part in its entirety.

For further information about the University and its activities, see the University Calendar.

**Faculty Information.**

**Undergraduate Study** outlines the courses available in each school in the faculty.

**Undergraduate Study: Subject Descriptions** lists each subject offered by the schools in the faculty. The schools are listed numerically.

Information includes:
- Subject number, title and description
- Prerequisite, co-requisite and excluded subjects, where applicable
- Additional information about the subject such as credit value, class contact or teaching hours per week, sessions when taught

**Graduate Study** is about higher degrees.

**Graduate Study: Subject Descriptions** lists each subject offered by the schools in the faculty. The schools are listed numerically.

Information included is as for **Undergraduate Study: Subject Descriptions**, above.

**Conditions for the Award of Higher Degrees.**

**Scholarships and Prizes** available at undergraduate and graduate level in the faculty.

**Staff** list.

For detailed reference, see the list of **Contents**.
The University of New South Wales
PO Box 1 Kensington NSW Australia 2033 Phone 697 2222

Applied Science

1986
Faculty Handbook
The address of the University of New South Wales is:

PO Box 1, Kensington
New South Wales, Australia 2033

Telephone: (02) 697 2222
Telegraph: UNITECH, SYDNEY
Telex AA26054
Subjects, courses and any arrangements for courses including staff allocated, as stated in the Calendar or any Handbook or any other publication, announcement or advice of the University, are an expression of intent only and are not to be taken as a firm offer or undertaking. The University reserves the right to discontinue or vary such subjects, courses, arrangements or staff allocations at any time without notice.

Information in this Handbook has been brought up to date as at 9 September 1985, but may be amended without notice by the University Council.

Contents

General Information .................................................. 1

Some People Who Can Help You ................................ 1

Calendar of Dates
The Academic Year .................................................... 2
1986 ................................................................. 2
1987 ................................................................. 5

Organization of the University ..................................... 6
Arms of the University/University Colours/Council/Professorial Board/Faculties/Boards of Study/Schools/Executive Officers/General Administration/Student Representation/Award of the University Medal/Subject Numbers/Textbook Lists/Textbook Costs etc/Co-operative Bookshop/General Studies

Student Services and Activities
Accommodation .......................................................... 7
Residential Colleges ................................................... 7
Other Accommodation ................................................ 8
Associations, Clubs and Societies ................................ 8
The Sports Association ............................................... 8
School and Faculty Associations ................................ 8
Australian Armed Services ...................................... 8
Chaplaincy Centre ................................................... 8
Student Services ..................................................... 9
Sport and Recreation Section .................................... 9
Physical Education and Recreation Centre ..................... 9
Student Counselling and Research Unit ....................... 9
Careers and Employment Section ............................... 9
Student Health Unit ................................................ 9
The Students' Union ................................................. 10
The University Library ............................................. 10
The University Union .............................................. 11

Financial Assistance to Students ................................. 11
Tertiary Education Assistance Scheme/Other Financial Assistance/Financial Assistance to Aboriginal Students
Applied Science

Rules and Procedures .................................................. 12
General Conduct .......................................................... 12
Appeals 12
Admission and Enrolment ............................................... 12
First Year Entry/Deferment of First Year Enrolment
Enrolment Procedures and Fees Schedules 1986
Leave of Absence ....................................................... 17
Undergraduate Course Transfers .................................... 17
Admission with Advanced Standing ................................ 17
Resumption of Courses ................................................. 18
Examinations ............................................................... 18
Timetables 18, Assessment 18, Results 18, Availability of Results 18, Review of Results 18, Special Consideration 18, Physical Disabilities 19, Computers and Electronic Calculators 19, Examinations Held Away from the Campus 19, Arrival at Examinations 19, Reading the Examination Paper 19, Linguistic Dictionaries 19, Academic Misconduct 19, Conduct of Examinations 19, Writing in Examinations 20, Acknowledgement of Sources 20, Further Assessment 20
Restrictions upon Students Re-enrolling .......................... 20
First Year Rule 20, Repeated Failure Rule 20, General Rule 20, The Session-Unit System 20, Exemption from Rules by Faculties 20, Showing Cause 20, Appeal 20, Exclusion 21, Readmission after Exclusion 21, Restrictions and Definitions 21
Schedule A ................................................................. 21
Admission to Degree or Diploma .................................... 22
Attendance at Classes ................................................... 23
Student Records .......................................................... 23
Release of Information to Third Parties ............................ 23
Change of Address ....................................................... 23
Ownership of Students' Work ........................................ 23
Notices ...................................................................... 23
Parking within the University Grounds .............................. 24
Academic Dress ........................................................... 24
Further Information ..................................................... 24

Foreword ........................................................................ 25

Faculty Information ....................................................... 26
Some People Who Can Help You .................................... 26
Enrolment Procedures ................................................... 26
Student Clubs and Societies .......................................... 26
Library Facilities .......................................................... 26
Bachelor of Social Science Degree Course (3420) ............... 27
Conditions for the Award of the Degree of Bachelor of Science or Bachelor of Engineering .............................................. 27
Conditions for the Award of the Degrees of Bachelor of Science (Technology) and Bachelor of Science (Engineering) .............................. 28
General Studies Program ............................................... 28

Undergraduate Study: Course Outlines ........................... 29
Applied Geology ............................................................ 30
3000 Applied Geology (BSc) Full-time 30
3145 Mining Geology (BSc) Full-Time 32
Chemical Engineering and Industrial Chemistry ............... 32
3040 Chemical Engineering (BE) Full-time 33
3040 Chemical Engineering (BE) Full-time/Part-time 36
Professional Electives in Course 3040 Chemical Engineering 36
Biological Process Engineering 36
Chemical Engineering 36
Fuel Engineering 36
3100 Industrial Chemistry (BSc) Full-time 38
3110 Industrial Chemistry (BSc(tech)) Part-time 38
Petroleum Engineering .................................................. 39
3045 Petroleum Engineering (BE) Full-time
<table>
<thead>
<tr>
<th>Subject</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Food Science and Technology</strong></td>
<td>39</td>
</tr>
<tr>
<td>3060 Food Technology (BSc) Full-time</td>
<td>40</td>
</tr>
<tr>
<td>3070 Food Technology (BSc(Technology)) Part-time</td>
<td>41</td>
</tr>
<tr>
<td><strong>Geography</strong></td>
<td>41</td>
</tr>
<tr>
<td>3010 Applied Geography (BSc) Full-time</td>
<td>42</td>
</tr>
<tr>
<td><strong>Metallurgy</strong></td>
<td>45</td>
</tr>
<tr>
<td>3120 Metallurgy (BSc) Old Full-time</td>
<td>46</td>
</tr>
<tr>
<td>3125 Metallurgy (BME) New Full-time</td>
<td>46</td>
</tr>
<tr>
<td>3130 Metallurgy (BSc(Technology)) Part-time</td>
<td>47</td>
</tr>
<tr>
<td>3025 Ceramic Engineering (BE) Full-time</td>
<td>49</td>
</tr>
<tr>
<td>3030 Ceramics (BSc(Technology)) Part-time</td>
<td>49</td>
</tr>
<tr>
<td><strong>Mining Engineering</strong></td>
<td>50</td>
</tr>
<tr>
<td>3126 Mineral Engineering (BE) Full-time</td>
<td>51</td>
</tr>
<tr>
<td>3140 Mining Engineering (BE) Full-time</td>
<td>51</td>
</tr>
<tr>
<td><strong>Textile Technology</strong></td>
<td>52</td>
</tr>
<tr>
<td>3170 Textile Technology (BSc) Full-time</td>
<td>53</td>
</tr>
<tr>
<td><strong>Wool and Pastoral Sciences</strong></td>
<td>54</td>
</tr>
<tr>
<td>3220 Wool and Pastoral Sciences (BSc) Full-time</td>
<td>55</td>
</tr>
</tbody>
</table>

**Undergraduate Study: Subject Descriptions**

<table>
<thead>
<tr>
<th>Subject</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>Identification of Subjects by Number</td>
<td>57</td>
</tr>
<tr>
<td>Physics</td>
<td>57</td>
</tr>
<tr>
<td>Chemistry</td>
<td>59</td>
</tr>
<tr>
<td>Metallurgy</td>
<td>60</td>
</tr>
<tr>
<td>Mechanical and Industrial Engineering</td>
<td>62</td>
</tr>
<tr>
<td>(See also Industrial Engineering below)</td>
<td>68</td>
</tr>
<tr>
<td>Electrical Engineering and Computer Science</td>
<td>69</td>
</tr>
<tr>
<td>Mining Engineering</td>
<td>69</td>
</tr>
<tr>
<td>Civil Engineering</td>
<td>72</td>
</tr>
<tr>
<td>Wool and Pastoral Sciences</td>
<td>72</td>
</tr>
<tr>
<td>Mathematics</td>
<td>74</td>
</tr>
<tr>
<td>Textile Technology</td>
<td>76</td>
</tr>
<tr>
<td>Accountancy</td>
<td>77</td>
</tr>
<tr>
<td>Economics</td>
<td>77</td>
</tr>
<tr>
<td>Biological Sciences</td>
<td>79</td>
</tr>
<tr>
<td>Industrial Engineering</td>
<td>79</td>
</tr>
<tr>
<td>Centre for Petroleum Engineering Studies</td>
<td>79</td>
</tr>
<tr>
<td>Applied Geology</td>
<td>81</td>
</tr>
<tr>
<td>Geography</td>
<td>81</td>
</tr>
<tr>
<td>Marketing</td>
<td>82</td>
</tr>
<tr>
<td>Surveying</td>
<td>82</td>
</tr>
<tr>
<td>Town Planning</td>
<td>82</td>
</tr>
<tr>
<td>Landscape Architecture</td>
<td>82</td>
</tr>
<tr>
<td>Food Science and Technology</td>
<td>83</td>
</tr>
<tr>
<td>Biochemistry</td>
<td>84</td>
</tr>
<tr>
<td>Biotechnology</td>
<td>84</td>
</tr>
<tr>
<td>Botany</td>
<td>86</td>
</tr>
<tr>
<td>Microbiology</td>
<td>86</td>
</tr>
<tr>
<td>Zoology</td>
<td>87</td>
</tr>
<tr>
<td>Faculty of Applied Science</td>
<td>87</td>
</tr>
<tr>
<td>Chemical Engineering and Industrial Chemistry</td>
<td>88</td>
</tr>
<tr>
<td>General</td>
<td>89</td>
</tr>
<tr>
<td>Department of Biological Process Engineering</td>
<td>99</td>
</tr>
<tr>
<td>Department of Fuel Technology</td>
<td>106</td>
</tr>
<tr>
<td>Department of Polymer Science</td>
<td>107</td>
</tr>
<tr>
<td><strong>Political Science</strong></td>
<td>107</td>
</tr>
</tbody>
</table>

**Graduate Study Course Outlines:**

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>8025 And Lands Management (MAppSc)</td>
<td>108</td>
</tr>
<tr>
<td>5025 And Lands Management (GradDip)</td>
<td>108</td>
</tr>
<tr>
<td>8026 Remote Sensing (MAppSc)</td>
<td>108</td>
</tr>
<tr>
<td>5026 Remote Sensing (GradDip)</td>
<td>109</td>
</tr>
<tr>
<td>8045 Environmental Studies (MEnvStudies)</td>
<td>114</td>
</tr>
</tbody>
</table>
## Applied Science

### School of Applied Geology
- 8020 Engineering Geology-Hydrogeology-Environmental Geology (MAppliedSc) 114
- 8031 Mineral Exploration (MAppliedSc) 115
- 8032 Exploration Geophysics (MAppliedSc) 115
- 8033 Exploration Geochronology (MAppliedSc) 116

### School of Chemical Engineering and Industrial Chemistry
- 8000 Bioprocess Engineering (MAppliedSc) 117
- 8015 Chemical Engineering and Industrial Chemistry (MAppliedSc) 118
- 8060 Fuel Technology (MAppliedSc) 118
- 5010 Corrosion Technology (GradDip) 118

### School of Food Technology
- 8030 Food Technology (MAppliedSc) 119
- 8035 Food Engineering (MAppliedSc) 120
- 5020 Food Technology (GradDip) 120

### School of Metallurgy

### School of Mining Engineering
- 8055 Minerals Engineering (MAppliedSc) 121
- 8056 Mining Geomechanics (MAppliedSc) Part-time External 121
- 5040 Mining and Mineral Engineering (GradDip) 122

### School of Textile Technology
- 5090 Textile Technology (GradDip) 123

### School of Wool and Pastoral Sciences
- 5081 Wool and Pastoral Sciences (GradDip) 123

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## Graduate Study: Subject Descriptions

### Identification of Subjects by Number
- Chemistry 127
- Electrical Engineering and Computer Science 127
- Mining Engineering 127
- Civil Engineering 130
- Wool and Pastoral Sciences 131
- Textile Technology 132
- Applied Geology 133
- Geography 135
- Surveying 137
- Organizational Behaviour 137
- Town Planning 138
- Food Science and Technology 138
- Graduate School of the Built Environment 141
- Biotechnology 141
- Zoology 141
- Faculty of Applied Science 142
- Environmental Studies 142
- Chemical Engineering and Industrial Chemistry 142
- General 142
- Department of Biological Process Engineering 144
- Department of Fuel Technology 144
- Department of Polymer Science 145

### Graduate Study: Conditions for the Award of Higher Degrees
- Doctor of Philosophy 146
- Master of Applied Science and Master of Environmental Studies 150
- Master of Engineering and Master of Science 151
- Master of Science and Master of Engineering without supervision 153
- Graduate Diploma 154

### Scholarships and Prizes
- Scholarships 156
- Undergraduate 156
- Graduate 160
- Prizes 162
- Undergraduate 162
- Graduate 168

### Staff

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General Information

To obtain the maximum benefit from your studies you should make an effort to learn what facilities the University offers, to investigate the best methods of study and to discover as much as possible about the course for which you are enrolled.

This Handbook has been specially designed as a detailed source of reference for you in all matters related to your Faculty. This General Information Section is intended to help you put the Faculty into perspective with the University as a whole, to introduce you to some of the services available to students and to note some of the most important rules and procedures.

For fuller details about some aspects of the University and its activities you might need to consult the University Calendar.

Some people who can help you

If you are experiencing difficulties in adjusting to the requirements of the University you will probably need advice. The best people to talk to on matters relating to progress in studies are your tutors and lecturers. If your problem lies outside this area there are many other people with specialized knowledge and skills who may be able to help you.

The Student Services staff, located on the ground floor of the Chancellery, will help those students who need advice and who have problems but who do not seem to be provided for by the other organizations and services mentioned. As well as dealing with general enquiries the staff is especially concerned with the problems of overseas, Aboriginal, and physically handicapped and disabled students. Enquire at Room G19, phone 3114.

The Senior Assistant Registrar (Student Administration), Ms Judith Tonkin, is located on the ground floor of the Chancellery. For particular enquiries regarding illness and other matters affecting performance in examinations and assessment, graduation ceremonies, release of examination results and variations to enrolment programs, phone 3102 or 3097.

The Senior Administrative Officer (Admissions), Mr John Beauchamp, is located on the ground floor of the Chancellery. General inquiries should be directed to 3095.
The Senior Administrative Officer (Examinations), Mr John Grigg, is located on the ground floor of the Chancellery. Enquiries regarding examinations, including examination timetables and clash of examinations should be directed to 3088.

The Adviser for Prospective Students, Mrs Fay Lindsay, is located with the Careers and Employment Section and is available for personal interview. For an appointment phone the University switchboard.

The Careers and Employment Section is located in Hut E15c at the foot of Basser Steps. Enquiries should be directed to 3122.

The Off-campus Housing Service is located in Room G19 in the Chancellery. For assistance in obtaining suitable accommodation phone 3116.

Student Loans enquiries should be directed to Room G19 in the Chancellery, phone 3115.

The Student Health Unit is located in Hut E15b at the foot of Basser Steps. The Director is Dr Geoffrey Hansen. For medical aid phone 5427, 5426 or 5425.

The Student Counselling and Research Unit is located at the foot of Basser Steps. Dr Pat Cleary is the Head of the Unit. For assistance with educational or vocational problems ring 5418 or 5422 for an appointment.

The University Librarian is Mr Allan Horton. Library enquiries should be directed to 2686.

The Chaplaincy Centre is located in Hut E15a at the foot of Basser Steps.

The Students' Union has two offices on campus. One is located at the back of the Library Lawn (between the Chancellery and the Morven Brown Building), where the SU President, Education Vice President, Education Officer, Clubs and Societies Secretary and Postgraduate Officer are available to discuss student problems. The other is on the second floor of the Squarehouse, where the Secretary/Treasurer, Women's Officer, Overseas Student Director, the full-time Solicitor, Tharunka and Campuswide provide information and student services.

Cashier's Hours The University Cashier's office is open from 9.30 am to 1.00 pm and from 2.00 pm to 4.30 pm, Monday to Friday. It is open for additional periods at the beginning of Session 1. Consult noticeboards for details.

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**Calendar of Dates**

**The Academic Year**

The academic year is divided into two sessions, each containing 14 weeks for teaching. There is a recess of six weeks between the two sessions and there are short recesses of one week within each of the sessions.

Session 1 commences on the first Monday of March.

**1986**

**Faculties other than Medicine and University College/Australian Defence Force Academy**

<table>
<thead>
<tr>
<th>Session 1</th>
<th>3 March to 11 May</th>
</tr>
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<tbody>
<tr>
<td></td>
<td>May Recess: 12 May to 18 May</td>
</tr>
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<td></td>
<td>19 May to 15 June</td>
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<tr>
<td></td>
<td>Study Recess: 16 June to 22 June</td>
</tr>
<tr>
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<td>Midyear Recess: 23 June to 27 July</td>
</tr>
</tbody>
</table>

| Examinations | 23 June to 9 July |

<table>
<thead>
<tr>
<th>Session 2</th>
<th>28 July to 24 August</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>August Recess: 25 August to 31 August</td>
</tr>
<tr>
<td></td>
<td>1 September to 9 November</td>
</tr>
<tr>
<td></td>
<td>Study Recess: 10 November to 16 November</td>
</tr>
</tbody>
</table>

| Examinations | 17 November to 5 December |

**Faculty of Medicine**

First and Second Years

<table>
<thead>
<tr>
<th>Term 1 (10 weeks)</th>
<th>20 January to 30 March</th>
</tr>
</thead>
<tbody>
<tr>
<td>Term 2 (9 weeks)</td>
<td>7 April to 11 May</td>
</tr>
<tr>
<td>May Recess: 12 May to 18 May</td>
<td></td>
</tr>
<tr>
<td>19 May to 15 June</td>
<td></td>
</tr>
<tr>
<td>Term 3 (9 weeks)</td>
<td>23 June to 24 August</td>
</tr>
<tr>
<td>August Recess: 25 August to 31 August</td>
<td></td>
</tr>
<tr>
<td>Term 4 (10 weeks)</td>
<td>1 September to 9 November</td>
</tr>
</tbody>
</table>

Fifth Year

| Term 1 (8 weeks) | 20 January to 16 March |
| Term 2 (8 weeks) | 24 March to 18 May |
| Term 3 (8 weeks) | 26 May to 20 July |
| Term 4 (8 weeks) | 28 July to 21 September |
| Term 5 (8 weeks) | 29 September to 23 November |
Australian Graduate School of Management

Term 1 (10 weeks) 3 March to 9 May
Term 2 (10 weeks) 2 June to 8 August
Term 3 (10 weeks) 1 September to 7 November

Tuesday 25
Last day for undergraduate students who have completed requirements for pass degrees to advise the Registrar they are proceeding to an honours degree or do not wish to take out the degree for which they have applied for any other reason.

University College/Australian Defence Force Academy

Session 1 (14 weeks)
3 March to 3 May
May Recess: 4 May to 18 May
19 May to 20 June
Midyear Recess: 21 June to 13 July
Examinations 23 June to 13 July
Session 2 (13 weeks)
14 July to 22 August
August Recess: 23 August to 7 September
8 September to 24 October
Examinations 25 October to 15 November

March
Monday 3
Session 1 begins — all courses except Medicine III, IV and V
Wednesday 5
List of graduands for April/May ceremonies and 1984 prizewinners published in The Sydney Morning Herald
Monday 10
Last day for notification of correction of details published in The Sydney Morning Herald on 6 March concerning April/May graduation ceremonies
Friday 14
Last day for acceptance of enrolment by new undergraduate students (late fee payable thereafter)
Thursday 27
Last day for acceptance of enrolment by undergraduate students re-enrolling in second and later years (late fee payable thereafter)
Friday 28
Good Friday — Public Holiday
Saturday 29
Easter Saturday — Public Holiday
Monday 31
Easter Monday — Public Holiday

April
Friday 18
Last day for undergraduate students to discontinue without failure subjects which extend over Session 1 only
Friday 25
Anzac Day — Public Holiday
Wednesday 30
Confirmation of Enrolment forms despatched to all students

May
Friday 9
Last day for acceptance of corrected Confirmation of Enrolment forms

May Recess begins
Monday 12
Last day for undergraduate students completing requirements for degrees at the end of Session 1 to submit Application for Admission to Degree forms
Wednesday 14
Publication of provisional timetable for June/July examinations

January
Wednesday 1
Public Holiday — New Year’s Day
Monday 6
List of graduands in Medicine for February Graduation Ceremony published in The Sydney Morning Herald
Friday 10
Last day for acceptance of applications by office of the Admissions Section for transfer to another undergraduate course within the University
Monday 13
Last day for applications for review of results of assessment
Monday 27
Public Holiday — Australia Day

February
Monday 3
Enrolment period begins for second and later year undergraduate students and graduate students enrolled in formal courses
Tuesday 4
Enrolment period begins for new undergraduate students and undergraduate students repeating first year
<table>
<thead>
<tr>
<th>Date</th>
<th>Event</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sunday 18</td>
<td><strong>May Recess ends</strong></td>
</tr>
<tr>
<td>Friday 23</td>
<td>Last day for students to advise of examination clashes</td>
</tr>
<tr>
<td>June</td>
<td><strong>Session 1 ends</strong></td>
</tr>
<tr>
<td>Tuesday 3</td>
<td>Publication of timetable for June/July examinations</td>
</tr>
<tr>
<td>Monday 9</td>
<td>Queen’s Birthday — Public Holiday</td>
</tr>
<tr>
<td>Sunday 15</td>
<td><strong>Study Recess begins</strong></td>
</tr>
<tr>
<td>Monday 16</td>
<td><strong>Midyear Recess begins</strong></td>
</tr>
<tr>
<td>Sunday 22</td>
<td>Examinations begin</td>
</tr>
<tr>
<td>Monday 23</td>
<td><strong>Examinations end</strong></td>
</tr>
<tr>
<td>July</td>
<td><strong>Session 2 begins</strong></td>
</tr>
<tr>
<td>Wednesday 9</td>
<td>Examinations end</td>
</tr>
<tr>
<td>Monday 21</td>
<td>Assessment results mailed to students</td>
</tr>
<tr>
<td>Tuesday 22</td>
<td>Assessment results displayed on University noticeboards</td>
</tr>
<tr>
<td>Sunday 27</td>
<td><strong>Midyear Recess ends</strong></td>
</tr>
<tr>
<td>Monday 28</td>
<td><strong>Session 2 ends</strong></td>
</tr>
<tr>
<td>August</td>
<td><strong>August Recess begins</strong></td>
</tr>
<tr>
<td>Friday 8</td>
<td>Last day for students to discontinue without failure subjects which extend over the whole academic year</td>
</tr>
<tr>
<td>Monday 25</td>
<td><strong>August Recess begins</strong></td>
</tr>
<tr>
<td>Tuesday 26</td>
<td>Last day for undergraduate students who have completed requirements for pass degrees to advise the Registrar they are proceeding to an honours degree or do not wish to take out the degree for which they have applied for any other reason</td>
</tr>
<tr>
<td>Sunday 31</td>
<td><strong>August Recess ends</strong></td>
</tr>
<tr>
<td>September</td>
<td><strong>Session 2 ends</strong></td>
</tr>
<tr>
<td>Wednesday 3</td>
<td>List of graduands for October graduation ceremonies published in <em>The Sydney Morning Herald</em></td>
</tr>
<tr>
<td>November</td>
<td><strong>Study Recess begins</strong></td>
</tr>
<tr>
<td>Sunday 9</td>
<td><strong>Study Recess ends</strong></td>
</tr>
<tr>
<td>Monday 10</td>
<td>Examinations begin</td>
</tr>
<tr>
<td>Sunday 16</td>
<td>Examinations end</td>
</tr>
<tr>
<td>Monday 17</td>
<td>Examinations end</td>
</tr>
<tr>
<td>December</td>
<td><strong>Examinations end</strong></td>
</tr>
<tr>
<td>Friday 5</td>
<td>Assessment results mailed to students</td>
</tr>
<tr>
<td>Monday 22</td>
<td>Assessment results displayed on University noticeboards</td>
</tr>
<tr>
<td>Tuesday 23</td>
<td>Christmas Day — Public Holiday</td>
</tr>
<tr>
<td>Thursday 25</td>
<td>Boxing Day — Public Holiday</td>
</tr>
</tbody>
</table>
Faculties other than Medicine and University College/Australian Defence Force Academy

**Session 1** (14 weeks)
- 2 March to 10 May
- *May Recess: 11 May to 17 May*
- 18 May to 14 June
- *Study Recess: 15 June to 21 June*
- *Midyear Recess: 22 June to 26 July*
- Examinations 22 June to 8 July

**Session 2** (14 weeks)
- 27 July to 23 August
- *August Recess: 24 August to 30 August*
- 31 August to 8 November
- *Study Recess: 9 November to 15 November*
- Examinations 16 November to 4 December

Faculty of Medicine

**First and Second Years**
- As for other faculties

**Third and Fourth Years**
- Term 1 (10 weeks) 19 January to 29 March
- Term 2 (9 weeks) 6 April to 10 May
- *May Recess: 11 May to 17 May*
- 18 May to 14 June
- Term 3 (9 weeks) 22 June to 23 August
- *August Recess: 24 August to 30 August*
- Term 4 (10 weeks) 31 August to 8 November

**Fifth Year**
- Term 1 (8 weeks) 19 January to 15 March
- Term 2 (8 weeks) 23 March to 17 May
- Term 3 (8 weeks) 25 May to 19 July
- Term 4 (8 weeks) 27 July to 20 September
- Term 5 (8 weeks) 28 September to 22 November

Australian Graduate School of Management

**Term 1 (10 weeks)**
- 2 March to 8 May
- Term 2 (10 weeks) 1 June to 7 August
- Term 3 (10 weeks) 31 August to 6 November

**University College/Australian Defence Force Academy**

**Session 1** (14 weeks)
- 2 March to 3 May
- *May Recess: 4 May to 17 May*
- 18 May to 19 June
- *Midyear Recess: 20 June to 12 July*
- Examinations 22 June to 10 July

**Session 2** (13 weeks)
- 13 July to 23 August
- *August Recess: 24 August to 6 September*
- 7 September to 23 October
- Examinations 26 October to 13 November

**January**
- Thursday 1 Public Holiday (New Year)
- Monday 5 List of graduands in Medicine for February Graduation Ceremony published in *The Sydney Morning Herald*
- Friday 9 Last day for acceptance of applications by office of the Admissions Section for transfer to another undergraduate course within the University
- Monday 12 Last day for applications for review of results of annual examinations
- Monday 26 Australia Day — Public Holiday

**February**
- Monday 16 enrolment period begins for second and later year undergraduate students and graduate students enrolled in formal courses

**March**
- Monday 2 Session 1 begins — all courses except Medicine III, IV and V
- Friday 17 to Easter — Public Holiday

**April**
- Saturday 25 Anzac Day — Public Holiday
Organization of the University

The University of New South Wales was first incorporated by an Act of Parliament in 1949, under the name of the New South Wales University of Technology.

In 1985 the University had 18,350 students and over 3,600 staff who worked in more than eighty buildings.

Arms of the University of New South Wales
The arms of the University are reproduced on the front cover of this handbook. The arms were granted by the College of Heralds in London, on 3 March 1952, and the heraldic description is as follows:

‘Argent on a Cross Gules a Lion passant guardant between four Mullets of eight points Or a Chief Sable charged with an open Book proper thereon the word SCIENTIA in letters also Sable.

‘The lion and the four stars of the Southern Cross on the Cross of St George have reference to the State of New South Wales which brought the University into being; the open book with SCIENTIA across its page reminds us of its original purpose. Beneath the shield is the motto ‘Manu et Mente’, (‘with Hand and Mind’) which is the motto of the Sydney Technical College, from which the University has developed. The motto is not an integral part of the Grant of Arms and could be changed at will; but it was the opinion of the University Council that the relationship with the parent institution should in some way be recorded’.

The University Colours
The colours of the University are black and gold.

The Council
The chief governing body of the University is the Council which has the responsibility of making all major decisions regarding its policy, conduct and welfare.

The Council consists of 29 members including parliamentary and ex officio members, members elected by the staff, students and graduates of the University and some appointed by the Minister for Education.

The Council meets at least five times per year and its members also serve on special committees dealing with, for example, academic matters, finance, buildings and equipment, personnel matters, student affairs and public relations.

The Chairman of the Council is the Chancellor, the Hon. Mr Justice Samuels.

The Professorial Board
The Professorial Board is one of the two chief academic bodies within the University and includes all the professors from the various faculties, non-professorial Heads of Schools and Chairmen of Faculty, and several ex-officio and appointed members. It deliberates on all questions such as

The Faculties/Boards of Studies
The executive head of a faculty or board of studies is the dean, with the exception of the Australian Graduate School of Management, where the executive head is the director. Members of each faculty or board meet regularly to consider matters pertaining to their own areas of teaching and research, the result of their deliberations being then submitted to the Professorial Board.

The term ‘faculty’ is used in two distinct senses in the University. Sometimes it is used to refer to the group of schools comprising the faculty, and at others to the deliberative body of academic members of the Schools within the faculty.

The ten faculties are Applied Science, Architecture, Arts, Biological Sciences, Commerce, Engineering, Law, Medicine, Professional Studies and Science. In addition, the Board of Studies of the Australian Graduate School of Management (AGSM), the Board of Studies in General Education and the Academic Board of the University College, Australian Defence Force Academy fulfil a function similar to that of the faculties. The Board of Studies in Science and Mathematics, which was established to facilitate the joint academic administration of the Science and Mathematics degree course by the faculties of Biological Sciences and Science, considers and reports to the Professorial Board on all matters relating to studies, lectures and examinations in the Science and Mathematics degree course.

The Schools
Subjects come under the control of the individual schools (e.g. the School of Chemistry, the School of Accountancy). The head of the school in which you are studying is the person in this academic structure with whom you will be most directly concerned.

Executive Officers
As chief executive officer of the University, the Vice-Chancellor and Principal, Professor Michael Birt, is charged with managing and supervising the administrative, financial and other activities of the University.

He is assisted in this task by three Pro-Vice-Chancellors, together with the Deans and the two heads of the administrative divisions.

General Administration
The administrative work of the University is divided between the Deputy Principal (Administration) who is responsible for registrarial, property and staffing matters and the Deputy Principal (Planning and Information) who is responsible for planning information and analysis, finance and the provision of computing services.
Student Representation on Council and Faculties/Boards

Three members of the University Council may be students elected by students. All students who are not full-time members of staff are eligible to stand for a two-year term of office. The students who are elected to the Council are eligible for election to the committees of Council.

Students proceeding to a degree or a graduate diploma may elect members for appointment by the Council to their faculty or board of studies. Elections are for a one-year term of office.

Open Faculty/Board Meetings

If you wish you may attend a faculty or board meeting. You should seek advice at the office of the faculty whose meeting you wish to attend.

Award of the University Medal

The University may award a bronze medal to undergraduate students who have achieved highly distinguished merit throughout their degree course.

Identification of Subjects by Numbers

For information concerning the identifying number of each subject taught in each faculty as well as the full list of identifying numbers and subjects taught in the University, turn to the first page of the section Subject Descriptions. This list is also published in the Calendar.

Textbook Lists

Textbook lists are issued early in the year and are available from School and Faculty offices for re-enrolling students and from the Unisearch House Enrolment Centre for first year students.

Textbook Costs and Course-Related Costs

Students should allow quite a substantial sum for textbooks. This can vary from $250 to $600 per year depending on the course taken. These figures are based on the cost of new books. The Students' Union operates a secondhand bookshop.

Information about special equipment costs, accommodation charges and cost of subsistence on excursions, field work, etc, and for hospital residence (medical students) is available from individual schools.

Co-operative Bookshop

Membership is open to all members of the community, on initial payment of a fee of $12, refundable after 2 years.

General Studies Program

Almost all undergraduates in faculties other than Arts and Law are required to complete a General Studies program. The Department of General Studies within the Board of Studies in General Education publishes its own Handbook which is available free of charge. All enquiries about General Studies should be made to the General Studies Office, Room G56, Morven Brown Building, phone 2436.

Student Services and Activities

Accommodation

Residential Colleges

There are seven residential colleges on campus. Each college offers accommodation in a distinctive environment which varies from college to college, as do facilities and fees. A brief description of each college is given below, and further information may be obtained directly from the individual colleges. In addition to basic residence fees, most colleges make minor additional charges for such items as registration fees, caution money or power charges. Intending students should lodge applications before the end of October in the year prior to the one in which they seek admission. Most colleges require a personal interview as part of the application procedure.

The Kensington Colleges

The Kensington Colleges comprise Basser College, Goldstein College and Philip Baxter College. They house 416 men and women students, as well as tutorial and administrative staff members. Some aspects of traditional College life are maintained in an atmosphere which emphasises co-operation and mutual respect. Apply in writing to the Master, New College, Anzac Parade, Kensington, NSW 2033.

International House

International House accommodates 154 male and female students from Australia and up to thirty other countries. Generally about 25 disciplines are represented. College life is multicultural and multidisciplinary. Eight tutors are available to help students. Apply in writing to the Warden, International House, PO Box 1, Kensington, NSW 2033.

New College

New College is an Anglican college and it provides accommodation (with all meals) for 220 graduates and undergraduates, without regard to race, religion, or sex. The College has its own resident tutors, and a Senior Resident Academic Fellow, who sponsors a wide range of activities and encourages inter-disciplinary discussion. Apply to the Master, New College, Anzac Parade, Kensington 2033 (telephone 662 6066).

Shalom College

Shalom College is a Jewish residential college. It provides accommodation for 86 men and women students. Non-resident membership is available to students who wish to avail themselves of the Kosher dining room and tutorial facilities.
Fees are payable on a session basis. Conferences are catered for, particularly with Kosher requirements. Rates are available on application. Apply in writing to the Master, Shalom College, the University of New South Wales, PO Box 1, Kensington, NSW 2033.

Warrane College
Warrane College provides accommodation for 190 men and is open to students of all ages, backgrounds and beliefs. The College offers a comprehensive tutorial program along with a wide range of activities, professional orientation and opportunities to meet members of the University staff informally. Non-resident membership is available to those students who wish to participate in College activities and to make use of its facilities. The general spiritual care of the College has been entrusted to Opus Dei, a personal prelature of the Catholic Church. Enquiries: The Master, Warrane College, PO Box 123, Kensington 2033. Telephone (02) 6626199.

Creston Residence
Creston Residence offers accommodation to 25 undergraduate and graduate women students. Activities and tutorials are open to non-resident students. The spiritual activities offered at Creston are entrusted to the Women's Section of Opus Dei. Enquiries: 36 High Street, Randwick 2031. Telephone (02) 3985693.

Other Accommodation
Off-campus Accommodation
Students requiring other than College accommodation may seek assistance in Room G19, the Chancellery, in obtaining suitable accommodation in the way of rooms with cooking facilities, flats, houses, share flats, etc. Extensive listings of all varieties of housing are kept up-to-date throughout the year and during vacations. Accommodation in the immediate vicinity of the University is not usually easy to find at short notice, and is expensive.

No appointment is necessary but there may be some delay in February and March. The Housing staff are always happy to discuss any aspect of accommodation.

Special pamphlets on accommodation, lists of estate agents and hints on house-hunting are available on request.

Associations, Clubs and Societies

The Sports Association
The Sports Association is a student organization within the University which caters for a variety of sports for both men and women. In December 1952 the University Council approved the establishment of the Sports Association, which then consisted of five clubs. As the University has grown the Association has expanded, and it now includes thirty-seven clubs.

The Association office is situated on the 3rd floor, Square-house, E4, lower campus, and can be contacted on extension 4880. The control of the Association is vested in the General Committee which includes delegates from all the clubs.

Membership is compulsory for all registered students, and the annual fee is as set out later, in Rules and Procedures, Enrolment Procedures and Fees Schedules, section 15. Fees. Membership is also open to all members of staff and graduates of the University on payment of a fee as prescribed in the By-laws of the Association. All members are invited to take part in any of the activities arranged by the Association, and to make use of the University's sporting and recreational facilities.

The Association is affiliated with the Australian Universities Sports Association (AUSA) which is the controlling body for sport in all Australian universities.

School and Faculty Associations
Many schools and faculties have special clubs with interests in particular subject fields. Enquire at the relevant Faculty or School Office for information.

Australian Armed Services
The University maintains links with the Royal Australian Navy, the Australian Army Reserve and the Royal Australian Air Force, and opportunities exist for student participation in their activities.

Chaplaincy Centre
The University Chapel
The University provides a small chapel for the use of all faiths. In its temporary housing it is located in Hut E15a near the Chemistry Building. The chapel is available for services of worship by arrangement with the full-time chaplains. At other times it is available for private meditation to all members of the University.

Chaplaincy Service
A Chaplaincy Service is available within the University of New South Wales for the benefit of students and staff.

The service offers fellowship, personal counselling and guidance, together with leadership and biblical and doctrinal studies and in worship. The chaplains maintain close liaison with student religious societies.

The chaplains are located in Hut E15a at the foot of Basser steps, which also contains the temporary chapel.
Student Services

The Student Services staff, located on the ground floor of the Chancellery, will help those students who have problems and need advice but who do not seem to be provided for by the other organizations and services mentioned. As well as dealing with those enquiries and with off-campus housing and student loan matters, they are especially concerned with the problems of physically handicapped and disabled students, overseas students, and aboriginal students.

All enquiries should be made either at Room G19 or by telephoning 6973111.

Sport and Recreation Section

The Sport and Recreation Section seeks ways to encourage students and staff to include exercise as an essential part of their daily lives. It does this through Sports Clubs on a competitive basis and by offering physical recreation on a more casual basis to the University community.

The Section serves the Sports Association and its thirty-seven constituent clubs and is responsible for the continuing management of the Physical Education and Recreation Centre at which recreational programs are available for both students and staff.

It makes bookings for use of sporting facilities including tennis courts and playing fields. This section is located on the 3rd Floor, Squarehouse, E4, lower campus. The various services may be contacted by telephoning Recreation Program 6974884; Grounds Bookings 6974878; Tennis Bookings 6974877; Sports Association 6974880.

Physical Education and Recreation Centre

The Sport and Recreation Section provides a recreational program for students and staff at the Physical Education and Recreation Centre. The Centre consists of eight squash courts, seven tennis courts, a main building, and a 50-metre indoor heated swimming pool. The main building has a large gymnasium and practice rooms for fencing, table tennis, judo, weight-lifting, karate and jazz ballet, also a physical fitness testing room. A new three-storey 'Link Building' will be completed by mid-1986 between the gymnasium and squash courts. It provides three additional training rooms on the upper floors and administrative and control functions at ground floor level. The recreational program includes intramurals, teaching/coaching, camps. The Centre is located on the lower campus adjacent to High Street. The Supervisor at PERC may be contacted by telephoning 6974884.

Student Counselling and Research Unit

The Student Counselling and Research Unit provides counselling services to students, prospective students, parents and other concerned persons.

Together with the Careers and Employment Section, the unit is located in the huts near the foot of Basser Steps (access from College Road or Engineering Road).

Appointments are offered throughout the academic year and during recesses between 8 am to 5 pm on week days (up to 7 pm on some evenings). A 'walk-in' service for short interviews is available between 9 am and 5 pm. Appointments may be made by telephoning 6975418 between 8.30 am and 5.30 pm.

Counsellors offer assistance in planning, decision-making, problem solving, social and emotional development, and dealing with grievances. Group programs on such topics as study, tutorial and examination skills, stress management, communicating, and self-confidence are offered each session. Brochures are available from the receptionist.

Careers and Employment Section

The Careers and Employment Section provides careers advice and assistance in finding employment.

Assistance with careers and permanent employment opportunities includes: the regular mailing of a Job Vacancy Bulletin to registered students and graduates, a Library, and a Campus Interview Program in which final year students have the opportunity to speak to employers regarding employment prospects.

Assistance is also provided in obtaining course-related employment during long vacations as required by undergraduates in Engineering and Applied Science.

Together with the Student Counselling and Research Unit, this section is located in the huts near the foot of Basser Steps (access from College Road or Engineering Road).

For further information, telephone 6975470.

Student Health Unit

A student health clinic and first aid centre is situated within the University. The medical service although therapeutic is not intended to replace private or community health services. Thus, where chronic or continuing conditions are revealed or suspected the student may be referred to a private practitioner or to an appropriate hospital. The health service is not responsible for fees incurred in these instances. The service is confidential and students are encouraged to attend for advice on matters pertaining to health.
The service is available to all enrolled students by appointment, free of charge, between 9 am and 5 pm Mondays to Fridays. For staff members, immunizations are available, and first aid service in the case of injury or illness on the campus.

The centre is located in Hut E15b on the northern side of the campus in College Road at the foot of the Bassers Steps.

Appointments may be made by calling at the centre or by telephoning 697 5425, 697 5426 or 697 5427 during the above hours.

The Family Planning Association of NSW conducts clinics at the Student Health Unit and at the adjacent Prince of Wales Hospital which are available for both staff and students. Appointments may be made for the Student Health Unit clinic by telephoning 588 2833 or for the Prince of Wales Hospital clinics by telephoning 399 0111.

The Students' Union

The Students' Union was formed in 1952 as an organization, duly recognized by the University Council, to represent the student body and to provide a central organization for the administration of student activities. In the words of its constitution 'The Students' Union is formed for the purpose of advancing the interests of University men and women, facilitating their general scientific and technical education, and fostering a University spirit among them.'

The Students' Union affords a recognized means of communication between the student body and the University administration, and represents its members in all matters affecting their interests. It aims to promote the cultural, educational and recreational life of the University and to encourage a permanent interest among graduates in the life and progress of student activities within the University. The Students' Union also makes representations to government and other bodies outside the University on behalf of its members.

Membership of the Students' Union is compulsory for all registered students of the University; the annual subscription for full-time and part-time students is set out later, in Rules and Procedures, Enrolment and Procedures and Fees Schedules, section 15. Fees. Only those persons who were enrolled as Life Members prior to January 1 1985, shall retain such membership.

The Students' Union is governed by a Council consisting in the main of elected student representatives from the various faculties of the University. There are also representatives of the University Council, Life Members, the Staff Association and the Sports Association. The Council is elected annually in May-June.

The Students' Union has three full-time officers who are elected each year by popular ballot. They are the President, who is mainly the political figure-head of the Union; the Secretary/Treasurer, who organizes the smooth operation of the SU offices, keeps the membership rolls up to date, and oversees the financial operations; and the Women's Officer who represents women on campus and formulates, maintains and co-ordinates the Students' Union policy on women's affairs.

Other officers are the Education Vice-President, who works towards the implementation of Students' Union education policy; the Education Officer concerned with helping students with problems relating to TEAS, Show-Cause and other matters relevant to their courses; the Vice-President who ensures the efficient running of CASOC; and the Director of Overseas Students who deals with specific problems these students may encounter while in Australia.

The activities in which the Students' Union is involved include:
1. Publication of the Student Paper Tharunka.
2. Production of the student video program Campuswide.
3. A free legal service run by a qualified lawyer employed by the Students' Union Council.
4. The Secondhand Bookshop for cheap texts.
5. A child care centre, House at Pooh Corner.
6. CASOC (Clubs and Societies on Campus) which provides money from the SU for affiliated clubs and societies on campus.
7. A video service with access for students to equipment and advice.
8. A noticeboard for casual job vacancies.
9. Organization of orientation for new students.

The SU has two offices on campus. One is located at the back of the Library Lawn (between the Chancellery and the Morven Brown Building), where the SU President, Education Vice-President, Education Officer, Clubs and Societies Secretary and Postgraduate Officer are available to discuss student problems. The other is on the Second Floor of the Squarehouse (above the bar) at the bottom end of campus, where the Secretary/Treasurer, Women's Officer, Overseas Student Director, the full-time Solicitor, Tharunka and Campuswide provide information and student services.

The University Library

The University libraries are mostly situated on the upper campus. The library buildings house the Social Sciences and Humanities Library on Level 4, the Physical Sciences Library on Level 7 and the Law Library on Level 8. The undergraduate collection is on Levels 3 and 4. The Biomedical Library is in the western end of the Mathews Building and is closely associated with libraries in the teaching hospitals of the University.

For details consult Faculty Information in the relevant Faculty Handbook.

There are also library services at other centres:
- The Water Reference Library situated at Manly Vale (telephone 948 0261) which is closely associated with the Physical Sciences Library.
- The library at the Australian Defence Force Academy, ACT, serving the Faculty of Military Studies.
The University Union

The University Union provides the amenities which students, staff and graduates require in their daily University life and thus facilitates their knowing and understanding one another through associations outside the lecture room, the library and other places of work.

The Union is housed in a range of buildings across the campus, principal among which are the Roundhouse, the Blockhouse and the Squarehouse located near the Anzac Parade entrance to the University. Membership of the Union is compulsory for all registered students and is open to all members of staff and graduates of the University.

The control of the Union is vested in the Board of Management whose Chief Executive Officer is the Warden.

The Union operates a licensed Bar and twelve Food Service points on the campus, providing services ranging from takeaway snacks and cafeteria-type meals to an à la carte restaurant operation.

Shops run directly by the Union are the Logo Shop (University-crested gifts, mementos and clothing), two newsgency/stationery shops, one stationery shop specializing in architecture requisites and an ice cream/confectionery shop. Other facilities operating within buildings occupied by the Union are banks, a credit union agency, hairdressers and a beauty salon, barber, delicatessen, casual clothing shop, pharmacy, dentist, optical dispensing and travel services.

Showers, meeting, games, music practice, reading, craft and dark rooms are provided as well as a Student Resource Area where photocopying, screen printing, stencil cutting and typewriter services and equipment hire are available.

The Union's cultural activities program encompasses creative leisure classes, lunch hour concerts and films, market days and exhibitions.

Further information on Union programs, activities and services is provided in the Annual Union Handbook and in the Creative Leisure Classes and Activities brochures published each session.

Financial Assistance to Students

Tertiary Education Assistance Scheme

Under this scheme, which is financed by the Commonwealth Government, assistance is available for full-time study in approved courses, to students who are not bonded and who are permanent residents of Australia, subject to a means test on a non-competitive basis. The allowances paid are unlikely to be sufficient, even at the maximum rate, for all the living expenses of a student. Family help and/or income from vacation or spare-time work would also be needed.

Students in the following types of university courses are eligible for assistance:

- Undergraduate and graduate bachelor degree courses;
- Graduate diplomas;
- Approved combined bachelor degree courses;
- Masters qualifying courses (one year).

The rates of allowance and conditions for eligibility are set out in a booklet obtainable from the Commonwealth Department of Education.

It is most important that students advise the TEAS office if at any time they change or discontinue their study programs, as their eligibility for benefits might be affected.

Other Financial Assistance

In addition to the Tertiary Education Assistance Scheme financed by the Australian Government the following forms of assistance are available:

1. Deferment of Payment of Fees

   Deferments may be granted for a short period, usually one month, without the imposition of a late fee penalty, provided the deferment is requested prior to the due date for fee payments.

2. Short Term Cash Loans

   Donations from various sources have made funds available for urgent cash loans not exceeding $100. These loans are normally repayable within one month.

3. The Commonwealth Government has made funds available to the University to provide loans to students in financial difficulty. The loans are to provide for living allowances and other approved expenses associated with attendance at university. Students are required to enter into a formal agreement with the University to repay the loan. The University is unable to provide from the fund amounts large enough for all or even a major part of the living expenses of a student.

   Students who are in extremely difficult financial circumstances may apply for assistance by way of a grant. In order to qualify for a grant a student must generally show that the financial difficulty has arisen from exceptional misfortune. Grants are rarely made.

The University has also been the recipient of donations from the Arthur T. George Foundation, started by Sir Arthur George and his family, for the endowment of a student loan fund.
In all cases assistance is limited to students with reasonable academic records and whose financial circumstances warrant assistance.

Enquiries about all forms of financial assistance should be made at the office of Student Services, Room G19, the Chancellery.

**Financial Assistance to Aboriginal Students**

Financial assistance is available to help Aboriginal students from the Commonwealth Government's Aboriginal Study Grant Scheme. Furthermore, Aboriginal students may apply for loans from the Student Loan Funds.

The University has also received a generous bequest from the estate of the late Alice Brooks Gange for the education of Australian aborigines within the University. Under the terms of this Bequest the Vice-Chancellor approved the establishment of a Centre for Aboriginal Students. This Centre, which began operating in 1985, provides support for Aboriginal students who are enrolled in the University and who wish to use the Centre and its resources. The Centre has a Resident Supervisor.

All enquiries relating to these matters should be made at the office of Student Services, Room G19, the Chancellery.

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**Rules and Procedures**

The University, in common with other large organizations, has established rules and procedures which are designed for the benefit of all members of the University. In some cases there are penalties (eg fines or exclusion from examinations) for non-compliance. Any student who, after carefully reading the rules set out in the following pages, requires further information on their application should seek further advice, in the first instance, at the Enquiry Counter in the North Wing of the Chancellery Building.

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**General Conduct**

The University has not considered it necessary to formulate a detailed code of rules relating to the general conduct of students. Enrolment as a student of the University, however, involves an undertaking to observe the regulations, by-laws and rules of the University, and to pay due regard to any instructions given by any officer of the University.

**Appeals**

Section 5(c) of Chapter III of the By-laws provides that 'Any person affected by a decision of any member of the Professorial Board (other than the Vice-Chancellor) in respect of a breach of discipline or misconduct may appeal to the Vice-Chancellor, and in the case of disciplinary action by the Vice-Chancellor, whether on appeal or otherwise, to the Council.'

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**Admission and Enrolment**

The Student Enquiry Counter, located near the Cashier in the Chancellery on the upper campus, provides information for students on admission requirements, undergraduate and graduate courses and enrolment procedures. Faculty handbooks and the Calendar may be purchased from the Cashier. The Enquiry Counter is open from 9 am to 1 pm and 2 pm to 5 pm, Monday to Friday. During enrolment it is also open on some evenings.

Information may be obtained here about admission to first year undergraduate courses, special admission, admission with advanced standing and admission on overseas qualifications. Applications are also received from students who wish to transfer from one course to another, resume their studies after an absence of twelve months or more, or seek any concession in relation to a course in which they are enrolled.

Applications for admission to undergraduate courses from students who do not satisfy the requirements for admission (see section on Admission Requirements) are referred by the Admissions Section to the Admissions Committee of the Professorial Board.

It is essential that the closing dates for lodgement of applications are adhered to. For further details see the section on Enrolment Procedures and Fees.

Students wishing to enrol as higher degree candidates should first consult the Head of the School in which they wish to study. An application is then lodged on a standard form and the Postgraduate Section, after obtaining a recommendation from the Head of School, refers the application to the appropriate Faculty or Board of Studies Higher Degree Committee.

An Adviser for Prospective Students, Mrs Fay Lindsay, is located in the huts near the foot of Basser Steps (access from Engineering Road), and is available for personal interview with those who require additional information about the University.

**First Year Entry**

Those seeking entry to first year courses in one or more of twenty-two tertiary institutions in the State including all universities are required to lodge a single application form with the Universities and Colleges Admissions Centre (GPO Box 7049, Sydney 2001). On the application form provision is made for applicants to indicate preferences for courses available in any one of the seven universities and the other tertiary institutions. Students are notified individually of the result of their applications and provided with information.
2. New Undergraduate Enrolments

Persons who are applying for entry in 1986 must lodge an application for selection with the Universities and Colleges Admissions Centre, GPO Box 7049, Sydney 2001, by 1 October 1985.

Those who are selected will be required to complete enrolment at a specified time before the start of Session 1. Compulsory student activities fees should be paid on the day.

In special circumstances, however, and provided class places are still available, students may be allowed to complete enrolment after the prescribed time.

Application forms and details of the application procedures may be obtained from the Student Enquiry Counter, Ground Floor, North Wing of the Chancellery Building.

3. Re-enrolment

See also sections 4., 6. and 7. below.

Students who are continuing courses (or returning after approved leave of absence) should enrol through the appropriate school in accordance with the procedures set out in the current Enrolment Procedures booklet, available from the Student Enquiry Counter in the Chancellery and from School offices. Undergraduate students who have completed part of a course and have been absent without leave need to apply for entry through the Universities and Colleges Admissions Centre, GPO Box 7049, Sydney 2001, by 1 October 1985.

4. Restrictions Upon Re-enrolling

Students who in 1985 have infringed the rules governing re-enrolment should not attempt to re-enrol in 1986 but should follow the written instructions they will receive from the Registrar in December 1985.

5. New Research Students

Students enrolling for the first time in graduate research degree courses will be advised by letter concerning the method of enrolment. Enrolment other than in accordance with the procedure set out in this letter will incur a penalty (see section 16. below).

6. Re-enrolling Research Students

Students undertaking research degree courses (course codes 0-2999) will be re-enrolled automatically each year and sent an account for any fees due.

7. Submission of Project Report

Students registered for formal masters degree courses (course codes 8000-9999) who at the commencement of Session 1 have completed all the work for a degree or diploma except for the submission of the relevant project report are required to re-enrol by the end of the second week of the session.
Session 1. Completion of enrolment after then will incur a penalty (see section 16. below).
Information about possible student activities fees exemption is set out in section 17. (10) below.

8. Enrolments by Miscellaneous Students

Enrolments by Miscellaneous students are governed by the following rules:

(1) Enrolment in a particular subject or subjects as a miscellaneous student — ie as a student not proceeding to a degree or diploma — may be permitted provided that in every case the Head of School offering the subject considers that the student will benefit from the enrolment and provided also that accommodation is available and that the enrolment does not prevent a place in that subject being available to a student proceeding to a degree or diploma.

(2) A student who is under exclusion from any subject in the University may not enrol as a miscellaneous student in that subject.

(3) A student who is under exclusion from any course in the University may not enrol in any subject which forms a compulsory component of the course from which the student is excluded.

(4) A student who is subsequently admitted to a course of the University for which any subjects completed as a miscellaneous student form a part may receive standing for those subjects.

(5) There are quota restrictions on the number of students allowed to enrol as miscellaneous, irrespective of whether they have approval from the Head of School. Applicants with written Head of School approval may be permitted to enrol providing there are places available in the quotas.

(6) As a general rule the University does not permit miscellaneous students to enrol in first year undergraduate subjects. Enquiries concerning eligibility for enrolment may be made at the Student Enquiry Counter, the Chancellery (telephone 6973095).

9. Final Dates for Completion of Enrolment

No enrolments for courses extending over the whole year or for Session 1 only will be accepted from new students after the end of the second week of Session 1 (14 March 1986) except with the express approval of the Registrar and the Heads of the Schools concerned; no later year enrolments for courses extending over the whole year or for Session 1 only will be accepted after the end of the fourth week of Session 1 (28 March 1986) except with the express approval of the Registrar and the Heads of the Schools concerned. No enrolments for courses in Session 2 only will be accepted after the end of the second week of Session 2 (8 August 1986) except with the express approval of the Registrar and the Heads of the Schools concerned.

10. Student Card — Conditions of Issue

All students enrolled in degree or diploma courses or as miscellaneous students are issued with a University of New South Wales Student Card. All students are issued with cards on their initial enrolment.

The number appearing on the card below the student’s name is the student registration number used in the University’s records. This number should be quoted in all correspondence.

(1) The card must be carried at the University and shown on request. It must be presented when borrowing from the University libraries, when using Library facilities and when applying for concessions.

(2) The card is not transferable.

(3) The student to whom the card has been issued must notify the Circulation Department of the Library of its loss or theft. Failure to do so may result in the cardholder being held responsible for items issued on the card after its loss or theft.

(4) The card is valid only for the period of enrolment as indicated on the receipt issued by the Cashier at enrolment each year.

(5) The cardholder accepts responsibility for all Library books issued on his/her card and agrees to return books by the due date.

(6) If the card is damaged or becomes otherwise unusable, it is the cardholder’s responsibility to seek replacement.

(7) The card always remains the property of the University and must be returned to it when the holder leaves the University.

11. Payment of Fees

The fees and charges which are payable include those charges raised to finance the expenses incurred in operating activities such as the University Union, the Students’ Union, the Sports Association, and the Physical Education and Recreation Centre. Penalty payments are also incurred if a student fails to complete procedures as required. Charges may also be payable, sometimes in the form of a deposit, for the hiring of kits of equipment in certain subjects. Accommodation charges, costs of subsistence on excursions, field work etc, and for hospital residence (medical students) are payable in appropriate circumstances.

12. Assisted Students

Scholarship holders and sponsored students who have not received an enrolment voucher or appropriate letter of authority from their sponsor at the time when they are enrolling should pay their own fees and a refund will be made when the enrolment voucher or letter of authority is subsequently lodged with the Cashier.

Those unable to pay their own fees in these circumstances can apply for an extension of time (see section 13. below) in which to pay. Such an application must be made before the fees are due.

13. Extension of Time

Students who are unable to pay fees by the due date may apply for an extension of time, which may be granted in extenuating circumstances. Such applications must be made in writing, before the due date and lodged at the student Enquiry Counter, the Chancellery.
14. Failure to Pay Fees and Other Debts

Students who fail to pay prescribed fees or charges or are otherwise indebted to the University and who fail either to make a satisfactory settlement of indebtedness upon receipt of due notice or to receive a special exemption cease to be entitled to the use of University facilities. Such students are not permitted to enrol for a further session, to attend classes or examinations, or to be granted any official credentials. In the case of students enrolled for Session 1 only or for both Sessions 1 and 2 this disbarment applies if any portion of fees is outstanding after the end of the eighth week of Session 1 (25 April 1986). In the case of students enrolled for Session 2 only this disbarment applies if any portion of fees is outstanding after the end of the sixth week of Session 2 (5 September 1986).

In special cases the Registrar may grant exemption from the disqualification referred to in the preceding paragraph upon receipt of a written statement setting out all relevant circumstances.

15. Fees

Fees and penalties quoted are current at the time of publication but may be amended by the University without notice.

**University Union Entrance Fee**
Payable on first enrolment $40

Students enrolling for only one session must pay the full University Union entrance fee.

**Student Activities Fees**
All students (with the exceptions set out in section 17. below) are required to pay the following fees if enroiling for a program involving two sessions. Those enrolling for only one session will pay the full University Union Entrance Fee, if applicable, and one-half of any other fees due.

Students who consider themselves eligible for life membership of the University Union, the Sports Association, or the Students' Union, should make enquiries about the matter at the offices of those bodies.

Students often seek exemption from some or all of the student activities fees for reasons other than those set out in section 17. below. It is stressed that the fees charged are a contribution by students towards services and amenities for the University community (both now and in the future) and exemption from them cannot be claimed because a student is unable or unwilling to make use of some of those services or amenities.

Student Activities Fees are adjusted annually by a system of indexation and those set out below have been approved for 1986.

- **University Union** annual subscription $115
- **Sports Association** annual subscription $25
- **Students' Union** Annual Subscription
  - Students enrolling in full-time courses $34
  - Students enrolling in part-time courses or as miscellaneous students $28

Miscellaneous Fund annual fee

This fee is used to finance expenses generally of a capital nature relating to student activities and amenities. Funds are allocated for projects recommended by the Student Affairs Committee and approved by the University Council.

**Special Examination Fees**
Examinations conducted in special circumstances for each subject $20

Review of examination results for each subject $20

**Other Charges**
In addition to the fees outlined above and depending on the subject being taken, students may be required to make a payment for equipment; money so paid is, in general, refunded if the equipment is returned in satisfactory condition.

16. Penalties

(1) Failure to lodge enrolment form according to enrolment procedure $20

(2) Payment of fees after end of second week of session $20

(3) Payment of fees after end of fourth week of session $40

Penalties (1) and (2) or (1) and (3) may accumulate.

17. Exemptions — fees

Students often seek exemption from the fees for reasons other than those set out below. It is stressed that the fees charged are a contribution by students towards services and amenities for the University community (both now and in the future) and exemption from them cannot be claimed because a student is unable or unwilling to make use of some of those services or amenities.

(1) Life members of the University Union, the Sports Association, and Students' Union are exempt from the relevant fee or fees.

Students who consider themselves eligible for life membership of the University Union, the Sports Association, or the Students' Union, should make enquiries about the matter at the offices of those bodies.

(2) Students enrolled in courses classified as *External* are exempt from all Student Activities Fees and the University Union Entrance Fee.

(3) Students enrolled in courses at the University College (Australian Defence Force Academy) are exempt from the Student Activities Fees and the University Union Entrance Fee in section 15. above but shall pay such other fees and charges as the Council may from time to time determine.

(4) University Union fees and subscriptions may be waived by the Registrar for students enrolled in graduate courses in which the formal academic requirements are undertaken at a part of the University away from the Kensington campus.

(5) Students who while enrolled at and attending another university (or other tertiary institution as approved by the Vice-Chancellor) in a degree or diploma course are given...
approved to enrol at the University of New South Wales but only as miscellaneous students for subjects to be credited towards the degrees or diplomas for which they are enrolled elsewhere are exempt from all Student Activities Fees and the University Union Entrance Fee.

Institutions approved are: Australian Film and Television School, New South Wales Institute of Technology, Sydney College of Advanced Education and Sydney College of Chiropractic.

(6) Undergraduate students of a recognized university outside Australia who attend the University of New South Wales with the permission of the head of the appropriate school or department to take part as miscellaneous students in an academic program relevant to their regular studies and approved by the authorities of their own institution are exempt from all Student Activities Fees and the University Union Entrance Fee.

(7) Graduate students not in attendance at the University and who are enrolling in a project only other than for the first time, are exempt from all Student Activities Fees.

(8) Graduate students resubmitting a thesis or project only are exempt from all Student Activities Fees.

(9) All Student Activities Fees, for one or more sessions, may be waived by the Registrar for students who are given formal permission to pursue their studies at another institution for one or more sessions.

(10) Graduate students who have completed all the work for a qualification at the commencement of session, except for the submission of the relevant thesis or project report, may be exempted from the payment of Student Activities Fees by the Registrar on production of an appropriate statement signed by the relevant Supervisor or Head of School.

(11) Students enrolled in a session or sessions devoted entirely to training or experience away from the campus and its associated laboratories, hospitals, centres, institutes and field stations are exempt from all Student Activities Fees for that session or sessions.

(12) Students whose registration is cancelled or suspended by the University shall receive refunds of fees paid in accordance with the provisions of section 18. (5) below except that if notice of withdrawal is given before the end of the seventh week of Session 1 and the end of the fourth week of Session 2.

### 18. Variations in Enrolment (including Withdrawal)

(1) Students wishing to vary an enrolment program must make application on the Variation of Enrolment form available from the appropriate Course Authority and the Student Enquiry Counter.

(2) Students withdrawing from courses (and see also information about withdrawal from subjects below) are required to notify the Registrar in writing or complete the withdrawal form available from the Student Enquiry Counter. In some cases such students will be entitled to fee refunds (see 5 below).

(3) Enrolment in additional subjects
Applications for enrolment in additional subjects must be submitted by:
- 28 March 1986 for Session 1 only and whole year subjects;
- 22 August 1986 for Session 2 only subjects.

(4) Withdrawal from subjects
Applications to withdraw from subjects may be submitted throughout the year but applications lodged after the following dates will result in students being regarded as having failed the subjects concerned, except in special circumstances:
(a) for one session subjects, the end of the seventh week of that session (18 April or 19 September);
(b) for whole year subjects, the end of the second week of Session 2 (8 August).

(5) Withdrawal from Course – Refunds – Student Activities Fees
Whether or not a student's withdrawal entails academic penalties (covered in item (4) above) there are rules governing Student Activities Fees refunds in the case of complete withdrawal from a course as follows:
(a) If notice of withdrawal from a course is received before the first day of Session 1, a refund of all Student Activities Fees paid will be made.

(b) If notice of withdrawal is received on or after the first day of Session 1, a partial refund of the University Union Entrance Fee will be made on the following basis: any person who has paid the entrance fee in any year and who withdraws from membership of the University Union after the commencement of Session 1 in the same year, or who does not renew membership in the immediately succeeding year may on written application to the Warden receive a refund of half of the entrance fee paid.

(c) If the notice of withdrawal is given before the end of the fourth week of Session 1 (28 March 1986) a full refund of Student Activities Fees paid will be made; if notice is given before the end of the seventh week of Session 1 (18 April 1986) a refund of three-quarters of the Student Activities Fees paid will be made; if notice is given before the beginning of Session 2 (28 July 1986) a refund of one-half of the Student Activities Fees paid will be made; if notice is given before the end of the seventh week of Session 2 (19 September 1986) a refund of one-quarter of Student Activities Fees paid will be made; thereafter no refund will be made except that provided for in (d) below.

(d) If a student's enrolment in any year is for one session only and the student gives notice of withdrawal prior to the end of the fourth week of that session (28 March or 22 August 1986) a full refund of Student Activities Fees paid will be made; if notice is given before the end of the seventh week of that session (18 April or 19 September 1986) a refund of one-half of the Student Activities Fees paid will be made; thereafter no refund will be made.

(e) The refunds mentioned in (c) and (d) above may be granted by the Registrar to a student unable to notify the Registrar in writing by the times required provided evidence is supplied that the student has ceased attendance by those times.
6) Acknowledgements
The Registrar will acknowledge each application for a variation in enrolment (including withdrawals from subjects) as follows:

a) variations lodged before the Friday of the seventh week of each session (18 April or 19 September) will be incorporated in the Confirmation of Enrolment Program notice forwarded to students on 29 April or 30 September as appropriate.

b) variations lodged after those dates will be acknowledged by letter.

c) withdrawals from a course are acknowledged individually whenever they are lodged.

(7) It is emphasized that failure to attend for any assessment procedure, or to lodge any material stipulated as part of an assessment procedure, in any subject in which a student is enrolled will be regarded as failure in that assessment procedure, in any subject in which a student is enrolled for any degree or other award of the University may be such as to give full credit in the course to which the applicants transfer.

19. Exemption – Membership
The Registrar is empowered to grant exemption from membership of any or all of the University Union, the Students' Union and the Sports Association to students who have a genuine conscientious objection to such membership, subject to payment of the prescribed fees to the Miscellaneous Fund.

Leave of Absence

Leave of absence from an undergraduate course of study may be granted to students other than those in the first year of a course. Leave of absence has generally been restricted to one year but in special circumstances two years have been granted.

To apply for such leave of absence, a letter should be submitted to the Registrar immediately following the release of annual examination results and must include the student’s full name, registration number, the course and stage in which enrolled in the previous year and, most important, the reason why leave is being sought. The letter advising the result of the application will provide details about how to re-enrol.

Higher degree and graduate diploma candidates may apply for suspension of enrolment under similar conditions.

Undergraduate Course Transfers

Students wishing to transfer from one course to another must complete and submit an application form, obtainable from the Student Enquiry Counter, the Chancellery, by Friday 10 January 1986.

Students whose applications to transfer are successful, and who are transferring from one school to another are required to comply with the enrolment procedure laid down for new students with advanced standing. Students transferring from one course to another within the same school are required to attend the appropriate enrolment session for the course to which they have approval to transfer.

Students must present the approval to transfer to the enrolling officer, and those who have not received advice regarding their application to transfer before the date on which they are required to enrol should check with the office of the Admissions Section.

Students should also advise the enrolling officer in the school in which they were enrolled in 1985 of their intention to transfer.

Admission with Advanced Standing

Any persons who make application to register as a candidate for any degree or other award granted by the University may be admitted to the course of study leading to such degree or award with such standing on the basis of previous attainments as may be determined by the Professorial Board provided that:

1. the Board shall not grant such standing under these rules as is inconsistent with the rules governing progression to such degree or award as are operative at the time the application is determined;

2. where students transfer from another university such students shall not in general be granted standing in this University which is superior to what they have in the University from which they transfer;

3. the standing granted by the Board in the case of any application based on any degree/s or other awards already held by the applicants, shall not be such as will permit them to qualify for the degree or award for which they seek to register without completing the courses of instruction and passing the examinations in at least those subjects comprising the later half of the course, save that where such a program of studies would involve them repeating courses of instruction in which the Board deems them to have already qualified, the Board may prescribe an alternative program of studies in lieu thereof;

4. the standing granted by the Board in the case of any application based on partial completion of the requirements for any degree or other award of another institution shall not be such as will permit the applicants to qualify for the degree or award for which they seek to register by satisfactory completion of a program of study deemed by the Board to be less than that required of students in full-time attendance in the final year of the course in which the applicants seek to register;

5. the standing granted by the Board in the case of any application based on the partial completion of the requirements for any degree or other award of the University may be such as to give full credit in the course to which the applicants
Examining Results

Grading of Passes

Passes are graded as follows:

- **High Distinction**: an outstanding performance
- **Distinction**: a superior performance
- **Credit**: a good performance
- **Pass**: an acceptable level of performance
- **Satisfactory**: satisfactory completion of a subject for which graded passes are not available

Pass Conceded

A pass conceded may be granted provided that the overall performance is considered to warrant such a concession. A pass conceded in a subject will allow progression to another subject for which the former subject is a prerequisite.

Pass Terminating

A pass terminating may be granted provided that the overall performance is considered to warrant such a concession. A pass terminating does not allow progression to another subject for which the former subject is a prerequisite.

Availability of Results

Final examination results will be posted to a student's term address, or vacation address if requested. Forms requesting that results be posted to a vacation address and change of address forms are obtainable at the Student Enquiry Counter, the Chancellery. Forms can be accepted up to Friday 4 July for Session 1 results and Friday 5 December for Session 2 and whole year results. Results are also posted on School noticeboards and in the University Library. Results on noticeboards are listed by Student Registration Number.

No examination results are given by telephone.

Review of Results

A student may make application to the Registrar for the review of a result. The application form, accompanied by an appropriate fee, must be submitted not later than fifteen working days after the date of issue of the Notification of Result of Assessment form.

In reviewing a result, the subject authorities shall ensure that all components of the assessment have been assessed and a mark assigned.

A review of a result is not a detailed reassessment of a student's standard of knowledge and understanding of, and skills in, the subject. It is rather a search for arithmetic error in arriving at the composite mark and for gross and obvious error in assignment of marks in components of the final composite mark.

When a change in grade is recommended, the application fee will be refunded by the Registrar.

Special Consideration

Students who believe that their performance in a subject, either during session or in an examination, has been adversely affected by sickness or any other reason should inform the Registrar and ask for special consideration in the determination of their standing.
Such requests should be made as soon as practicable after the occurrence and in any event no more than seven days after the final examination in a subject.

When submitting a request for special consideration students should provide all possible supporting evidence (e.g. medical certificates) together with their registration number and enrolment details.

**Physical Disabilities**

Students suffering from a physical disability which puts them at a disadvantage in written examinations should advise the Examinations Section (Ground Floor, the Chancellery) immediately their disability is known. If necessary, special arrangements will be made to meet the student’s requirements.

Students who are permanently disabled and need to make special arrangements for their examinations, should contact the Examinations Section as soon as the final timetable becomes available.

**Use of Computers and Electronic Calculators**

The use of computers or electronic calculators may be permitted in examinations conducted within the University. Computers and electronic calculators which are authorized by the University for this purpose must be hand-held, internally powered, and silent. Computers are distinguished from electronic calculators for this purpose by the existence of a full alphabetic keyboard on them. Computers are not permitted in examinations for which an electronic calculator has been specified. When an electronic calculator is permitted in an examination, any programmable memory on it must be cleared prior to entering an examination room.

The University does not provide computers or electronic calculators of the kind described in this rule for use in examinations although some schools may make them available in special circumstances.

**Examinations Held Away from the Campus**

Except in the case of students enrolled on external courses, examinations will not be permitted away from the campus unless the candidate is engaged on compulsory industrial training. Candidates must advise the Officer-in-charge, Examinations Section, immediately the details of the industrial training are known. Special forms for this purpose are available at the Student Enquiry Counter in the north wing of the Chancellery.

**Arrival at Examinations**

Examination Rooms will be open to students twenty-five minutes before the commencement of the examination. Candidates are requested to be in their places at least fifteen minutes before the commencement to hear announcements.

**Reading the Examination Paper**

The examination paper will be available for reading ten minutes before the instruction is given to commence writing.

**Use of Linguistic Dictionaries**

The answers in all examinations and in all work submitted must be in English unless otherwise directed. Students may apply for permission to use standard linguistic dictionaries in the presentation of written work for assessment. Such applications should be made in writing to the Officer-in-charge, Examinations Section not later than 14 days prior to the need to use the linguistic dictionary.

**Academic Misconduct**

Students are reminded that the University regards academic misconduct as a very serious matter. Students found guilty of academic misconduct are usually excluded from the University for two years. Because of the circumstances in individual cases the period of exclusion can range from one session to permanent exclusion from the University.

The following are some of the actions which have resulted in students being found guilty of academic misconduct in recent years: taking unauthorized materials into an examination; submitting work for assessment knowing it to be the work of another person; improperly obtaining prior knowledge of an examination paper and using that knowledge in the examination; failing to acknowledge the source of material in an assignment.

**Conduct of Examinations**

Examinations are conducted in accordance with the following rules and procedure:

1. Candidates are required to obey any instruction given by an examination supervisor for the proper conduct of the examination.

2. Candidates are required to be in their places in the examination room not less than fifteen minutes before the time for commencement.

3. No bag, writing paper, blotting paper, manuscript or book, other than a specified aid, is to be brought into the examination room.

4. Candidates shall not be admitted to an examination after thirty minutes from the time of commencement of the examination.

5. Candidates shall not be permitted to leave the examination room before the expiry of thirty minutes from the time the examination commences.

6. Candidates shall not be re-admitted to the examination room after they have left it unless, during the full period of their absence, they have been under approved supervision.

7. Candidates shall not by any improper means obtain, or endeavour to obtain, assistance in their work, give, or endeavour to give, assistance to any other candidate, or commit any breach of good order.

8. All answers must be in English unless otherwise stated. Foreign students who have the written approval of the Registrar may use standard linguistic dictionaries.

9. Smoking is not permitted during the course of examinations.

10. A candidate who commits any infringement of the rules governing examinations is liable to disqualification at the particular examination, to immediate expulsion from the examination room and to such further penalty as may be determined in accordance with the By-laws.
Writing in Examinations
Candidates are permitted to take pens, pencils and erasers into the examination room but are advised that all answers must be written in ink. Except where expressly required, pencils may be used only for drawing, sketching or graphical work.

Acknowledgement of Sources
Students are expected to acknowledge the source of ideas and expressions used in submitted work. To provide adequate documentation is not only an indication of academic honesty but also a courtesy enabling the marker to consult sources with ease. Failure to do so may constitute plagiarism, which is subject to a charge of academic misconduct.

Further Assessment
In special circumstances further assessment including assessment or further assessment on medical or compassionate grounds may be granted.

Further assessment may be given by the subject authority at his or her discretion at any time prior to the meeting of the relevant faculty assessment committee (normally the fourth week of the Midyear Recess and the second week of December). Further assessment may also be awarded at the faculty assessment committee and students affected may need to be free to undertake that further assessment in the last week in the Midyear Recess and in the period up to the end of the second week in January; students should consult their subject authority for details of further assessment immediately their results are known.

Restrictions upon Student Re-enrolling

The University Council has adopted the following rules governing re-enrolment with the object of requiring students with a record of failure to show cause why they should be allowed to re-enrol and retain valuable class places.

First Year Rule
1. Students enrolled in the first year of any undergraduate course of study in the University shall be required to show cause why they should be allowed to continue the course if they do not pass the minimum number of subjects, units or credits prescribed for this purpose by the relevant faculty or board of studies.

The prescribed minimum for each undergraduate course may be found in Schedule A below; the schedule may be varied from time to time by the Professorial Board.

Repeated Failure Rule
2. Students shall be required to show cause why they should be allowed to repeat a subject which they have failed more than once. Where the subject is prescribed as part of the course they shall also be required to show cause why they should be allowed to continue that course.

General Rule
3. (1) Students shall be required to show cause why they should be allowed to repeat a subject they have failed if the assessment committee of the faculty or board of studies so decides on the basis of previous failures in that subject or in a related subject. Where the subject is prescribed as part of the course they shall also be required to show cause why they should be allowed to continue that course.

(2) Students shall be required to show cause why they should be allowed to continue their course if the assessment committee of the faculty or board of studies so decides on the basis of their academic record.

The Session-Unit System
4. (1) Students who infringe the provisions of Rules 1. or 2. at the end of Session 1 of any year will be allowed to repeat the subject(s) (if offered) and/or continue the course in Session 2 of that year, subject to the rules of progression in the course.

(2) Such students will be required to show cause at the end of the year, except that students who infringe Rule 2. at the end of Session 1, and repeat the subjects in question in Session 2, and pass them, will not be required to show cause on account of any such subjects.

Exemption from Rules by Faculties
5. (1) A faculty or board of studies assessment committee may, in special circumstances, exempt students from some or all of the provisions of Rules 1. and 2.

(2) Such students will not be required to show cause under such provisions and will be notified accordingly by the Registrar.

Showing Cause
6. (1) Students wishing to show cause must apply for special permission to re-enrol. Application should be made on the form available from the Registrar and must be lodged with the Registrar by the dates published annually by the Registrar. A late application may be accepted at the discretion of the University.

(2) Each application shall be considered by the Admissions and Re-enrolment Committee of the relevant faculty or board of studies which shall determine whether the cause shown is adequate to justify the granting of permission to re-enrol.

Appeal
7. (1) Students who are excluded by the Admissions and Re-enrolment Committee from a course and/or subject under the provisions of the Rules will have their applications to re-enrol reconsidered automatically by the Re-enrolment Committee of the Professorial Board.

(2) Students whose exclusion is upheld by the Re-enrolment Committee may appeal to an Appeal Committee constituted by Council for this purpose with the following membership:

A Pro-Vice-Chancellor, nominated by the Vice-Chancellor who shall be Chairman.

The Chairman of the Professorial Board, or if its Chairman is unable to serve, a member of the Professorial Board, nominated by the Chairman of the Professorial Board, or when the
Chairman of the Professorial Board is unable to make a nomination, nominated by the Vice-Chairman.

One of the category of members of the Council elected by the graduates of the University, nominated by the Vice-Chancellor.

The decision of the Committee shall be final.

(3) The notification to students of a decision which has been upheld by the Re-enrolment Committee of the Professorial Board to exclude them from re-enrolling in a course and/or subject shall indicate that they may appeal against that decision to the Appeal Committee. The appeal must be lodged with the Registrar within fourteen days of the date of notification of exclusion; in special circumstances a late appeal may be accepted at the discretion of the chairman of the Appeal Committee. In lodging such an appeal with the Registrar students should provide a complete statement of all grounds on which the appeal is based.

(4) The Appeal Committee shall determine appeals after consideration of each appellant’s academic record, application for special permission to re-enrol, and stated grounds of appeal. In particular circumstances, the Appeal Committee may require students to appear in person.

Exclusion

8. (1) Students who are required to show cause under the provisions of Rules 1, or 3, and either do not attempt to show cause or do not receive special permission to re-enrol from the Admissions and Re-enrolment Committee (or the Re-enrolment Committee on appeal) shall be excluded, for a period not in excess of two years, from re-enrolling in the subjects and courses on account of which they were required to show cause. Where the subjects failed are prescribed as part of any other course (or courses) they shall not be allowed to enrol in any such course.

(2) Students required to show cause under the provisions of Rule 2, who either do not attempt to show cause or do not receive special permission to re-enrol from the Admissions and Re-enrolment Committee (or the Re-enrolment Committee on appeal) shall be excluded, for a period not in excess of two years, from re-enrolling in any subject they have failed twice. Where the subjects failed are prescribed as part of a course they shall also be excluded from that course. Where the subjects failed are prescribed as part of any other course (or courses) they shall not be allowed to enrol in any such course.

Re-admission after Exclusion

9. (1) Excluded students may apply for re-admission after the period of exclusion has expired.

(2) (a) Applications for re-admission to a course should be made to the Universities and Colleges Admissions Centre before the closing date for normal applications in the year prior to that in which re-admission is sought. Such applications will be considered by the Admissions and Re-enrolment Committee of the relevant faculty or board of studies.

(b) Applications for re-admission to a subject should be made to the Registrar before 30 November in the year prior to that in which re-admission is sought. Such applications will be considered by the relevant subject authority.

(3) Applications should include evidence that the circumstances which were deemed to operate against satisfactory performance at the time of exclusion are no longer operative or are reduced in intensity and/or evidence of action taken (including enrolment in course/s) to improve capacity to resume studies.

(4) Students whose applications for re-admission to a course or subject are unsuccessful (see 9. (2) (a), (b) respectively) will be invited to appeal to the Re-Enrolment Committee of the Professorial Board. The decision of the Re-Enrolment Committee will be final.

10. Students who fail a subject at the examinations in any year or session and re-enrol in the same course in the following year or session must include in their programs of studies for that year or session the subject which they failed. This requirement will not be applicable if the subject is not offered the following year or session, is not a compulsory component of a particular course, or if there is some other cause which is acceptable to the Professorial Board, for not immediately repeating the failed subject.

Restrictions and Definitions

11. (1) These rules do not apply to students enrolled in programs leading to a higher degree or graduate diploma.

(2) A subject is defined as a unit of instruction identified by a distinctive subject number.

Schedule A

(See First Year Rule 1. above)

Where the minimum requirement is half the program, this is defined as half the sum of the unit values of all the subjects in a student’s program.

<table>
<thead>
<tr>
<th>Faculty/Board of Studies</th>
<th>Minimum Requirement</th>
<th>Course</th>
<th>Unit Values (UV)</th>
</tr>
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<tbody>
<tr>
<td>Applied Science</td>
<td>Half the program</td>
<td>3000-3220</td>
<td>One-session subjects: UV 1</td>
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<td></td>
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<td>Two-session subjects: UV 2</td>
</tr>
<tr>
<td>Architecture</td>
<td>Half the program</td>
<td>3270, 3275, 3330</td>
<td>Elective subjects: UV 0</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>All other subjects: appropriate UV corresponding to credit points*</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>3320</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>All subjects: UV equal to the allocated hours*</td>
</tr>
<tr>
<td></td>
<td></td>
<td>3360, 3380</td>
<td>Elective subjects: UV 0</td>
</tr>
<tr>
<td>Arts</td>
<td>18 Level I credit points</td>
<td>3400-3420</td>
<td>All other subjects: UV equal to the allocated hours*</td>
</tr>
</tbody>
</table>

*For details see the appropriate Faculty Handbook.
**Faculty/Board of Studies**  
**Minimum Requirement**  
**Course**  
**Unit Values (UV)**

<table>
<thead>
<tr>
<th>Faculty/Board of Studies</th>
<th>Minimum Requirement</th>
<th>Course</th>
<th>Unit Values (UV)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Biological Sciences</td>
<td>4 units</td>
<td>3430</td>
<td>Science subjects: appropriate UV*</td>
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<tr>
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<td></td>
<td></td>
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<td>6 credit points = UV 1</td>
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<tr>
<td></td>
<td></td>
<td></td>
<td>12 credit points = UV 2</td>
</tr>
<tr>
<td>Commerce</td>
<td>Three subjects</td>
<td>3490-3595 FT</td>
<td>1.061; UV 0</td>
</tr>
<tr>
<td></td>
<td>in both sessions</td>
<td></td>
<td>One-session subjects: UV 1</td>
</tr>
<tr>
<td></td>
<td>Two subjects</td>
<td>3490-3595 FT</td>
<td>Two-session subjects: UV 2</td>
</tr>
<tr>
<td>Engineering</td>
<td>Half the program</td>
<td>3610-3612, 3620-3730</td>
<td>All subjects: UV equal to the allocated hours*</td>
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<tr>
<td></td>
<td>including</td>
<td>3660-3662, 3680-3682, 3700-3702</td>
<td>One-session subjects: UV 1</td>
</tr>
<tr>
<td></td>
<td>Physics I or</td>
<td>3620, 3730</td>
<td>Two-session subjects: UV 2</td>
</tr>
<tr>
<td></td>
<td>Mathematics I</td>
<td></td>
<td>All other two-session subjects: UV 2</td>
</tr>
<tr>
<td>Law</td>
<td>Half the program</td>
<td>4710-4790</td>
<td>One-session subjects: UV 1</td>
</tr>
<tr>
<td></td>
<td>including</td>
<td></td>
<td>90.741: UV 0</td>
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<td></td>
<td>Statics or Mathematics I</td>
<td>All other two-session subjects: UV 2</td>
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<tr>
<td></td>
<td>Half the program</td>
<td>3800</td>
<td>Physics I or Mathematics I</td>
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<tr>
<td></td>
<td>including</td>
<td></td>
<td>Half the program</td>
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<tr>
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<td>Half the program</td>
<td>3740, 3760</td>
<td>One General Studies elective: UV 1</td>
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<tr>
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<td></td>
<td>3720-3725</td>
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<td>Half the program</td>
<td>4030, 4040</td>
<td>All subjects: UV 1</td>
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<tr>
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<td>4070-4080</td>
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<tr>
<td></td>
<td>Half the program</td>
<td>3910, 3950</td>
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<td>including</td>
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</tr>
<tr>
<td></td>
<td>Half the program</td>
<td>3970</td>
<td>All subjects: appropriate UV*</td>
</tr>
</tbody>
</table>

*For details see the appropriate Faculty Handbook.

**Admission to Degree or Diploma**

Students whose current program will enable them to complete all requirements for the degree or diploma, including industrial training where necessary, should lodge with the Registrar the form Application for Admission to Degree/Diploma and return it to the Registrar by the second Monday in May for the October ceremonies, and the second Friday in October for all other ceremonies. The forms are available from the Student Enquiry Counter in the north wing of the Chancellery.

Students who have indicated on their enrolment form that they are potential graduands are forwarded an application form with their Confirmation of Enrolment Program notice in September (or, in the case of students who expect to satisfy requirements at the end of Session 1, with the form issued in April). Students who do not complete an application form will not graduate; students who do not return their application form by the due date will graduate at a later series of ceremonies.

Students enrolled in courses 3400, 3910 and 3970 who have completed an application form to graduate at the pass level and who then decide to proceed to an honours year should advise the Registrar, in writing before 1 September for those completing requirements at the end of Session 1, or before 28 February for those completing requirements at the end of Session 2.

A list of graduands in Medicine who have applied for their degree is published in *The Sydney Morning Herald* in January.

A list of graduands other than Medicine who have applied for their degree/diploma and who expect to graduate in October is published in *The Sydney Morning Herald* on the first Wednesday in September.

A list of graduands other than Medicine who have applied for their degree/diploma and who expect to graduate in April/May the following year is published in *The Sydney Morning Herald* on the first Wednesday in March.

Students who are potential graduands and who wish to notify the Registrar of a change of address should submit an additional form Final Year Students' Graduation: Change of Address.
Attendance at Classes

Students are expected to be regular and punctual in attendance at all classes in the subjects in which they are enrolled. All applications for exemption from attendance at classes of any kind must be made in writing to the Registrar.

In the case of illness or of absence for some other unavoidable cause students may be excused by the Registrar for non-attendance at classes for a period of not more than one month or, on the recommendation of the Dean of the appropriate faculty, for a longer period.

Absence from Classes

Explanations of absences from classes, or requests for permission to be absent from forthcoming classes, should be addressed to the Registrar and, where applicable, should be accompanied by a medical certificate. If examinations or other forms of assessment have been missed, this should be stated in the application.

If students attend less than eighty per cent of their possible classes they may be refused final assessment.

Student Records

Confirmation of Enrolment Program notices are sent to all students on 28 April and 29 September. It is not necessary to return these forms unless any of the information recorded is incorrect. If amendments need to be made, students should contact the appropriate course office.

Change of Address Advice forms are available at Faculty and School offices and from the Student Enquiry Counter in the north wing of the Chancellery.

All communications from the University will be sent to the Session or Term address except when arrangements are made otherwise in the case of results of assessment (see Examinations: Availability of Results, earlier in this section). Change of Address Advice forms will be accepted up to Friday 5 December, except for final-year students wishing to change their Application for Admission for Degree/Diploma form. Changes to this form will be accepted up to a date four weeks before the student's graduation ceremony.

Ownership of Students' Work

The University reserves the right to retain at its own discretion the original or one copy of any drawings, models, designs, plans and specifications, essays, theses or other work executed by students as part of their courses, or submitted for any award or competition conducted by the University.

Notices

Official University notices are displayed on the noticeboards and students are expected to be acquainted with the notices which concern them. These boards are in the Biological Sciences Building, the Mathews Building, the Chancellery (lower ground floor), Central Lecture Block, Dalton Building (Chemistry), Main Building (Physics and Mining) and in the Western Grounds Area.
Parking within the University Grounds

A limited amount of parking is available on campus. Copies of the University's parking rules may be obtained on application to Room 240, the Chancellery.

Academic Dress

Information about the University's academic dress requirements may be obtained from the Ceremonials Section, Room LG2, the Chancellery (phone extension 3112).

Further Information

Lost Property

All enquiries concerning lost property should be made to the Superintendent (Patrol and Cleaning Services) on extension 3460 or to the Lost Property Office at the Union.

The Calendar

Please consult the Calendar for a more detailed account of the information contained in this section.
The Faculty of Applied Science is where science-based and engineering-based disciplines that are directly concerned with some aspect of Australia's natural resources have been established in a single Faculty. As a consequence there are many specialized options available to students that are based upon a wide range of inter-disciplinary and multi-disciplinary course options.

The undergraduate courses in the Faculty are: **Applied Geology** (including specialization in Mineral Resources, Basin Analysis, Engineering Geology and Geophysics); **Chemical Engineering and Industrial Chemistry** (including Biological Process Engineering and Fuel Engineering); **Food Science and Technology; Geography** (including Applied Physical Geography, Applied Economic Geography, and Human and Physical Resources); **Metallurgy** (including Ceramic Engineering); **Mining Engineering** (including Mineral Processing) **Mining Geology; Petroleum Engineering; Textile Technology** (including Textile Chemistry, Textile Engineering, Textile Manufacture and Textile Physics); **Wool and Pastoral Sciences.**

In most Schools there is also a variety of other options available. Students should discuss their programmes with appropriate staff to ensure that their chosen course of study is appropriate to their aims and aspirations.

There is a wide range of research programs in the Faculty; many of the staff have achieved international recognition for their work, and there is much that you, as students, can learn from them. It is essential, however, that you participate fully in your study program from the first day of your first year.

You are also urged to play an active role in the extra-mural activities of the University, especially in the student societies in the Schools.

The Faculty is dynamic with changing activities and programs to meet the rapid technological developments in applied science. The staff are enthusiastic and I hope that you will share their enthusiasm. The importance of Applied Science to the University — and to the wider community outside — is fully recognized and is especially referred to in the University Act of Incorporation. 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 problems.

G. J. S. Govett
Dean
Faculty of Applied Science
Faculty Information

Some People Who Can Help You

If you require advice and information of a general nature contact:
Mr R. Starr, Senior Administrative Officer, Faculty of Applied Science. Room 103, Sir Robert Webster Building. Tel. (02) 697 4469.

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

Applied Geology Mr G. Baldwin, Senior Administrative Officer.
Room 810, Applied Science Building. Tel. 697 4262

Chemical Engineering and Industrial Chemistry Mr J. Gatenby, Senior Administrative Officer.
Room 314, Applied Science Building. Tel. 697 4319.

Food Science and Technology Mr R. Greenwood, Administrative Officer.
Room 411, Applied Science Building. Tel. 697 4364.

Geography Mr P. Dunkley, Administrative Assistant.
Room G10, Geography and Surveying. Tel. 697 4386.

Metallurgy Mrs E. Carlysie-Sainty, Clerk.
Room 110B, Metallurgy Building. Tel. 697 4436.

Mining Engineering Mr R. Rolls, Administrative Assistant.
Room 51B, Main Building. Tel. 697 4516.

Textile Technology Mr R. Starr, Senior Administrative Officer.
Room 103, Sir Robert Webster Building. Tel. 697 4469.

Wool and Pastoral Sciences Mr J. Lawrence, Administrative Officer.
Room 102, Wool and Pastoral Sciences Building. Tel. 697 4492.

Faculty of Applied Science
Enrolment Procedures

All students re-enrolling in 1986 should obtain a copy of the free booklet Enrolment Procedures 1986 available from School Offices and the Admissions Office. This booklet provides detailed information on enrolment procedures and fees, enrolment timetables by Faculty and course, enrolment in miscellaneous subjects, locations and hours of Cashiers and late enrolments.

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.

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 Sciences, and from the Schools of Food Science and Technology, Health Administration and Wool and Pastoral Sciences. It is closely associated with the libraries of the teaching hospitals of the University.

The Biomedical Library is located on Levels 2, 3 and 4 of the Mathews Building Annexe and is connected to the other special Libraries via a link through the undergraduate collection.

Professional staff are available at the Reader Assistance Unit on Level 2 to provide reference services and to assist in the use of the catalogues. Instructional classes in the use of the library and in specific subject material can be arranged.

Computerized literature searches and interlibrary loans are also available.

Acting Biomedical Librarian Betty McEwin

The Physical Sciences Library

This library, situated on Levels 6 and 7 of the Library tower, caters for the information needs of staff, graduate and undergraduate students in the pure and applied sciences, engineering and architecture. Details of the books, series and microfilms in the Physical Sciences Library are included in the microfiche monograph and serial catalogues and the items themselves are identified by the prefix ‘P’. Serials with the index ‘P’ are not available for loan, but self-service photocopying facilities are located on Level 7. This library provides reference, reader assistance and reader education services and also, where appropriate, inter-library loan and literature-searching services. Trained staff are available on Level 7 to assist readers with their enquiries.

Physical Sciences Librarian Marian Bate

The Bachelor of Social Science Degree Course (3420)

The Bachelor of Social Science (BSocSc) is a degree course of special interest to students wishing to pursue careers in research, teaching, social planning and social administration. It enables students to gain a broad view of social issues, and introduces them to a diversity of social data. The program combines depth and breadth by requiring students to undertake a range of studies and to complete compulsory courses in the theories and methods of the various social sciences.

Although administered by the Faculty of Arts, the BSocSc degree course allows for in-depth study in two major disciplines drawn from various faculties. These disciplines are economic History, Economics, Industrial Relations, Geography, History, History and Philosophy of Science, Mathematics, Philosophy, Political Science, Psychology, Sociology and Statistics.

It may be possible for a limited number of students who have completed a year of study in a faculty other than Arts to transfer into the second year state of the course if their performance in at least two of the above disciplines is of a sufficiently high standard (Credit grade or better).

For further enquiries, contact the Arts Faculty Office, Room G1, Morven Brown Building, Tel. 6972288.

Conditions for the Award of the Degree of Bachelor of Science or Bachelor of Engineering

The courses leading to the award of the degree of Bachelor of Science or Bachelor of Engineering in the Faculty of Applied Science are programmed over four years of full-time study. 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 Bachelor of Science or Bachelor of Engineering shall:
   (1) comply with the requirements for admission;
   (2) follow the prescribed course of study in the appropriate School, and satisfy the examiners in the necessary subjects;
   (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 Professors Board on the recommendation of Faculty, but in each case must complete the appropriate period of approved industrial training before being eligible for the award of the degree.

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.

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**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 degrees of BSc(Tech) and BSc(Eng) shall be awarded at Pass level only but in the case of superior performance throughout the course the degree shall be conferred 'with merit'.

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

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**General Studies Program**

Almost all undergraduates in faculties other than Arts and Law are required to complete a General Studies program. The only course in the Faculty of Applied Science which does not have this requirement is the Bachelor of Science course in Economic Geography.

For further details, consult General Information earlier in this handbook.
Undergraduate Study

Course Outlines

The Faculty of Applied Science consists of the Schools of Applied Geology, Chemical Engineering and Industrial Chemistry, Food Science and Technology, Geography, Metallurgy, Mining Engineering, Textile Technology and Wool and Pastoral Sciences. 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) or Bachelor of Science (Engineering).

Full-time Courses

Full-time courses of four years’ duration leading to the award of the degree of Bachelor of Science are offered in Applied Geography, Applied Geology, Food Science and Technology, Industrial Chemistry, Metallurgy, Textile Technology and Wool and Pastoral Sciences. Four-year courses leading to the award of the degree of Bachelor of Engineering are offered in Ceramic Engineering, Chemical Engineering, Mineral Engineering, Mining Engineering and Petroleum Engineering. A four-year course leading to the award of a Bachelor of Metallurgical Engineering is offered in Metallurgical Engineering.

Honours: Candidates for a degree at Honours level are required to undertake special reading and other assignments as directed by the Head of the School concerned. In considering the award of Honours special attention is paid to the performance of a candidate in the final research project, for which a thesis describing a theoretical or experimental study is required. Honours are awarded in Class 1; Class 2 Division 1; and Class 2 Division 2.

Industrial Training Requirements: 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.

Part-time Courses

Six-year part-time courses leading to the award of the degree of Bachelor of Science (Technology) are offered by the School of Food Science and Technology; in Industrial Chemistry by the School of Chemical Engineering and Industrial Chemistry; and in Metallurgy and Ceramic Engineering by the School of Metallurgy.

The BSc(Tech) degree courses 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) and BSc(Eng) degree courses, but in both...
cases 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.

**BSc(Eng) Degree Courses With Partial Full-time Attendance**

BSc(Eng) degree courses may be completed by a combination of full-time and part-time study. The first two stages are to be completed part-time; in the following two years students complete Years 2 and 3 of the corresponding full-time course, and in the fifth stage a special program is prepared. Full details are set out below under the Schools which provide the courses.

**General Studies Electives**

The following summary of the changes in General Studies requirements which took effect in the 1983 academic year is provided for the benefit of continuing students.

<table>
<thead>
<tr>
<th>Previous Requirement</th>
<th>Current Requirement</th>
</tr>
</thead>
<tbody>
<tr>
<td>4-42 hour electives or equivalent</td>
<td>3-56 hour electives or equivalent</td>
</tr>
<tr>
<td>3-42 hour electives or equivalent</td>
<td>2-56 hour electives or equivalent</td>
</tr>
<tr>
<td>2-42 hour electives or equivalent</td>
<td>1½-56 hour electives or equivalent</td>
</tr>
<tr>
<td>1-½42 hour electives or equivalent</td>
<td>1-56 hour electives or equivalent</td>
</tr>
</tbody>
</table>

**School of Applied Geology**

**Head of School**
Associate Professor P. R. Evans

**Senior Administrative Officer**
Mr G. J. Baldwin

Geology is 'the science of the earth' and is concerned with the nature and evolution of our planet. Resource geology is concerned with the exploration and exploitation of minerals and energy, and other aspects of the science that form a foundation on which much of people's well-being is based. Thus geology has both an applied, professional function as well as being a scientific discipline. The structure and syllabus of the BSc degree courses in Applied Geology and Mining Geology are designed to prepare graduates for employment in some field of resource geology.

Training to meet this objective demands a thorough understanding of basic geological principles. Accordingly, in the early part of the course in Applied Geology students receive instruction in standard fundamental geological subjects. As the course progresses, increasing emphasis is placed on practical applications in the geology of minerals and energy, on engineering and environmental geology and on exploration techniques including geochemical and geophysical methods. In Session 1 of Year 4 students choose between tuition strands of mineral resources, sedimentary basin resources, engineering and environmental geology, or geo-physics. Session 2 of Year 4 is devoted to field and laboratory work on a specialized research project.

Year 1 of the course in Mining Geology is common to that in Applied Geology. Years 2 to 4 allow for greater emphasis on the engineering aspects of both underground and open-cut mining techniques while still providing a good basis of geological principles. Session 2 of Year 4 is devoted to a research project in mining geology either within the School of Applied Geology or the School of Mining Engineering.

A three-year full-time course in Geology, and courses that combine a single major in Geology with Physics, Chemistry, Mathematics, or Botany and Zoology, and courses that combine Geology with Geophysics and Geography are available to students in the Faculty of Science. Provision is also made for part-time study in the first year of Geology within that Faculty. Selected students in the Faculty of Science may study for an Honours degree in Geology.

Master of Applied Science degree courses in Engineering Geology, Hydrogeology, Environmental Geology, Mineral Exploration, Exploration Geochemistry and Exploration Geophysics are offered on a part-time or a full-time basis. The courses are designed to provide specialized training in practical applications of these fields.

**General Studies Electives**

For details of changes in the General Studies requirements refer to the table earlier in this chapter.

| 3000 |
|---|---|
| **Applied Geology — Full-time** |
| **Bachelor of Science** |
| **BSc** |
| **Year 1** |
| **Hours per week** |
| **S1** | **S2** |
| 1.001 | Physics 1 |
| 1.002 | Chemistry 1A |
| 1.131 | Chemistry 1B |
| 10.001 | Mathematics 1 or 2 |
| 10.011 | Higher Mathematics 1 or 2 |
| 10.021B | General Mathematics 1B or 2 |
| 10.021C | General Mathematics 1C |
| 25.110 | Earth Materials and Processes* |
| 25.120 | Earth Environments and Dynamics* |
| **Total** | **24** |

*Up to 2 days of field tutorials in 25.110 Earth Materials and Processes and up to 4 days in 25.120 Earth Environments and Dynamics are essential parts of these subjects. Attendance is compulsory.
Year 2

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Hpw</th>
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<th>S2</th>
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<tr>
<td>25.211</td>
<td>Earth Materials 1**</td>
<td></td>
<td>6</td>
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</tr>
<tr>
<td>25.212</td>
<td>Earth Environments 1**</td>
<td></td>
<td>6</td>
<td>0</td>
</tr>
<tr>
<td>25.221</td>
<td>Earth Materials 2***</td>
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<td>6</td>
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<tr>
<td>25.223</td>
<td>Earth Physics*</td>
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<td>25.2261</td>
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<td></td>
<td></td>
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<td>14</td>
<td>17</td>
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</table>

*Field work of up to 2 days is a compulsory part of the subject.
**Field work of up to 5 days is a compulsory part of the subject.
***Field work of up to 4 days is a compulsory part of the subject.

Students take Ancillary Subjects equivalent to 2 units from Table 1 of the Combined Sciences Handbook.

Year 3

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Hpw</th>
<th>S1</th>
<th>S2</th>
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</thead>
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<td>25.311</td>
<td>Earth Materials 3</td>
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<td>25.321</td>
<td>Earth Materials 4*</td>
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<td>25.312</td>
<td>Earth Environments 2**</td>
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<tr>
<td>25.333</td>
<td>Exploration Geophysics</td>
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<td>25.3162</td>
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<td>25.324</td>
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*Field work of up to 4 days is a compulsory part of the subject.
**Field work of up to 7 days is a compulsory part of the subject.
***Field work of up to 3 days is a compulsory part of the subject.

Year 4

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and either

A. Mineral Resources strand, consisting of

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B. Sedimentary Basin Resources strand, consisting of

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<td>Advanced Sedimentology</td>
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<td>25.4122</td>
<td>Seismic Stratigraphy and Log Analysis</td>
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<td>Geology of Selected Oil and Gas or Coal Fields</td>
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<td>25.4124</td>
<td>Palynology or Foraminiferal Micropalaeontology</td>
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C. Engineering and Environmental Geology strand, consisting of

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D. Geophysics strand**, consisting of

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<td>Gravity and Magnetic Methods</td>
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§Session 1 is divided into 2 segments of 7 weeks each. Hours listed under A apply to weeks 1-7; those under B apply to weeks 8-14.

*Field work of up to 7 days is a compulsory part of this subject.
**Field work of up to 3 days is a compulsory part of the subject of the strand.
3145
Mining Geology — Full-time

Bachelor of Science

BSc

Year 1

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Hours per week</th>
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<td>1.001</td>
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<td>S1 6 S2 6</td>
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<td>2.121</td>
<td>Chemistry 1A</td>
<td>S1 6 S2 0</td>
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<td>2.131</td>
<td>Chemistry 1B</td>
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<tr>
<td>10.011</td>
<td>Higher Mathematics</td>
<td>6 6</td>
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<tr>
<td>25.110</td>
<td>Earth Materials and Processes*</td>
<td>S1 6 S2 0</td>
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<tr>
<td>25.120</td>
<td>Earth Environments and Dynamics**</td>
<td>S1 0 S2 6</td>
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*Up to 2 days of compulsory field tutorials are part of this subject.

**Up to 4 days of compulsory field tutorials are part of this subject.

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<thead>
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Year 2

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<td>5.0201</td>
<td>Engineering Dynamics</td>
<td>S1 0 S2 3</td>
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<td>5.030</td>
<td>Engineering C</td>
<td>S1 6 S2 0</td>
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<tr>
<td>8.171</td>
<td>Mechanics of Solids 1</td>
<td>S1 0 S2 3</td>
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<td>7.142</td>
<td>Mine Development</td>
<td>S1 1 S2 1</td>
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<td>25.211</td>
<td>Earth Materials 1*</td>
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<td>25.221</td>
<td>Earth Materials 2**</td>
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<td>25.223</td>
<td>Earth Physics*</td>
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<td>25.2261</td>
<td>Mathematical Geology 1</td>
<td>S1 0 S2 3</td>
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<td>Sedimentary Environments***</td>
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*Field work of up to 1 day is a compulsory part of this subject.

**Field work of up to 4 days is a compulsory part of this subject.

***Field work of up to 5 days is a compulsory part of this subject.

<table>
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<th>Hours per week</th>
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Year 4*

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<td>7.214</td>
<td>Mine Economics and Planning</td>
<td>S1 4 S2 4</td>
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<td>7.424</td>
<td>Industrial and Research Seminars</td>
<td>S1 1 S2 1</td>
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<td>25.410</td>
<td>Resource Geology**</td>
<td>S1 6 S2 0</td>
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<td>25.4101</td>
<td>Topics in Advanced Geology</td>
<td>S1 3 S2 0</td>
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<td>25.4141</td>
<td>Mineral Exploration**</td>
<td>S1 2.5 S2 0</td>
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<td>25.4142</td>
<td>Geological Sampling and Analytical Methods</td>
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<td>25.4143</td>
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<td>25.542</td>
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<td>S1 0 S2 18</td>
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<td></td>
<td>or</td>
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</table>

*Includes a mandatory work experience period of at least 100 days before graduation.

**Field work of up to 7 days is a compulsory part of this subject.

†Offered by the School of Applied Geology

††Offered by the School of Mining Engineering.

School of Chemical Engineering and Industrial Chemistry

Head of School
Professor C. J. D. Fell

Senior Administrative Officer
Mr J. R. Gatley

The former Schools of Chemical Engineering and Chemical Technology were amalgamated in January 1980 to form the combined School of Chemical Engineering and Industrial Chemistry. The new school offers the courses previously taught by the former two schools, ie a course in Chemical Engineering and a course in Industrial Chemistry. The combined school contains the Departments of Chemical Engineering and Industrial Chemistry which service the two degree courses, and the Departments of Biological Process Engineering, Fuel Technology and Polymer Science which offer professional electives in these degree courses.

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.
Biological process engineering is the extension of chemical engineering principles to systems involving biological materials. Typical areas of interest are: the manufacture of antibiotics; the fermentation industries; bacterial mineral extraction; and the production of industrially useful materials by the growth and utilization of micro-organisms.

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

Industrial Chemistry is the discipline in which the scientific work of the research chemist is translated into the activities of the chemical industry. The thermodynamic feasibility of a reaction in inorganic or organic chemistry, the conditions under which the reaction might proceed, the kinetics of the reaction and the means whereby the reaction might be controlled to produce the desired product are the fundamentals of the course.

For the award of Honours in both 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 the full-time course in Chemical Engineering must obtain a minimum of twelve weeks' professionally oriented, or industrial experience. Students in the part-time courses in Chemical Engineering should complete three years of industrial training concurrently with their University work.

It is recommended that before graduation students in the full-time courses in Industrial Chemistry obtain a minimum of eight 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.

**General Studies Electives**
For details of changes in the General Studies requirements refer to the table earlier in this chapter.

### 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.

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*In certain cases this subject may be replaced by another elective with approval of the Head of School.

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Plus one of the following electives:

- 44.101** Introductory Microbiology | 6 | 0 |
- 48.039 Chemical Engineering 2J | 3 | 3 |
- 48.321 Fuel Engineering | 3 | 3 |

Any other elective approved by Head of School

**Students should note the special proviso for enrolment in this subject as indicated in the Subject Descriptions later in this handbook.
"The project is selected from:
48.040 Chemical Engineering Project
48.240 Biological Process Engineering Project
48.340 Fuel Engineering Project

Plus one of the following:
48.048 Advanced Chemical Engineering
48.211 Biological Process Engineering
48.331 Fuel Engineering
48.046 Chemical Engineering Projects (additional)

Any other elective approved by Head of School.

Chemical Engineering — Subjects and Units

Students should note that there may be some rearrangement of units within subjects in 1986.

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<td>2 Material and Energy Balances</td>
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<td>3 Dimensions and Dimensional Analysis</td>
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<td>Unit 1 Heat Transfer 1</td>
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<td>2 Computation 1</td>
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<td>48.025 Chemical Engineering for Ceramic Engineers</td>
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Chemical Engineering — Full-time/Part-time Course

Bachelor of Engineering
BE

The BSc(Tech) degree course in Chemical Engineering was replaced in 1975 by a part-time/full-time course leading to the award of a BE degree normally to be completed in seven years. The preferred course pattern is as follows:

Stages 1 and 2 or Year 1
Stages 3 and 4 or Year 2
Stages 5 and 6 or Year 3
Stage 7 or Year 4

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

Candidates presently enrolled in the BSc(Tech) degree course are allowed to complete their degrees as outlined in the 1974 Calendar.

Professional Electives in Course 3040 Chemical Engineering

Biological Process Engineering
The Department of Biological Process Engineering offers a coherent professional elective in Biological Process Engineering designed for students wishing to pursue a career in the biologically based processing industries. Students electing for this professional elective should take 44.101 Introductory Microbiology in Year 3, and 48.211 Biological Process Engineering and 48.240 Biological Process Engineering Project in Year 4.

Chemical Engineering
Students wishing to pursue a career in the chemicals, petroleum, petrochemical, minerals utilization or metallurgical industries are advised to take 48.039 Chemical Engineering 2J in Year 3 and 48.048 Advanced Chemical Engineering together with the 48.040 Chemical Engineering Project in Year 4. Part-time students should take these subjects at equivalent stages of the part-time degree.

Fuel Engineering
The Department of Fuel Technology offers a coherent professional elective in Fuel Engineering designed for those students wishing to pursue a career concerned with fuel and energy conversion and the application of fossil fuels to the process industries. The Department is the only one of its kind in Australia and has a long history of teaching and research in the fossil fuels area. The elective covers the broad areas of properties, constitution, processing and conversion, and utilization of fossil fuels. Topics include combustion science and engineering; radiation and flames; design and performance evaluation of fuel using plant such as furnaces, boilers and heat recovery appliances; coal and oil conversion processes; energy conservation; and progress in fuel science and fuel processing. Students choosing this professional elective should take 48.321 Fuel Engineering 2 in Year 3 and 48.331 Fuel Engineering 3 and 48.340 Fuel Engineering Project in Year 4. Part-time students should take these subjects at equivalent stages of the part-time degree.

This elective may qualify graduates for membership of the Australian Institute of Energy or the Institute of Energy (UK).

Preferred course pattern for BSc(Tech) and BE degree courses — Full-time/Part-time

For variations to this course pattern students should contact the School.

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*In certain cases this subject may be replaced by another elective with approval of Head of School.

### Stage 5

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### Year 1

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*Plus:*

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*One session only.

### Stage 7

As per Year 4 of full-time course.

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**Students should note the special proviso for enrolment in this subject as indicated in the Subject Descriptions later in this handbook.
### Year 4

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<td>48.165 Laboratory Automation Science</td>
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Plus one of the following:*  
- 48.115 Industrial Electrochemistry       | 2   |
- 48.116 Water Chemistry                  | 2   |
- 48.166 Microprocessors in Analytical Instrumentation | 2 |
- 48.303 Fuel Science for Industrial Chemists | 2 |

*Only one of these is offered in any one year as selected by student preferences.

### 3110 Industrial Chemistry — Part-time Course

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

**Stages 1 and 2***

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Plus:
- 5.010 Engineering A†                      | 6              |
- 17.031 Biology A†                         | 6              |
- 25.110 Earth Materials and Processes†     | 6              |
- 5.030 Engineering C†                       | 6              |

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

†One session only.

### Centre for Petroleum Engineering Studies

The Centre of Petroleum Engineering has been established and a four-year course leading to the award of a Bachelor of Engineering in Petroleum Engineering commences in 1986.
The first two years of the Petroleum Engineering Course are 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, Mechanical, Civil or Mining degree course 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.

3045 Petroleum Engineering — Full-time Course
Bachelor of Engineering
BE

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<td>20.301</td>
<td>Properties and Phase Behaviour of Petroleum Reservoir Fluids</td>
</tr>
<tr>
<td>20.302</td>
<td>Reservoir Rock Properties and Fluid Flow in Porous Media</td>
</tr>
<tr>
<td>20.303</td>
<td>Well Drilling and Completions</td>
</tr>
<tr>
<td>20.304</td>
<td>Reservoir Engineering 1</td>
</tr>
<tr>
<td>20.305</td>
<td>Drilling and Production Lab</td>
</tr>
<tr>
<td>20.306</td>
<td>Petroleum Production Economics</td>
</tr>
<tr>
<td>20.307</td>
<td>Petroleum Thermodynamics</td>
</tr>
<tr>
<td>25.301</td>
<td>Physical Geology</td>
</tr>
<tr>
<td>25.302</td>
<td>Structural Geology</td>
</tr>
<tr>
<td>48.031</td>
<td>Chemical Engineering 2A (Units 1, 2 and 3)</td>
</tr>
<tr>
<td>48.163</td>
<td>Instrumentation and Process Control</td>
</tr>
<tr>
<td></td>
<td>General Studies Elective</td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Year 4</th>
<th>Hours per week</th>
</tr>
</thead>
<tbody>
<tr>
<td>20.401</td>
<td>Reservoir Engineering 2</td>
</tr>
<tr>
<td>20.402</td>
<td>Reservoir Fluids Laboratory</td>
</tr>
<tr>
<td>20.403</td>
<td>Production Engineering</td>
</tr>
<tr>
<td>20.404</td>
<td>Formation Evaluation</td>
</tr>
<tr>
<td>20.405</td>
<td>Oil and Gas Law and Regulation</td>
</tr>
<tr>
<td>20.406</td>
<td>Reservoir Simulation</td>
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<tr>
<td>20.407</td>
<td>Advanced Recovery Methods</td>
</tr>
<tr>
<td>20.408</td>
<td>Natural Gas Engineering</td>
</tr>
<tr>
<td>20.409</td>
<td>Petroleum Engineering Project</td>
</tr>
<tr>
<td>20.410</td>
<td>Well Pressure Testing</td>
</tr>
</tbody>
</table>

Undergraduate Study: Course Outlines

School of Food Science and Technology

Head of School
Professor R. A. Edwards

Administrative Officer
Mr R. J. Greenwood

Food Technology is the application of basic science to the management of foods from the time of production until their use by the consumer. It is concerned with optimum food quality and quantity, with nutritional status and safety, and with means of production, processing, preservation, distribution and utilization.

A study of food science and technology demands an interdisciplinary and integrated approach, one that brings many scientific disciplines into focus. Its basis is in areas of chemistry, biochemistry and microbiology, and it borders merge with those of agriculture, engineering, nutrition and commerce.

The food technologist acquires new knowledge by laboratory and process research, and applies it to the development of acceptable foods by optimum processes and equipment. Foods are studied in terms of their basic constituents and the changes they undergo when subjected to modern processing and distribution. The technologist is equally concerned with the development and selection of raw materials from agricultural, horticultural, animal and marine sources.

There is a demand, both national and international, for professionally trained people who are prepared to accept responsibility for the quality and safety of humans’ food supply, who can contribute to the solution of one of the greatest problems of our age, how to make food supplies grow faster than population.

The School of Food Science and Technology offers a four-year full-time course leading to the award of the degree of Bachelor of Science and six-year part-time course leading to
the award of the degree of Bachelor of Science (Technology). Students completing the Year 1 require-
tments are eligible for selection for admission to Year 2 of the course.

General Studies Electives
For details of changes in the General Studies requirements refer to the table earlier in this chapter.

Year 3

<table>
<thead>
<tr>
<th>Hours per week</th>
<th>S1</th>
<th>S2</th>
</tr>
</thead>
<tbody>
<tr>
<td>2.043L Chemistry and Enzymology of Foods</td>
<td>6</td>
<td>6</td>
</tr>
<tr>
<td>10.301 Statistics SA</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>38.131 Principles of Food Preservation</td>
<td>4</td>
<td>0</td>
</tr>
<tr>
<td>38.132 Plant Food Science</td>
<td>3</td>
<td>0</td>
</tr>
<tr>
<td>38.133 Animal Food Science</td>
<td>0</td>
<td>2</td>
</tr>
<tr>
<td>38.134 Food Science Laboratory</td>
<td>6</td>
<td>6</td>
</tr>
<tr>
<td>38.135 Food Quality Assessment</td>
<td>0</td>
<td>3</td>
</tr>
<tr>
<td>38.331 Food Microbiology 1</td>
<td>3</td>
<td>0</td>
</tr>
<tr>
<td>38.432 Food Engineering 2</td>
<td>3</td>
<td>0</td>
</tr>
<tr>
<td>General Studies Elective</td>
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<td>4</td>
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</tbody>
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<table>
<thead>
<tr>
<th>Total</th>
<th>S1</th>
<th>S2</th>
</tr>
</thead>
<tbody>
<tr>
<td>27</td>
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<td>23</td>
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</table>

Year 4

<table>
<thead>
<tr>
<th>Hours per week</th>
<th>S1</th>
<th>S2</th>
</tr>
</thead>
<tbody>
<tr>
<td>38.140 Food Technology Project</td>
<td>8</td>
<td>8</td>
</tr>
<tr>
<td>38.141 Food Regulation and Control</td>
<td>3</td>
<td>0</td>
</tr>
<tr>
<td>38.146 Inspections</td>
<td>0</td>
<td>3</td>
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<tr>
<td>38.444 Computer Applications in Food Technology</td>
<td>2</td>
<td>0</td>
</tr>
<tr>
<td>General Studies Elective</td>
<td>2</td>
<td>2</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Total</th>
<th>S1</th>
<th>S2</th>
</tr>
</thead>
<tbody>
<tr>
<td>15</td>
<td></td>
<td>13</td>
</tr>
</tbody>
</table>

Plus three or more of the following electives to a total of not less than 9 hours per week.

<table>
<thead>
<tr>
<th>Hours per week</th>
<th>S1</th>
<th>S2</th>
</tr>
</thead>
<tbody>
<tr>
<td>2.003B Organic Chemistry</td>
<td>0</td>
<td>6</td>
</tr>
<tr>
<td>18.121 Production Management</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>18.551 Operations Research</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>28.012 Marketing Systems</td>
<td>4</td>
<td>0</td>
</tr>
<tr>
<td>28.052 Marketing Research</td>
<td>0</td>
<td>4</td>
</tr>
<tr>
<td>38.142 Oenology</td>
<td>6</td>
<td>0</td>
</tr>
<tr>
<td>38.143 Cereal Technology</td>
<td>6</td>
<td>0</td>
</tr>
<tr>
<td>38.144 Treatment and Utilization of Food Processing Wastes</td>
<td>0</td>
<td>3</td>
</tr>
<tr>
<td>38.145 Marine Products Technology</td>
<td>2</td>
<td>0</td>
</tr>
<tr>
<td>38.149 Postharvest Technology of Fruit and Vegetables</td>
<td>6</td>
<td>0</td>
</tr>
<tr>
<td>38.171 Special Topics in Meat Science</td>
<td>2</td>
<td>0</td>
</tr>
<tr>
<td>38.341 Food Microbiology 2</td>
<td>0</td>
<td>6</td>
</tr>
<tr>
<td>38.344 Yeast Technology</td>
<td>3</td>
<td>0</td>
</tr>
<tr>
<td>38.443 Food Engineering 3</td>
<td>6</td>
<td>0</td>
</tr>
<tr>
<td>38.541 Advanced Nutrition</td>
<td>0</td>
<td>3</td>
</tr>
<tr>
<td>38.544 Nutritional Evaluation of Foods</td>
<td>0</td>
<td>6</td>
</tr>
<tr>
<td>42.102A Biotechnology A</td>
<td>6</td>
<td>0</td>
</tr>
<tr>
<td>42.102B Biotechnology B</td>
<td>0</td>
<td>6</td>
</tr>
</tbody>
</table>

or such other electives, to a total of not less than 9 hours per week, as approved by the Head of School.

During Years 2, 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.
3070 Food Technology — Part-time Course

Bachelor of Science (Technology) BSc(Tech)

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 School 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 specialize 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 a BSc degree 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 School not later than 31 December of the year in which the sixth stage is completed.

Stages 1 and 2*

<table>
<thead>
<tr>
<th>Hours per week</th>
<th>S1</th>
<th>S2</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.001 Physics 1 or</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1.021 Introductory Physics 1</td>
<td>6</td>
<td>6</td>
</tr>
<tr>
<td>2.121 Chemistry 1A</td>
<td>6</td>
<td>0</td>
</tr>
<tr>
<td>2.131 Chemistry 1B</td>
<td>0</td>
<td>6</td>
</tr>
<tr>
<td>10.001 Mathematics 1 or</td>
<td></td>
<td></td>
</tr>
<tr>
<td>10.011 Higher Mathematics 1† or</td>
<td>6</td>
<td>6</td>
</tr>
<tr>
<td>10.021B General Mathematics 1B and</td>
<td></td>
<td></td>
</tr>
<tr>
<td>10.021C General Mathematics 1C</td>
<td></td>
<td></td>
</tr>
<tr>
<td>17.031 Biology A</td>
<td>6</td>
<td>0</td>
</tr>
<tr>
<td>17.041 Biology B</td>
<td>0</td>
<td>6</td>
</tr>
</tbody>
</table>

*Physics and Mathematics are usually taken as Stage 1, the other subjects as Stage 2.
†There are no evening lectures in this subject.

Stage 3

<table>
<thead>
<tr>
<th>Hours per week</th>
<th>S1</th>
<th>S2</th>
</tr>
</thead>
<tbody>
<tr>
<td>2.102B Organic Chemistry</td>
<td>0</td>
<td>6</td>
</tr>
<tr>
<td>2.102D Chemical and Spectroscopic Analysis</td>
<td>0</td>
<td>6</td>
</tr>
<tr>
<td>41.101 Introductory Biochemistry</td>
<td>12</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td>12</td>
<td>12</td>
</tr>
</tbody>
</table>

School of Geography

Head of School
Professor B. J. Garner
Administrative Assistant
Mr P. Dunkley

Geographers study the spatial relationships of the phenomena which make up humans' physical and social environment, and aim to establish principles which govern those relationships. The geographer may concentrate on selected variables, as in systematic geography, or may deal with variables operative in 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 finding such professional employment. 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.

General Studies Electives
For details of changes in the General Studies requirements refer to the table earlier in this chapter.

Applied Geography — Full-time Courses
Bachelor of Science

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 specializations in physical geography (with special emphasis on either the biologic or geomorphic aspects), economic geography (with emphasis on urban geography), 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 or economic bases of geography. There is progressive specialization 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 formal work, in additional assignments as directed by the Head of the School, and in the final year project for which a thesis will be required.

All students are expected to spend a period of four to six weeks with organizations concerned with the investigation and planned use of resources etcetera.

Several units in Geography include laboratory and project work involving the use of computer and quantitative techniques. Students need a battery-operated calculator. It is also 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.

Applied Physical Geography

Year 1

<table>
<thead>
<tr>
<th>Hours per week</th>
<th>S1</th>
<th>S2</th>
</tr>
</thead>
<tbody>
<tr>
<td>10.021B General Mathematics 1B and 1C</td>
<td>6</td>
<td>6</td>
</tr>
<tr>
<td>10.001 Mathematics 1 or 10.011 Higher Mathematics 1</td>
<td>6</td>
<td>6</td>
</tr>
<tr>
<td>17.031 Biology A</td>
<td>6</td>
<td>0</td>
</tr>
<tr>
<td>17.041 Biology B</td>
<td>0</td>
<td>6</td>
</tr>
<tr>
<td>25.110 Earth Materials and Processes</td>
<td>6</td>
<td>0</td>
</tr>
<tr>
<td>25.120 Earth Environments and Dynamics</td>
<td>0</td>
<td>6</td>
</tr>
<tr>
<td>27.111 Applied Physical Geography 1*</td>
<td>5</td>
<td>5</td>
</tr>
<tr>
<td>27.641 Data Processing Systems</td>
<td>2</td>
<td>2</td>
</tr>
</tbody>
</table>

25 25

†Up to 1½ days of field tutorials in 25.110 and up to 3½ days in 25.120 are essential parts of these subjects. Attendance is compulsory.

*Up to 5 days field work, equivalent to 40 tutorial hours, is an essential part of the subject.

Year 2

<table>
<thead>
<tr>
<th>Hours per week</th>
<th>S1</th>
<th>S2</th>
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</thead>
<tbody>
<tr>
<td>2.121 Chemistry 1A or Introductory Chemistry</td>
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<td>0</td>
</tr>
<tr>
<td>2.131 Chemistry 1B</td>
<td>0</td>
<td>6</td>
</tr>
<tr>
<td>27.162 Geographical Statistics and Computing</td>
<td>4</td>
<td>2</td>
</tr>
<tr>
<td>27.172 Environmental Measurements General Studies Elective and either</td>
<td>6</td>
<td>6</td>
</tr>
<tr>
<td>25.211 Earth Materials 1 and Earth Materials 2†</td>
<td>6</td>
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</tr>
<tr>
<td>25.221 or any two of the following (one session)</td>
<td>0</td>
<td>6</td>
</tr>
<tr>
<td>43.111 Flowering Plants</td>
<td>6</td>
<td>0</td>
</tr>
<tr>
<td>43.121 Environmental Physiology</td>
<td>0</td>
<td>6</td>
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<tr>
<td>45.152 Population and Community Ecology</td>
<td>6</td>
<td>0</td>
</tr>
<tr>
<td>45.201 Invertebrate Zoology</td>
<td>0</td>
<td>6</td>
</tr>
<tr>
<td>45.301 Vertebrate Zoology</td>
<td>6</td>
<td>0</td>
</tr>
<tr>
<td>45.601 Introductory Genetics</td>
<td>0</td>
<td>6</td>
</tr>
</tbody>
</table>

24 22

†Field work of up to 3 days, equivalent to 7 tutorial hours, is an essential part of this subject.

‡May be taken in either Year 2 or Year 3. 10.001 or 10.011 is a prerequisite.
### Undergraduate Study: Course Outlines

#### Applied Economic Geography

<table>
<thead>
<tr>
<th>Year 1</th>
<th>Hours per week</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>S1</td>
</tr>
<tr>
<td>10.021B General Mathematics 1B and 10.021C General Mathematics 1C or 10.001 Mathematics 1 or 10.011 Higher Mathematics 1 15.001 Microeconomics 1 15.011 Macroeconomics 1</td>
<td>6</td>
</tr>
<tr>
<td>27.611 Applied Economic Geography 1*</td>
<td>5</td>
</tr>
<tr>
<td>27.641 Data Processing Systems</td>
<td>2</td>
</tr>
<tr>
<td>54.1002 Power and Democracy in Australia</td>
<td>3</td>
</tr>
<tr>
<td>54.1004 Government in the Modern World</td>
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<tr>
<td><strong>Total</strong></td>
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</table>

*Up to 5 days fieldwork, equivalent to 40 tutorial hours, is an essential part of the subject.

#### Year 3

<table>
<thead>
<tr>
<th>Courses</th>
<th>Hpw</th>
<th>S1</th>
<th>S2</th>
</tr>
</thead>
<tbody>
<tr>
<td>27.133 Pedology*</td>
<td>5</td>
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<td></td>
</tr>
<tr>
<td>27.143 Biogeography*</td>
<td>5</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td>27.153 Climatology</td>
<td>0</td>
<td>5</td>
<td></td>
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<tr>
<td>27.175 Introduction to Remote Sensing</td>
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</tr>
<tr>
<td>27.183 Geomorphology*</td>
<td>0</td>
<td>5</td>
<td></td>
</tr>
<tr>
<td>27.193 Environmental Impact Assessment and either</td>
<td>4</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td>General Studies Elective</td>
<td>2</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>25.510 Geology for Geomorphologists and Pedologists and</td>
<td>0</td>
<td>5</td>
<td></td>
</tr>
<tr>
<td>25.622 Hydrological and Coastal Surveying</td>
<td>3</td>
<td>3</td>
<td></td>
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<tr>
<td>or any two of the following (one each session)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>27.176 Remote Sensing Applications‡</td>
<td>0</td>
<td>4</td>
<td></td>
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<tr>
<td>43.112 Taxonomy and Systematics§</td>
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<td>6</td>
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</tr>
<tr>
<td>43.142 Environmental Botany</td>
<td>6</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td>43.152 Plant Community Ecology</td>
<td>0</td>
<td>6</td>
<td></td>
</tr>
<tr>
<td>45.121 Evolutionary Theory</td>
<td>6</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td>45.152 Population and Community Ecology†</td>
<td>6</td>
<td>0</td>
<td></td>
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<tr>
<td>45.302 Vertebrate Zoogeography</td>
<td>0</td>
<td>6</td>
<td></td>
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<tr>
<td><strong>Total</strong></td>
<td><strong>22</strong></td>
<td><strong>20</strong></td>
<td></td>
</tr>
</tbody>
</table>

*Prerequisites for 27.176 are either 27.175 or 29.514 or 29.511 and 29.631.

*Up to 5 days fieldwork, equivalent to 40 tutorial hours, is an essential part of the subject.

§Offered in alternate years.

†May be taken in either Year 2 or Year 3. 10.001 or 10.011 is a prerequisite.

#### Year 4

<table>
<thead>
<tr>
<th>Courses</th>
<th>Hpw</th>
<th>S1</th>
<th>S2</th>
</tr>
</thead>
<tbody>
<tr>
<td>27.194 Assessment and Management of Physical and Biological Resources*</td>
<td>12</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td>27.504 Project†</td>
<td>10</td>
<td>16</td>
<td></td>
</tr>
<tr>
<td>27.514 Practical Applications in Geography</td>
<td>0</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>22</strong></td>
<td><strong>19</strong></td>
<td></td>
</tr>
</tbody>
</table>

*Up to 5 days fieldwork, equivalent to 40 tutorial hours, is an essential part of the subject.

†Includes scheduled tutorials of one hour per week in Session 1 and two hours per week in Session 2.

*Three days fieldwork, equivalent to 24 tutorial hours, is an essential part of the subject.

†May be taken in either Session 1 or Session 2.

**Enrolment in this subject is dependent on approval by the Head of School.
### Human and Physical Resources

<table>
<thead>
<tr>
<th>Year 1</th>
<th>Hours per week</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>S1</td>
</tr>
<tr>
<td>10.021B General Mathematics 1B</td>
<td>6</td>
</tr>
<tr>
<td>10.021C General Mathematics 1C</td>
<td>0</td>
</tr>
<tr>
<td>27.111 Applied Physical Geography 1***</td>
<td>5</td>
</tr>
<tr>
<td>27.611 Applied Economic Geography 1*</td>
<td>5</td>
</tr>
<tr>
<td>27.641 Data Processing Systems</td>
<td>2</td>
</tr>
<tr>
<td>and either</td>
<td></td>
</tr>
<tr>
<td>15.001 Microeconomics 1</td>
<td>3½</td>
</tr>
<tr>
<td>and</td>
<td></td>
</tr>
<tr>
<td>15.011 Microeconomics 1</td>
<td>0</td>
</tr>
<tr>
<td>or</td>
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<tr>
<td>17.031 Biology A and</td>
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<td>25.110 Earth Materials and Processes**</td>
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<tr>
<td>25.120 Earth Environments and Dynamics**</td>
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</table>

*Up to 3 days field work, equivalent to 24 tutorial hours, is an essential part of this subject.

**Up to 1½ days of field tutorials in 25.110 and up to 3½ days in 25.120 are essential parts of these subjects. Attendance is compulsory.

***Up to 5 days fieldwork, equivalent to 40 tutorial hours, is an essential part of this subject.

<table>
<thead>
<tr>
<th>Year 2</th>
<th>Hours per week</th>
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<tr>
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<tr>
<td>27.162 Geographical Statistics and</td>
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<td>Computing</td>
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<td>27.172 Environmental Measurements**</td>
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<td>27.432 Computer Mapping and Data</td>
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<td>27.662 Urban Systems</td>
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<tr>
<td>and either</td>
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<tr>
<td>15.062 Applied Macroeconomics†</td>
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<tr>
<td>or</td>
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</tr>
<tr>
<td>15.072 Applied Microeconomics†</td>
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<td>or</td>
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<tr>
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<td>or</td>
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<tr>
<td>25.221 Earth Materials 2§</td>
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<td>45.201 Invertebrate Zoology</td>
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<td>45.301 Vertebrate Zoology</td>
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*Up to 5 days fieldwork, equivalent to 40 tutorial hours, is an essential part of this subject.

†May be taken in either Session 1 or Session 2.

§Fieldwork up to 3 days, equivalent to 7 tutorial hours, is an essential part of this subject.

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<td>27.633 Geographic Data Analysis 3</td>
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<tr>
<td>8.403G Theory of Land Use/Transport</td>
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<td>Interaction†</td>
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<tr>
<td>8.413G Transport Economics‡</td>
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<td>15.043 Marxist Political Economy</td>
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<td>27.723 Transport Geography†</td>
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<td>27.733 Regional Policy and Planning§</td>
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<td>27.743 Regional Population Analysis†</td>
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<tr>
<td>27.783 Spatial Impacts and Opportunities†</td>
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<tr>
<td>27.793 Models of Spatial Systems†</td>
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<td>28.012 Marketing Systems†</td>
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</table>

*Three days field work, equivalent to 24 tutorial hours, is an essential part of the subject.

†Subject to the availability of staff.

**Up to two subjects may be substituted for those listed with permission of Head of School.

†‡By arrangement with Heads of Schools.

†‡7.175 is a prerequisite for this subject in the Applied Economic Geography program.

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<tr>
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*Includes scheduled tutorials of one hour per week in Session 1 and two hours per week in Session 2.
Undergraduate Study: Course Outlines

### Year 3

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<th>Course and Credits</th>
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<th>S2</th>
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<td>27.175 Introduction to Remote Sensing</td>
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<td>27.423 Environmental Impact Evaluation</td>
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<td>4</td>
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<tr>
<td>27.433 Geographic Data Analysis</td>
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<td>3</td>
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<tr>
<td><strong>plus four of the following subjects†‡</strong></td>
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<td>27.133 Pedology **</td>
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</tr>
<tr>
<td>27.143 Biogeography **</td>
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<td>0</td>
</tr>
<tr>
<td>27.153 Climatology</td>
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<td>5</td>
</tr>
<tr>
<td>27.176 Remote Sensing Applications</td>
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<td>4</td>
</tr>
<tr>
<td>27.183 Geomorphology **</td>
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<td>5</td>
</tr>
<tr>
<td>27.652 Geographic Information Systems</td>
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<td>3</td>
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<tr>
<td>27.713 Marketing Geography</td>
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<td>27.743 Regional Population Analysis</td>
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<td>27.753 Social Welfare and Urban Development</td>
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<td>0</td>
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<td><strong>and either</strong></td>
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<td>15.053 Economic Development</td>
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<td>25.510 Geology for Geomorphologists and Pedologists and</td>
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<td>25.622 Hydrological and Coastal Surveying</td>
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<td>3</td>
</tr>
<tr>
<td><strong>or two of ‡</strong></td>
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<tr>
<td>43.112 Taxonomy and Systematics ‡</td>
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<tr>
<td>43.142 Environmental Botany</td>
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<td>43.152 Plant Community Ecology</td>
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<td>45.422 Economic Zoology</td>
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</table>

**23**  **16**

†Appropriate subjects may be substituted with the permission of the Head of School.
‡All of these subjects are offered subject to the availability of staff and a minimum number of students.
§Offered in alternate years.
**Up to 5 days fieldwork, equivalent to 40 tutorial hours, is an essential part of this subject.**

### Year 4

<table>
<thead>
<tr>
<th>Course and Credits</th>
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<th>S2</th>
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<tr>
<td>27.494 Assessment of Human and Physical Resources **</td>
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<tr>
<td>27.504 Project **</td>
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<tr>
<td>27.514 Practical Applications in Geography</td>
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**22**  **19**

**Up to 5 days fieldwork, equivalent to 40 tutorial hours, is an essential part of this subject.**

**Includes scheduled tutorials of one hour per week in Session 1 and two hours per week in Session 2.**

---

### School of Metallurgy

**Head of School**
Associate Professor G. R. Wallwork

**Clerk**
Mrs E. Carlyle-Sainty

The School of Metallurgy consists of the Departments of Metallurgy and Materials. Courses in Metallurgical Engineering and Metallurgy are offered by the Department of Metallurgy and courses in Ceramics Engineering and Ceramics are offered by the Department of Materials.

---

### Metallurgical Engineering

The metallurgical profession has developed in importance in Australia in recent years, in keeping with the growth of our metal and mineral industries. In terms of value of production these industries are recognized as being important to Australia, especially in terms of export earnings, and there is a steady demand for professional metallurgists in all sectors of these industries, and in the manufacturing industry.

Industrial development in metallurgy has been accompanied by, and is based on, the development of metallurgical research. This is being carried on in a number of laboratories run by industry, government, and the universities.

Graduate metallurgists have a wide choice of type of employment and location. They may work in production, technical control or development, either in the ore treatment or metal extraction plants in locations such as Newcastle, Port Kembla, Broken Hill, Mt Isa, Townsville, Gladstone, Port Pirie, Whyalla, Kwinana, Kalgoorlie or Pilbara; or in the metal manufacturing plants, including the automobile, aircraft, construction and other industries, of the main centres and capital cities. In the metal industry in general the 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 the graduates are inclined towards research and development, they will find considerable scope in various government, university, and industrial research laboratories.

The undergraduate courses in metallurgy have been designed to prepare graduates for employment in any field of metallurgy within the metallurgical and manufacturing industries or in research institutions. The courses are broadly based on the physical sciences and on engineering commencing with studies in physics, chemistry, mathematics and engineering in the initial years. These disciplines are then applied in the later years of the courses involving the extraction, refining, working, fabrication, testing and heat treatment of metals.

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### Geography in Other Faculties

Courses in Geography are available on a full-time basis in the Faculties of Arts, Commerce and Science.
There are two undergraduate courses, a four-year full-time course in metallurgy leading to the award of the BMetE degree and a six-year part-time course in metallurgy leading to the award of the BSc(Tech) degree. Both courses have been revised with effect from 1986 and in the case of the full-time course the revision also includes a change in the award from the degree Bachelor of Science in Metallurgy to Bachelor of Metallurgical Engineering. Students enrolled in Years 1 to 3 of the old BSc course in 1985 are expected to transfer to the next year of the BMetE degree course for 1986. The course revision has been designed to enable such transfers to take place with normal progression and without loss of standing in the new course. Details of years 2 to 4 of the old full-time course are also given below preceding the BMetE degree course description. In the case of the part-time BSc(Tech) degree course revisions the degree awarded and course number have not been changed and course transfers are therefore not necessary for part-time students.

These courses meet the formal educational requirements for admission to the professional metallurgical institutes, such as the Australasian Institute of Mining and Metallurgy, the Institution of Metallurgists (London). Further details about membership of these institutes, the Australasian Institute of Metals and the undergraduate Society of the School, all of which students are encouraged to join, may be obtained from the Head of the School.

General Studies Electives
For details of changes in the General Studies requirements refer to the table earlier in this section.

<table>
<thead>
<tr>
<th>Year 3</th>
<th>Hours per week</th>
<th>Hpw</th>
<th>S1</th>
<th>S2</th>
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<tbody>
<tr>
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<td>4.403</td>
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<th>S2</th>
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*Project includes three weeks' laboratory work during Midyear Recess.

**3120**
Metallurgy — Old Full-time Course
Bachelor of Science BSc

<table>
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<th>S2</th>
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†Part only.

**3125**
Metallurgical Engineering — New Full-time Course
Bachelor of Metallurgical Engineering BMetE

This course extends over four years. Students attend the University for twenty-eight weeks each year excluding examination and recess periods.

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. In Year 2 two major strands of study in Physical Metallurgy and Metallurgical Engineering are introduced and these are supported by chemistry, mathematics and chemical metallurgy subjects. The two major strands are developed further in Years 3 and 4, but with the emphasis shifting from physical metallurgy to metallurgical engineering. 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 sixteen 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 Years 2, 3 and 4 of the course, visits are made to various metallurgical works, and students are required to submit reports on some of these.

### Year 1

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<td>10.011</td>
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### Year 2

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### Year 3

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</tbody>
</table>

**Project includes 84 hours of laboratory work during the mid year recess.

*Includes 4.001 Introduction to Materials Engineering.

†Includes 4.002 Introduction to Metallurgical Engineering.

### 3130

**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 up to one day 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 metallurgy 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 the approval of the Head of School may be completed after completion of the prescribed course of study.

### Stage 1

<table>
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<tr>
<th>Hours per week</th>
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</table>

**Project includes 84 hours of laboratory work during the mid year recess.**
### Ceramic Engineering and Ceramics

The Department of Materials offers 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.

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 Department offers the only degree course in Ceramic Engineering in Australasia. The Ceramic Engineering 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 two broad categories. Some go initially into activities associated directly with production, ie 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. In either case, graduates with organizing ability frequently move into management if they have an interest in this side of the industry.

In Australia, a number of government research organizations are active in ceramic research, eg the Australian Atomic Energy Commission Research Establishment, and the Divisions of Materials Science and Building Research of 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.

---

### Stage 2

<table>
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<td>5.030 Engineering C‡</td>
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<td>12</td>
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</table>

*There are no evening lectures in this subject.

†This subject includes 4.001 Introduction to Materials Engineering.

‡This subject includes 4.002 Introduction to Metallurgical Engineering.

---

### Stage 3

<table>
<thead>
<tr>
<th>Course</th>
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### Stage 4

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### Stage 5

<table>
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<td>12½</td>
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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) and the Royal Australian Chemical Institute.

---

### 3025

#### Ceramic Engineering — Full-time Course

**Bachelor of Engineering**

**BE**

<table>
<thead>
<tr>
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<tr>
<td>4.231</td>
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<tr>
<td>5.010</td>
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<td>5.0302</td>
<td>Engineering Drawing and Descriptive Geometry</td>
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<td>10.001</td>
<td>Mathematics 1 or 2.1022 Physics (Introduction to Solids)</td>
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**Year 3**

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<td>4.233</td>
<td>Ceramic Process Principles</td>
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*Additional 14 hours bridging course for students not having done 48.001.

**Year 4**

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### 3030

#### Ceramics — Part-time Course

**Bachelor of Science (Technology)**

**BSc(Tech)**

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*Physics and Mathematics are usually taken in Stage 1 and the other subjects in Stage 2.
Stage 3

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Stage 4

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Stage 5

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<td>4.233</td>
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<td>48.163</td>
<td>Instrumentation and Process Control 1</td>
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*Additional 14 hours bridging course for students not having done 48.001.

Stage 6

<table>
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<td>Fuel Engineering 1</td>
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<tr>
<td></td>
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<td>10½</td>
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</tbody>
</table>

School of Mining Engineering

Head of School
Professor F. F. Roxborough

Administrative Assistant
Mr R. Rolls

Australia is one of the world's largest producers of minerals and, with vast reserves of metallic ores, coal and diverse other minerals, the mining industry of this country is assured of a long and prosperous future. Mining, whether underground, at the surface or on the ocean floor has become a technically advanced activity and education for mining engineers has progressed rapidly to cater for present day and future requirements of the industry. Mining engineers are now frontline executives; they plan, co-ordinate and control the many activities which comprise the operations of a mine. They are in control of all phases of mining projects from the initial planning and development to mineral extraction and processing and final restoration of the land.

To prepare graduates for these tasks, the School of Mining Engineering provides an education in a wide range of engineering topics and associated scientific subjects, at the same time providing a comprehensive insight into the techniques and practices of modern mining, mineral processing and mine management.

The School 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 and a graduate course requiring one year of full-time or two years of part-time study leading to the award of the Graduate Diploma (GradDip) in Mining and Mineral Engineering.

Formal graduate programs also comprise Master of Applied Science (MAppSc) degree courses in Minerals Engineering and Mining Geomechanics. The latter is available by external correspondence only and is chiefly designed for professionals working in geographically remote areas in the mining industry.

After graduation, mining engineers are equipped to enter any sector of the mining industry such as coal mining, metalliferous mining, petroleum production, sea-floor mining, quarrying or mineral processing. If they choose to develop careers in production management, they will be required to gain further practical experience before obtaining a Mine Managers 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.

Graduate mining engineers are not, however, restricted to primary production for employment. Many find posts in civil sub-surface construction; research and development; with consulting, governments or universities; or with their broad engineering training, in a wide range of manufacturing industries.

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.

General Studies Electives

For details of changes in the General Studies requirements refer to the table earlier in this section.
3126
Mineral Engineering — Full-time Course
Bachelor of Engineering
BE

Mineral Engineering comprises those professional activities required for the extraction of valuable components from mined ore, and their conversion into refined metals and similar products used in the manufacturing industries. Graduates from the Mineral Engineering degree course are capable of the professional activities of research and development, design and commissioning of processes and plants, and operation and supervision of production plants in the mineral industry.

The mineral industry is diverse in scope, scale and location. It produces refined metals, constructional materials, coal and coke, and a wide variety of other products such as chemicals, ceramics, abrasives and paints. Every mineral deposit has some unique characteristics that influence the extraction processes. Also each deposit is limited in quantity, consequently new ones must be continually investigated and developed. There is, therefore, a progressive challenge to mineral engineers to improve extraction methods and develop new techniques.

The Mineral Engineering course is based on a broad spectrum of mathematics, physics, chemistry, geology, mineralogy and chemical engineering, and specializes in mineral processing, extractive metallurgy and process plant design.

### Year 1

<table>
<thead>
<tr>
<th>Subject</th>
<th>Hours per week</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
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<tr>
<td>1.001 Physics 1</td>
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<tr>
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*This subject includes 46.001 Introduction to Mining and Mineral Engineering.

### Year 2

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<tr>
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<td>2.102A Physical Chemistry</td>
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<tr>
<td>10.301 Statistics A</td>
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<tr>
<td>25.520 Geology for Mining Engineers 1</td>
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<tr>
<td>46.211 Mineral Engineering Science 1</td>
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<tr>
<td>46.212 Mineral Engineering 1</td>
<td>3</td>
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<tr>
<td>46.213 Mineral Engineering Laboratory 1</td>
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<tr>
<td>48.021 Chemical Engineering 1A</td>
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<td>Unit 1 Heat Transfer 1</td>
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<tr>
<td>4.972 Materials for Mining Engineers</td>
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<tr>
<td>6.654 Electrical Power Engineering</td>
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<td>7.113 Mining Methods</td>
<td>2</td>
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<td>10.032 Mathematics</td>
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<td>25.523 Mineralogy</td>
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<tr>
<td>48.031 Chemical Engineering 2A</td>
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<td>Unit 1 Mass Transfer Theory</td>
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<td>48.136 Reactor Design</td>
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<td>48.163 Instrumentation and Process Control 1</td>
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### Year 4

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<tr>
<td>7.214 Mine Economics and Planning</td>
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<td>46.402 Mineral Engineering 3</td>
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<td>46.403 Mineral Engineering Projects and Laboratory</td>
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<td>48.041 Chemical Engineering 3A</td>
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<td>Unit 2 Simultaneous Heat and Mass Transfer</td>
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</tr>
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<td>Unit 4 Transport Phenomena</td>
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<td>48.042 Chemical Engineering 3B</td>
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<td>Unit 2 Optimization</td>
<td>3</td>
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</table>

Professional Electives: Appropriate subjects to the total of six session hours may be nominated. A list of some such subjects is available from the Head of School.

3140
Mining Engineering — Full-time Course
Bachelor of Engineering
BE

Year 1 of the course is essentially the same as that for several other Engineering courses and Year 2 includes those subjects 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 a personal research or study project in mining or minerals engi-
neering on which they are required to submit a thesis for examination.

For the award of Honours at the conclusion of the full-time course, students will need to have distinguished themselves in the formal work, in other assignments as directed by the Head of School, and in the final year project.

In the undergraduate 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 in securing suitable vacation employment. Students are required to submit for assessment an industrial training report on the vacation and other relevant experience acquired.

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### Year 1

<table>
<thead>
<tr>
<th>Subject</th>
<th>Hours per week</th>
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<tr>
<td>1.001 Physics 1</td>
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<tr>
<td>2.951 Chemistry (ME)</td>
<td>S1: 6, S2: 6</td>
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<td>5.010 Engineering A</td>
<td>S1: 6, S2: 0</td>
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<td>5.0201 Engineering Dynamics</td>
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<td>5.0301 Engineering C†</td>
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<tr>
<td>8.1711 Mechanics of Solids 1</td>
<td>S1: 0, S2: 3</td>
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#### Year 2

<table>
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<th>Subject</th>
<th>Hours per week</th>
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<tbody>
<tr>
<td>1.9222 Electronics</td>
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</tr>
<tr>
<td>4.972 Materials for Mining Engineers</td>
<td>S1: 1½, S2: 1½</td>
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<tr>
<td>6.854 Electrical Power Engineering</td>
<td>S1: 0, S2: 4</td>
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<tr>
<td>7.132 Fluid Mechanics and Machines</td>
<td>S1: 2, S2: 2</td>
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<tr>
<td>7.142 Mine Development†</td>
<td>S1: 1, S2: 1</td>
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<tr>
<td>8.1721 Mechanics of Solids 2</td>
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<td>8.6130 Properties of Materials</td>
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<tr>
<td>10.022 Engineering Mathematics 2</td>
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<tr>
<td>10.301 Statistics SA</td>
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<tr>
<td>25.520 Geology for Mining Engineers‡</td>
<td>S1: 2, S2: 2</td>
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<tr>
<td>29.441 Surveying for Engineers</td>
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<tr>
<td>29.491 Survey Camp</td>
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#### Year 3

<table>
<thead>
<tr>
<th>Subject</th>
<th>Hpw S1</th>
<th>S2</th>
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<tbody>
<tr>
<td>7.113 Mining Methods†</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>7.123 Geomechanics</td>
<td>2½</td>
<td>2½</td>
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<tr>
<td>7.133 Mine Transport</td>
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<td>2½</td>
</tr>
<tr>
<td>7.143 Mine Environment and Safety Engineering‡</td>
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<tr>
<td>7.153 Power Supply in Mines</td>
<td>2½</td>
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<td>7.163 Excavation Engineering</td>
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<td>2</td>
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<tr>
<td>7.173 Computer Applications in Mining</td>
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<td>2</td>
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<td>7.213 Mine Surveying</td>
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<td>0</td>
</tr>
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<td>7.313 Minerals Engineering Processes</td>
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<td>7.433 Mining Laboratory</td>
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<tr>
<td>25.530 Geology for Mining Engineers 2§</td>
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#### Year 4

<table>
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<tr>
<th>Subject</th>
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<th>S2</th>
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<tbody>
<tr>
<td>7.114 Geotechnical Engineering</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>7.174 Mining Legislation</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>7.214 Mine Economics and Planning</td>
<td>4</td>
<td>4</td>
</tr>
<tr>
<td>7.224 Operational Management</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>7.414 Minerals Industry Project</td>
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<td>4</td>
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<tr>
<td>7.424 Industrial and Research Seminars</td>
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<td>1</td>
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<tr>
<td>7.434 Advanced Mining Laboratory</td>
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<tr>
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</tbody>
</table>

### School of Textile Technology

**Head of School**
Dr R. Griffith

**Senior Administrative Officer (Faculty)**
Mr R. F. Starr
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. Graduates with a good background in physics, chemistry or engineering, and with a broad training in the range of textile sciences and technologies, as provided in the courses in Textile Technology, will substantially meet the present and future technological requirements of the textile and allied industries. Since present day textile technology is based on engineering and the fundamental sciences, excellent opportunities also await university-trained scientists and technologists in research and development organizations. Such scientists and technologists will play a decisive part in bridging the gap which exists between fundamental research and its industrial application.

Students are given the opportunity of choosing from four courses, viz Textile Chemistry, Textile Physics, Textile Engineering and Textile Manufacture. The course in Textile Manufacture, which includes subjects in Commerce, is especially designed to meet the need for executives in industry who have been given a comprehensive technological training. Each course extends over four years. All students take a common first year, and they need not choose the option they desire to follow until the end of that year. The aim of all four courses is to produce graduates who have acquired a comprehensive knowledge of all the textile sciences and technologies, the courses themselves differing only in the subjects undertaken at the end of Year 3. A period of at least 40 working days' approved industrial training is compulsory, of which at least 30 working days' training must be undertaken at the end of Year 3.

### General Studies Electives
For details of changes in the General Studies requirements refer to the table earlier in this section.

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### 3170 Textile Technology — Full-time Course

#### Bachelor of Science BSc

**Year 1 (All courses)**

<table>
<thead>
<tr>
<th>Course Code</th>
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<th>Hours per week</th>
</tr>
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<tbody>
<tr>
<td>1.001</td>
<td>Physics 1†</td>
<td>S1: 6, S2: 6</td>
</tr>
<tr>
<td>1.041</td>
<td>Laboratory Computers in Physical Sciences</td>
<td>S1: 6, S2: 0</td>
</tr>
<tr>
<td>2.121</td>
<td>Chemistry 1A</td>
<td>S1: 6, S2: 0</td>
</tr>
<tr>
<td>2.131</td>
<td>Chemistry 1B</td>
<td>S1: 0, S2: 6</td>
</tr>
<tr>
<td>5.010</td>
<td>Engineering A</td>
<td>S1: 0, S2: 6</td>
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<tr>
<td>10.001</td>
<td>Mathematics 1 or Higher Mathematics 1</td>
<td>S1: 6, S2: 0</td>
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</tbody>
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†Students who do not qualify for entry into 1.001 Physics 1, may be allowed, at the discretion of the Head of the School, to substitute 1.021 Introductory Physics 1. Such students will be ineligible to proceed to the Textile Physics or Textile Engineering courses.

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### Textile Chemistry

**Year 2**

<table>
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<td>2.102B</td>
<td>Organic Chemistry</td>
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<td>2.102D</td>
<td>Analytical Chemistry</td>
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<td>Mathematics</td>
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<td>Statistics SA</td>
<td>S1: 2, S2: 0</td>
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<td>13.111</td>
<td>Textile Technology 1</td>
<td>S1: 8, S2: 8</td>
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<td>13.211</td>
<td>Textile Science 1</td>
<td>S1: 3, S2: 3</td>
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**Year 3**

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<tr>
<td>2.003B</td>
<td>Organic Chemistry</td>
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<tr>
<td>2.003H</td>
<td>Molecular Spectroscopy and Structure</td>
<td>S1: 0, S2: 6</td>
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<tr>
<td>13.112</td>
<td>Textile Technology 2</td>
<td>S1: 12, S2: 12</td>
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<td>13.212</td>
<td>Textile Science 2</td>
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<td>Textile Engineering 1</td>
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### Textile Physics

**Year 2**

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<tr>
<td>1.002</td>
<td>Mechanics, Waves and Optics</td>
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<td>1.012</td>
<td>Electromagnetism and Thermal Physics</td>
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<td>1.022</td>
<td>Modern Physics</td>
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<tr>
<td>10.1113</td>
<td>Multivariable Calculus</td>
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<td>Vector Calculus</td>
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<td>Mathematical Methods for Differential Equations</td>
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<td>Textile Science 1</td>
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**Year 3**

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<td>Statistical Mechanics and Solid State Physics</td>
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<td>Computer Applications in Electronics</td>
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<td>Experimental Science 2</td>
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<td>Textile Engineering 1</td>
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<tr>
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53
Despite growth in the minerals industry, agricultural products still contribute a significant share of Australia's export income. Australian agriculture, and in particular the pastoral industries, has 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 economies. 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.

The School of Wool and Pastoral Sciences 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 utilization 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.

The School also offers a course requiring one year of full-time or two years of part-time study leading to the award of the Graduate Diploma in Wool and Pastoral Sciences. Research may also be undertaken for the award of the degrees of Master of Science and Doctor of Philosophy.

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/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 School.

General Studies Electives

For details of changes in the General Studies requirements refer to the table earlier in this section.

3220 Wool and Pastoral Sciences — Full-time Course

Bachelor of Science

BSc

<table>
<thead>
<tr>
<th>Year 1</th>
<th>Hours per week</th>
</tr>
</thead>
<tbody>
<tr>
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<td>Introductory Chemistry or 6</td>
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<td>2.121</td>
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<td>9.101</td>
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<td>27.121</td>
<td>Pedology for Pastoral Sciences 0</td>
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</table>

*Up to 5 days of compulsory field excursions are part of this subject.
†This subject extends over 7 weeks of the Session.

Year 2

| 2.003J | Agricultural and Biological Chemistry 6 | 0 |
| 9.111  | Livestock Production 1* 2 | 2 |
| 9.201  | Agronomy 3 | 3 |
| 9.301  | Agricultural Economics and Management 2 3 | 3 |
| 9.501  | Wool Science 1 6 | 6 |
| 9.601  | Animal Physiology 1 0 | 4 |
| 10.301 | Statistics SA 2 | 2 |
|        | General Studies Elective 2 | 4 |
|        | 24   | 24    |

*A 5 day field excursion is an essential part of the subject.
### Year 3

<table>
<thead>
<tr>
<th>Code</th>
<th>Subject</th>
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<tr>
<td>9.131</td>
<td>Animal Health 1</td>
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<tr>
<td>9.202</td>
<td>Pastoral Agronomy</td>
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<td>9.421</td>
<td>Animal Nutrition</td>
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<td>9.801</td>
<td>Genetics 1</td>
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<td>41.101</td>
<td>Biochemistry</td>
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<tr>
<td></td>
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</tbody>
</table>

19 17

Plus at least one subject in Session 1 and at least two subjects in Session 2, chosen from the list of optional subjects and approved by the Head of School.

### Year 4

<table>
<thead>
<tr>
<th>Code</th>
<th>Subject</th>
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<th>S2</th>
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<td>Project</td>
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<td>9.002</td>
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</table>

Plus subjects providing at least 15 hours per week of lectures, tutorials and laboratory classes per session, chosen from the list of optional subjects. A minimum of 2 subjects in each session must be chosen from subjects in Group A. The choice of subjects is to be approved by the Head of School who may vary the requirements in special circumstances.

### Optional subjects

<table>
<thead>
<tr>
<th>Group A</th>
<th>Hours per week</th>
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<tbody>
<tr>
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<tr>
<td>9.113</td>
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<tr>
<td>9.132</td>
<td>Animal Health 2</td>
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<tr>
<td>9.204</td>
<td>Range Management*†</td>
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<tr>
<td>9.503</td>
<td>Wool Science 3</td>
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<tr>
<td>9.502</td>
<td>Genetics 2</td>
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<tr>
<td>9.611</td>
<td>Biostatistics 1</td>
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<tr>
<td>9.612</td>
<td>Biostatistics 2</td>
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*One week of instruction at Fowlers Gap Research Station is an essential part of this course.

### Group B

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<th>Subject</th>
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<td>Livestock Production 2</td>
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<td>9.203</td>
<td>Crop Agronomy†</td>
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<tr>
<td>9.302</td>
<td>Agricultural Economics and</td>
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<td></td>
<td>Management 2</td>
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<tr>
<td>9.502</td>
<td>Wool Science 2</td>
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<td>9.901</td>
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<td>Environmental Botany</td>
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<td>44.101</td>
<td>Introductory Microbiology*</td>
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<tr>
<td>68.451</td>
<td>Biological Laboratory Computing</td>
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</tbody>
</table>

*Range Management and Crop Agronomy are offered in alternate years.

*Students should note the special proviso for enrolment in this subject as indicated in the Subject Descriptions later in this handbook.
A subject is defined by the Professorial Board as 'a unit of instruction approved by the University as being a discrete part of the requirements for a course offered by the University'.

Each approved subject of the University is identifiable both by number and by name as this is a check against nomination of subject other than the one intended.

Subject numbers are allocated by the Registrar and the system of allocation is based on the following guidelines:

1. The authority offering the subject, normally a School of the University, is indicated by the number before the decimal point.

2. Each subject number is unique and is not used for more than one subject title.

3. Subject numbers which have previously been used are not used for new subject titles.

4. Graduate subjects are indicated by a suffix 'G' to a number with three digits after the decimal point. In other subjects three or four digits are used after the decimal point.

Subjects taught are listed in full in the handbook of the faculty or board of studies responsible for the particular course within which the subjects are taken. Subject descriptions are contained in the appropriate section in the handbooks.

The identifying numerical prefixes for each subject authority are set out on the following page.

Servicing Subjects are those taught by a school or department outside its own faculty. Their subject descriptions are published in the handbook of the faculty which originates the subject and are also published in the handbook of the Faculty in which the subject is taught.

The following pages contain descriptions for most of the subjects offered for the courses described in this book, the exception being the General Studies subjects. For General Studies subjects see the General Studies Handbook which is available free of charge.

HSC Exam Prerequisites
Subjects which require prerequisites for enrolment in terms of the HSC Examination percentile range, refer to the 1978 and subsequent Examinations.

Candidates for enrolment who obtained the HSC in previous years or hold other high school matriculation should check with the appropriate school on what matriculation status is required for admission to a subject.

Information Key
The following is the key to the information which may be supplied about each subject:
- S1 (Session 1); S2 (Session 2)
- F (Session 1 plus Session 2, ie full year)
- S1 or S2 (Session 1 or Session 2, ie choice of either session)
- SS (single session, but which session taught is not known at time of publication)
- CCH class contact hours
- L (Lecture, followed by hours per week)
- T (Laboratory/Tutorial, followed by hours per week)
- hpw (hours per week)
- C (Credit or Credit units)
- CR (Credit Level)
- DN (Distinction)
<table>
<thead>
<tr>
<th>School, Department etc</th>
<th>Faculty</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 School of Physics*</td>
<td>Science</td>
<td>59</td>
</tr>
<tr>
<td>2 School of Chemistry*</td>
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<tr>
<td>4 School of Metallurgy</td>
<td>Applied Science</td>
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</tr>
<tr>
<td>5 School of Mechanical and Industrial Engineering*</td>
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<td>6 School of Electrical Engineering and Computer Science*</td>
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<td>7 School of Mining Engineering</td>
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<td>44 School of Microbiology*</td>
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</table>
Physics

Physics Level I Units

1.001 Physics 1 F L3T3
Prerequisites: 2 unit Mathematics* or 3 unit Mathematics or 4 unit Mathematics and (for 1.001 only) 10.021B
2 unit Science (Physics) or 31-100
2 unit Science (Chemistry) or 31-100
4 unit Science (Multistrand) 31-100
Co-requisite: 10.021C or 10.001 or 10.011.

*This refers to the 2 Unit Mathematics subject which is related to the 3 Unit Mathematics subject. It does not refer to the subject 2 Unit Mathematics (Mathematics in Society).

Aims and nature of physics and the study of motion of particles under the influence of mechanical, electrical, magnetic and gravitational forces. Concepts of force, inertial mass, energy, momentum, charge, potential, fields. Application of the conservation principles to solution of problems involving charge, energy and momentum. Electrical circuit theory, 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. The wave theories of physics, transfer of energy by waves, properties of waves. Application of wave theories to optical and acoustical phenomena such as interference, diffraction and polarization.

1.021 Introductory Physics 1 (For Health and Life Scientists) F L3T3
Prerequisites: None. Co-requisites: 10.021A and 10.021B, or 10.021B and 10.021C, or 10.001 or 10.011.

 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.

Physics Level II Units

1.002 Mechanics, Waves and Optics S1 L3T1
Prerequisites: 1.001 or 1.011, 10.001 or 10.011. Co-requisite: 10.2111. Excluded: 1992, 10.4111, 10.4211.

Harmonic motion, systems of particles, central force problems, Lagrange's equations, coupled oscillations, travelling waves, pulses, energy and momentum transfer, polarization, birefringence, interference, thin films, gratings, lasers, holography, fibre optics, Faraday effect, photoelasticity.

1.012 Electromagnetism and Thermal Physics S2 L3T1

Electric field strength and potential, Gauss' law, Poisson's and Laplace's equations, capacitance, dielectrics and polarization, 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.

1.022 Modern Physics F L1½T½

Special theory of Relativity: time dilation, length contraction, simultaneously, Lorentz transformations, energy and mass. Photon properties, de Broglie relations, Uncertainty principle, operators in quantum mechanics, postulates of quantum mechanics, potential wells, steps and barriers, harmonic oscillator, H atom, angular momentum, magnetic moment, electron spin, nuclear spin. Atomic and molecular spectra, lasers, quantum statistics, free electron model of a metal, band theory; nuclear size, density, mass, nuclear models, fission and fusion, nuclear forces.

1.062 Computer Applications In Experimental Science 2 S1 L2T3
Prerequisites: 1.061 or 1.041. Excluded: 1.042.

Interface between computer and experiment, programmed and interrupt interaction, direct and dual port memory access concepts, hardware, software and timing restraints. Real-world variables, transducers and conversion to binary representation, converters and counters, signals and noise. Data collection, reduction and storage as digital matrices. Numerical modelling, analysis and elementary control of a system.

1.9222 Electronics S1 L1T2
Prerequisites: 1.001 or 1.001 or 1.021. Excluded: 1.032.

The application of electronics to other disciplines. Includes: principles of circuit theory and analogue computing; amplifiers, their specification and application, transducers; electronic instrumentation; industrial data acquisition.

1.9322 Introduction to Solids S2 L2T1
Prerequisites: 1.001 or 1.011 or 1.021. Excluded: 1.022, 4.402, 4.412.

Introductory quantum mechanics and atomic physics; crystal structure; point and line defects; introductory band theory; conductors, semi-conductor and insulators; energy level diagrams.
Physics Level III Units

1.023 Statistical Mechanics and Solid State Physics
Prerequisites: 1.012, 1.022, 10.2112.
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.

2.030 Organic Chemistry
Prerequisite: 2.002B.
The spectroscopic identification of organic compounds, free radical chemistry and electro-organic 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 discussing syntheses and reactions including degradation.

Chemistry

2.003B Organic Chemistry
Prerequisite: 2.002B.
Heterocyclic Chemistry. Synthesis and reactions of the following heteroaromatic systems: pyridine, quinoline, isoquinoline, pyrimidine, pyrrole, furan, thiophen, indole, imidazole; examples of naturally occurring alkaloids where relevant. Alicyclic Chemistry. Stereochemistry of acyclic systems; classical and non-classical strain in cyclic systems; stereochemistry and conformation of monocyclic and polycyclic compounds; synthesis, reactions and rearrangement of monocyclic compounds including stereochemical selectivity; transannular reactions in medium rings. Synthesis and reactions of fused and bridged polycyclic systems, examples of steroids and terpenes where relevant. Structure determination: application of spectroscopic methods (eg nuclear magnetic resonance, mass spectroscopy) to determination of organic structures.

2.003H Molecular Spectroscopy and Structure
Prerequisites: 2.121 and 2.131, or 2.141.
Absorption and emission of radiation. Atomic spectra. Molecular spectroscopy: vibrational, including infrared and Raman; UV-visible; instrumentation and sample handling. Magnetic resonance. Mass spectrometry with particular reference to structure determination. Laboratory and tutorial work to illustrate the above, including inspection of major instruments.

2.030A Physical Chemistry
Prerequisites: 2.121 and 2.131, or 2.141; and 10.011 or 10.001 or 10.021B and 10.021C. Excluded 2.002A.
Thermodynamics: first, second and third laws of thermodynamics; statistical mechanical treatment of thermodynamic properties; applications of thermodynamics: chemical equilibria, phase equilibria, solutions of nonelectrolytes and electrolytes, electrochemical cells. Kinetics: order and molecularity; effect of temperature on reaction rates; elementary reaction rate theory. Surface chemistry and colloids: adsorption, properties of dispersions, macromolecules and association colloids.

2.030B Organic Chemistry
Prerequisite: 2.002B.
The spectroscopic identification of organic compounds, free radical chemistry and electro-organic 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 discussing syntheses and reactions including degradation.

2.043A Environmental Chemistry
Prerequisites: 2.002A, 2.002D.
Physico-chemical aspects of atmosphere chemistry: dispersion of colloids and solid matter, photochemical reactions. Hydrological cycle: reactions in the sea, rivers and estuaries; chemical characteristics of surface and sub-surface waters. Corrosion of metals. Distribution of elements and nutrient cycles in water; organic carbon cycles, oxygen balance (redox processes in aquatic systems). Chemical models of these processes (including an introduction to simple computing). Practical project (mostly field work) dealing with nutrient cycles.

2.043L Chemistry and Enzymology of Foods
Prerequisite: 2.002B. Excluded: 2.003J, 2.043L.
The chemistry of food constituents at an advanced level and the relationship between the chemistry and enzymology associated with the origin and handling of foodstuffs. Treatment of the stability of constituents, changes in colour and texture occurring during processing and storage. Methods of assessment, chemical and physical. General classification of constituents, role of free and combined water. Fixed oils and fats, rancidity of enzymic and autoxidative origin, antioxidants — natural and synthetic — theories on mechanisms of action, carbohydrates, reactivity, role in brewing processes, carbohydrate polymers, starch structure, enzymic susceptibility and mode of action, estimations, enzymic degradation and enzymic browning, reactions and stability of natural pigments, vitamins, preservatives.
2.102B Organic Chemistry  
**Prerequisite:** 2.131 or 2.141. **Excluded:** 2.002B

Discussion of the major types of organic reaction mechanisms (e.g., addition, substitution, elimination, free-radical, molecular rearrangement) within context of important functional groups (e.g., aliphatic hydrocarbons, monocyclic aromatic hydrocarbons, 

2.102C Inorganic Chemistry and Structure S1 or S2 L3T3

**Prerequisites:** 2.121 and 2.131, or 2.141. **Excluded:** 2.042C.


2.102D Chemical and Spectroscopic Analysis  
**Prerequisites:** 2.121 and 2.131, or 2.141; and 10.011 or 10.001 or 10.021B and 10.021C. **Excluded:** 2.002D and 2.003H.


2.111 Introductory Chemistry  
**Prerequisite:** Nil.

**Note:** Students who have passed 2.121 or 2.131 may not enrol in 2.111 or 2.141. Students meeting the 2.121 or 2.141 prerequisite are not permitted to enrol in 2.111 without the permission of the Head of the School of Chemistry. Students who enrol in 2.111 must pass 2.111 before they can proceed to 2.121 or 2.131 or 2.141.

2.121 Chemistry 1A  
**Prerequisites:**

2 unit Mathematics* or 3 unit Mathematics or

4 unit Mathematics and
2 unit Science (Physics) or 2 unit Science (Chemistry) or 4 unit Science (multistrand) or 2 unit Science (Geology) or 2 unit Science (Biology) or 2.111.

*This refers to the 2 Unit Mathematics subject which is related to the 3 Unit Mathematics subject. It does not refer to the subject 2 Unit Mathematics (Mathematics in Society).

2.131 Chemistry 1B  
**Prerequisite:** 2.121.

Chemical equilibrium, equilibrium constants, quantitative calculations applied to acid-base and solubility equilibria; buffers, titrations, chemical analysis. Oxidation and reduction reactions, electrode potentials. Chemical thermodynamics, entropy, free energy. Chemistry of carbon compounds, alcohols, ethers, amines. Analysis

2.141 Chemistry 1M  
**Prerequisites:**

HSC Exam  
**Percentile Range**  
Required
2 unit Mathematics*  71-100
3 unit Mathematics  21-100
4 unit Mathematics  1-100
2 unit Science (Physics) or 2 unit Science (Chemistry) or 4 unit Science (multistrand) or 2 unit Science (other than Physics or Chemistry) or 2.111

*This refers to the 2 Unit Mathematics subject which is related to the 3 Unit Mathematics subject. It does not refer to the subject 2 Unit Mathematics (Mathematics in Society).

**Note:** As for Note, 2.121 Chemistry 1A.

The syllabus is an integrated one of 2.121 and 2.131 (see above). Students majoring in Chemistry may take 2.141 in lieu of 2.121 and 2.131.
A treatment of chemistry which illustrates the application of the principles of chemistry to problems of concern to mechanical engineers. Topics: chemistry of materials, thermochemistry, chemical kinetics and equilibrium, radioactivity and nuclear power, electrochemistry and corrosion of metals. Introduction to organic chemistry, structure and properties of polymers, fuels and lubricants. Surface chemistry.

### Metallurgy

#### 4.001 Introduction to Materials Engineering S1 or S2 L1
Forms part of 5.010 Engineering A.
Metals, ceramics, polymers and composites, their structure, chemical, physical and mechanical properties, engineering applications and production, with particular reference to Australian industries.

#### 4.002 Introduction to Metallurgical Engineering S2 L2
Forms part of 5.030 Engineering C.
Metal production in Australia. Description of methods used to produce metals from ores. Description of metal forming and fabrication processes and how these modify the structure and properties of metals. Topics include: sand, investment, die and continuous casting; shaping, including forging, rolling, wire drawing, extrusion, pressing, deep drawing and spinning; joining, including soldering, brazing and welding; hardening, including cold work, heat treatment and surface hardening processes.

#### 4.024 Metallurgy Project S1 6 S2 3
An experimental investigation of some aspects of metallurgy. Includes three weeks laboratory work during the mid-year recess.

#### 4.034 Industrial Metallurgy Project S1 4 S2 2
An experimental investigation of some aspects of industrial metallurgy.

#### 4.044 Professional Electives F5

#### 4.054 Metallurgy Seminar F L2
Lectures on the preparation and presentation of technical papers. Development of encoding and decoding communication skills in the various communication media. Chairmanship. Professional ethics and etiquette. Organization and direction of conferences. Traditional and on line retrieval of information. Each student is required to prepare and present a paper on a nominated subject.

### 4.002 Introduction to Materials Engineering S1 or S2 L1

4.121 Principles of Metal Extraction F L2T1
The fundamental principles of metal extraction. Oxidation and reduction, roasting, slag reactions, distillation, leaching, precipitation and electrolysis.

4.204 Ceramic Materials Selection S1 or S2 L2

4.213 Chemical Ceramics S1 L3T3 S2 L2T3
Structural principles: crystal chemistry, structure of glasses, defect solid state: phase equilibria and transformations; diffusion; solid state reactions. A systematic treatment of the chemistry of ceramic products.
Students are required to take part in a series of factory inspections.

4.224 Physical Ceramics F L2T4
Prerequisites: 4.213, 4.233.

4.231 Introduction to Ceramic Engineering S2 L2
The nature of ceramics. The scope of ceramic industry. The origin, classification, physical properties and uses of clay minerals and other non-clay raw materials. Principal unit operations used in the ceramic industry. Drying and firing of ceramics, melt forming, hot forming and other forming processes.

4.232 Ceramic Engineering 1 S1 L3
The principles of operation, construction and fields of application of equipment used in the mining, preparation and fabrication of raw materials, and the drying and firing of ceramic products.

4.233 Ceramic Process Principles F L1T2½
Students are required to take part in a series of factory inspections.
4.234 Ceramic Engineering 2  
Prerequisites: 4.232, 4.233, 8.112, 48.021, 48.025.


Students are required to partake in a series of factory inspections.

4.294 Project (Ceramic Engineering)  
An experimental or technical investigation or design related to some aspect of ceramic engineering. Prerequisites and/or co-requisites are determined depending on the nature of the project.

4.302 Chemical and Extraction Metallurgy 1  
Co-requisite: 2.002A.

Metal extraction from ores in terms of unit operations and overall systems, illustrated by the extraction of iron, copper, aluminium and other metals. Elementary process analysis. Laboratory — analysis and solution of problems.

4.303 Chemical and Extraction Metallurgy 2  
Prerequisites: 4.302, 4.602 and 4.402 or 4.412.


4.312 Chemical and Extraction Metallurgy 1A  
Co-requisites: 2.002A.

As for 4.302 Chemical and Extraction Metallurgy 1.

4.314 Chemical and Extraction Metallurgy 3A  
Prerequisite: 4.303.


4.324 Chemical and Extraction Metallurgy 3B  
Prerequisite: 4.303.

A selection of advanced topics in chemical and extractive metallurgy.

4.374 Metal Extraction Processes  
Analysis of pyrometallurgical and hydrometallurgical extraction and refining processes using the principles of chemical equilibrium and kinetics. Extraction and refining processes for commercially important ferrous and non-ferrous metals. Nature of the inter-relationship between raw material, extraction process and product characteristics. Economic factors in process selection and operation; acceptance standards for ores and concentrates, smelter charges; penalties and bonuses; by-products.

4.402 Physical Metallurgy 1  


4.403 Physical Metallurgy 2  
Prerequisite: 4.402. Excluded: 1.3033.


4.404 Physical Metallurgy 3  
Applications of dislocation theory to work hardening and annealing processes. Phase transformations in alloys. Mathematical crystallography, reciprocal lattice, diffraction. Electron and X-ray metallography. Selection of advanced topics in physical metallurgy including radiation damage, martensitic transformations, neutron diffraction, internal friction, sintering, creep, superplasticity, fracture, microplasticity.

4.412 Metallurgical Phases — Structure and Equilibrium, Part 1  

The crystal structure of metallic phases. Crystal defects. Physical properties of solids. Phase equilibrium in alloy systems. The genesis of microstructure. Metallography.

4.412A Physical Metallurgy 1A  
Unit 1: Phase Equilibria I  
Co-requisite: 2.102A, 4.632.

Elements of crystallography. The crystal structure of metallic phases. Defect structures, dislocations, grain boundaries, plasticity, deformation and recrystallization. Phase equilibrium in alloy systems. Genesis of microstructure. Mechanisms of phase transformations, depa-
ture from equilibrium, metastable transition phases. Use of free energy principles to determine nature of phase equilibrium, common tangent construction. Application of Hume-Rothery principles to determine liquidus and solidus boundaries, electron compounds. Introduction to nucleation theory.

Unit 2: Phase Equilibria Laboratory


4.413 Physical Metallurgy 2A
Prerequisite: 4.412A.

4.414 Physical Metallurgy 3A
Prerequisite: 4.433C.

4.422 Metallurgical Phases — Structure and Equilibrium, Part 2

4.422B Physical Metallurgy 1B
Prerequisite: 4.412A.

4.423 Physical Metallurgy 2B
Prerequisite: 4.412A.

4.424 Physical Metallurgy 3B
Prerequisite: 4.423.

4.432 Physical Metallurgy 1C
Prerequisite: 4.412A.

4.433 Physical Metallurgy 2C
Prerequisite: 4.402.

4.433C Physical Metallurgy 2C
Prerequisite: 4.412A.

4.434 Physical Metallurgy 3C
Prerequisite: 7.303.

4.442 Physical Metallurgy 1D
Prerequisite: 1.001 or 1.011.
4.443 Physical Metallurgy 2D  
Prerequisite: 4.412A, 4.432.


4.444 Advanced Crystallography of Phase Transformations  
Co- or prerequisite: 4.414.


4.453 Physical Metallurgy 2E  
Prerequisite: 4.412A, 4.432.


4.494 High Temperature Techniques  
Prerequisite: 4.403 or 4.433, 4.502 or 4.522.

Experimental methods for the determination of thermophysical and thermochemical properties at elevated temperatures.

4.504 Mechanical and Industrial Metallurgy  
Prerequisites: 4.403 or 4.433, 4.502 or 4.522.

The application of metallurgical principles to industrial processing with particular reference to casting, welding, shaping, properties and selection of materials. Metal finishing. Metallurgical aspects in engineering design. Fracture mechanics, design against fatigue, brittle and ductile fracture.

4.514 Industrial Metallurgy  
Prerequisites: 4.433, 4.522.

As for 4.504 Mechanical and Industrial Metallurgy.

4.602 Metallurgical Engineering 1  
Co-requisite: 4.302.

Mass and energy accounting in metallurgical processes. An introduction to the principles and applications of transport processes in systems with specific reference to industrial processes in primary and secondary metallurgy.

4.612 Metallurgical Engineering 1A  
Combination of 4.512 and 4.522.


4.613 Metallurgical Engineering 2A  
Prerequisite: 4.602.

An extension of the principles and applications of transport processes to metallurgical systems. The principles of metallurgical heating and cooling including fuels, refractories and furnace design and operation. Solidification in moulds, continuous casting. Process Economics: As for 48.031 Chemical Engineering 2A Unit 6.

4.613A Metallurgical Engineering 2A  
Prerequisite: 4.622.

4.614 Metallurgical Engineering 3A  L1T1
Prerequisite: 4.613A.


4.622 Metallurgical Engineering 1B  S2 L1T2½
Prerequisite: 4.612.


4.623B Metallurgical Engineering 2B  S2 L3T½
Prerequisite: 2.002A.


4.624B Metallurgical Engineering 3B  S1 L3
Prerequisite: 4.632.


4.632 Metallurgical Engineering 1C  S1 L2T2
Prerequisite: 5.010. Co-requisite: 4.412A.


4.633 Metallurgical Engineering 2C  F L2T1
Prerequisites: 10.001 or 10.011, 4.442.


4.634 Metallurgical Engineering 3C  S2 L2½T½
Prerequisite: 4.453.


4.642 Metallurgical Engineering 1D  S2 L1T1
Prerequisite: 4.632.


4.643 Metallurgical Engineering 2D  S2 L2T1
Prerequisites: 4.412A, 4.632.


4.644 Metallurgical Engineering 3D  S2 L2T2
Prerequisite: 4.453.


4.654 Metallurgical Engineering 3E  S2 L1T3
Prerequisites: 4.633, 4.643.

Engineering Design. Engineering design codes of practice, experimental and theoretical stress analysis and fracture mechanics. Design codes and statutory regulations with emphasis on selection of materials for service conditions. Design approaches to fatigue and...
brittle fracture are treated in terms of contemporary rules for dynamic loading and low temperature service. Stress analysis component is presented in terms of both experimental techniques and numerical analysis using finite element computer programs. Emphasis in laboratory classwork is on electrical resistance strain gauge techniques but other techniques are also applied. Quantitative design against fracture in terms of linear elastic fracture mechanics and elastic plastic fracture mechanics using COD and J integral approaches is presented with reference to case studies.

4.664 Surface Treatments and Wear  
**Prerequisite:** 4.623B.


4.674 Mathematical Plasticity  
**Prerequisite:** 4.633.

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.

4.684 Transport Phenomena in Metallurgical Processes  
**Co- or prerequisite:** 4.614.

Control of many metallurgical processes and design of suitable plant depend on an appreciation of factors affecting rate of reaction. In many cases, especially when conditions are far from equilibrium, transport of heat and/or mass is rate limiting.

Deals with application of transport processes (fluidised flow, heat and mass transfer) to a number of typical processes. Illustration from: ironmaking, steelmaking, combustion, fluidized bed processing, leaching, solvent extraction, vacuum processing.

4.694 Air Pollution control in the Metallurgical Industry  
**Prerequisite:** 4.403.

Case studies of emission surveys, measurements and compliance program planning in the primary and secondary metallurgical industries.

4.703 Materials Science  
**Prerequisite:** 4.403.

The application of the principles of physical metallurgy to the development of modern materials. Particular attention is paid to the structure/property relationships that determine the design of materials. The topics covered include materials used for structural purposes, high temperature application, corrosive environments, nuclear engineering, fuel cells, magnetic applications.

4.802 Metallurgical Physics  
**Prerequisite:** 1.001 or 1.011.


4.813 Mathematical Methods  
**Prerequisite:** 10.031 or 10.211A.


4.823 Numerical Methods  
**Prerequisite:** 10.031.

Consists of Unit 2 — Numerical Methods of 4.813 Mathematical Methods.

4.913 Materials Science  
**Prerequisite:** 1.982 Solid State Physics.


4.941 Metallurgy for Engineers  
**Prerequisite:** 1.982 Solid State Physics.


4.964 Materials Science and Engineering for Electrical Engineers  
**Prerequisite:** 1.982 Solid State Physics.

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.
4.972 Materials for Mining Engineers


5.010 Engineering A

Prerequisite: HSC Exam

Percentile Range

Either
2 unit Science (Physics) or 31-100
4 unit Science (multistrand) 31-100
or
2 unit Industrial Arts or 31-100
3 unit Industrial Arts 11-100

Note: Students who wish to enrol in this subject in courses other than the full-time courses in Aeronautical Engineering, Civil Engineering, Industrial Engineering, Mechanical Engineering and Naval Architecture make up for the lack of the prerequisite by work taken in Physics in the first half of the first year.

Statics: Composition and resolution of forces, laws of equilibrium. Friction. Statics of rigid bars, pin-jointed frames, and beams. Simple states of stress. Statics of fluids. Introduction to Engineering Design: Engineering method, problem identification, creative thinking, mathematical modelling, computer-aided design, materials and processes, communication of ideas, the place of engineering in society. Introduction to Materials Science: The structure and properties of the main types of engineering materials, with emphasis on the way in which properties may be controlled by controlling structure.

5.0201 Engineering Dynamics 1A

Prerequisite: 5.010.

Kinematics of a particle in the plane: rectilinear and curvilinear motion; motion relative to a translating frame of reference. Kinetics of a particle in the plane: Newton's second law; D'Alembert's principle; work, power and energy. Virtual work. Kinetics of a system of particles: impulse and momentum; moment of momentum; equations of motion; impact. Fixed-axis rotation of a rigid body: angular momentum; equation of motion; moment of inertia; energy; centre of percussion. Steady mass flow.

5.030 Engineering C

Prerequisites: as for 5.010.


and one of the following options (determined by the course of study)

1. Production Technology

(Chemical, Industrial and Aeronautical Engineering and Naval Architecture students must take this option.) Description and appraisal of the processes classified as: forming from liquid or solid, material removal, material joining. Machines. Analysis of the primary functions of the machine tools and an appraisal of their limitations. Principles of operation of common machine tools and illustrations of their use.

2. Introduction to Chemical Industry

(Chemical Engineering and Industrial Chemistry students must take this option.) The chemical industry in Australia. The role of professional societies. Special topics on the engineering and chemical aspects of the industry, ie pollution control, energy sources, food and biochemicals and polymers, mineral processing, safety, etc. A visit to a factory in the Sydney area and the preparation of a short report after an introduction to information retrieval by university librarians.

3. Introduction to Metallurgical Engineering

(Metallurgy students must take this option.) History and significance of the exploitation of metals. Ores, mineral economics, mineral processing, and metal extraction and processing methods illustrated by reference to the Australian mineral and metal industries. Properties, uses and applications of metallic materials. The role of the metallurgist in industry and in processing and materials research, and in relation to conservation and the environment.

4. Introduction to Mining Engineering

(Mining Engineering students must take this option.) Mineral deposits; metallic, non-metallic and fuels. Elements of prospecting and exploration. Basic mining techniques. Mining phases: development, exploitation, beneficitation and withdrawal. Mining and the environment. Mining services. Relevance of basic science and engineering subjects to mining design and operations.

5. Introduction to Ceramic Engineering

(Ceramic Engineering students take this option.) The classification of materials. The nature of ceramics. The materials science approach. The scope of the ceramic industry. The origin, classification, physical properties and uses of clay minerals and other non-clay raw materials. Principal unit operations used in the ceramic industry. Drying and firing of ceramics, melt forming, net forming and other forming procedures.

5.0302 Engineering Drawing and Descriptive Geometry

Design of basic engineering elements and simple systems. Selection and specification of materials and manufacturing processes for engineering items. Communication by means of engineering drawings (including tolerances) of manufacturing information for simple structures and assemblies. Application of standards and trade literature to design. Simple design-and-make project to meet a published specification and to demonstrate the product's performance.

**Electrical Engineering and Computer Science**

**6.611 Computing 1**

Prerequisite: As for 10.001. Corequisite: 10.001 or 10.011. Excluded: 6.600, 6.620, 6.021D (1.041 excluded for students enrolled in Program 6806 and Computer Science programs in the Science and Mathematics course).

Introduction to programming: design and correctness of algorithms and data structures; programming in a high-level algorithmic language which provides simple, high level program control and data structuring facilities. Problem solving: basic ideas of problem solving; introduction to abstract structures used for computing solutions to problems. Introduction to propositional logic, computing machinery, computer arithmetic, artificial intelligence, and operating systems.

**6.621 Computing 2A**

Prerequisites: 6.611 (Pass Conceded (PC) awarded prior to Session 2, 1983, is not acceptable for this subject), 10.001 or 10.011. Excluded: 6.620, 6.021D.

For those students who intend to take further subjects in computer science.

For expansion and development of material introduced in 6.611 Computing 1. Systematic program development: introduction to programming language semantics, reasoning about programs, program derivation, abstract programs, realization of abstract programs (conversion from abstract to concrete). Practice in programming in a high-level programming language. Data-structures: arrays, lists, sets, trees; recursive programming. Introduction to computer organization: a simple machine architecture. Introduction to operating systems.

**6.854 Electrical Power Engineering**

Prerequisite: 1.001 or equivalent (1.9222 or 6.851 for students in Course 3140).

Extensive introduction to the theory and application of heavy current electrical engineering. Commences with the requisite circuit theory and then proceeds to consideration of the distribution of electrical power and the characteristics and selection of electrical machinery. DC power supplies, three-phase AC supply, voltage regulation, transformers, AC and DC machines and their rating: a project illustrating the application of electrical engineering to various aspects of industry. Consists of two 2-hour tutorial or laboratory sessions per week each commencing with a structured mini-lecture. Detailed lecture notes are provided.

**Mining Engineering**

**7.013 Principles of Mining**


**7.023 Mineral Process Engineering**


**7.033 Mineralogical Assessment**

Assessment of the physical and chemical properties of economic minerals. Significance of the textures of minerals on the selection of mineral beneficiation processes. Destructive and non-destructive testing of bore cores. Factors influencing effective comminution and liberation.

**7.044 Mining Economics**

7.111 Introduction to Mining and Mineral Engineering  
S1 L2
Forms part of 5.030 Engineering C.


7.113 Mining Methods  
F L2
Prerequisite: 7.142.


7.114 Geotechnical Engineering  
F L1T1
Prerequisites: 7.123, 7.113, 7.433.


7.123 Geomechanics  
F L2T½
Prerequisite: 10.001. Co-requisites: 7.433, 7.301 or 7.331.


7.124 Coal Face Mechanization  
F L1T1

7.132 Fluid Mechanics and Machines  
F L2
Prerequisites: 1.001 or 1.011 or 1.951, 5.010, 5.0201, 8.171, 10.001. Co- or prerequisite: 10.022.


7.133 Mine Transport  
S2 L2½

7.142 Mine Development  
F L1

7.143 Mine Environment and Safety Engineering  
F L2


7.144 Surface and Offshore Mining  
F L1T1
7.153 Power Supply in Mines

Prerequisites: 1.9222 or 6.851, 7.132.


7.154 Petroleum Engineering


7.155 Excavation Engineering


7.173 Computer Applications in Mining

Prerequisite: 10.022.

FORTRAN programming. Simulation of mining problems. Application of selected programs to mining exploration, operations, economics and design.

7.174 Mining Legislation

An appreciation of the laws relating to mining practice and to safety and health in mines.

7.175 Underground Metalliferous Mining

Not available to students who have completed 7.134. Prerequisite: 7.133.


7.194 Tunnel Engineering and Shaft Sinking

Not available to students who have completed 7.164.


7.213 Mine Surveying

Prerequisites: 10.301, 29.441.

Surveying methods applied to the development and extraction of minerals. Instruments of special value in mine surveying. Correlation of underground and surface surveys. Progress measurement. Determination of reserves. The surveying and logging of boreholes. Preparation of mine plans.

7.214 Mine Economics and Planning

Prerequisite: 7.113.


7.224 Operational Management


7.234 Mineral Economics

7.313 Minerals Engineering Processes  
Prerequisites: 25.520 or 25.201, 5.030.

7.314 Mineral Process Technology  
Prerequisite: 7.313 or 7.313R.

7.414 Minerals Industry Project  
Candidates are required to submit a dissertation or thesis on a mining, minerals engineering or other topic approved by the Head of School. The work may take the form of an engineering analysis, experimental investigation, theoretical study or design project. Candidates may be required to present themselves for oral examination on the subject of their submission.

7.424 Industrial and Research Seminars  
The program includes two types of seminar. One deals with research work being undertaken or recently completed by members of the School of Mining Engineering. The other involves engineers and scientists from industry, other University schools and research establishments discussing projects of special or topical interest in mining and allied fields.

7.425 Mining Geology Project  
S2

7.433 Mining Laboratory  
Co-requisites: 7.123, 7.143.
A program of laboratory experiments for Year 3 students requiring the submission of appropriate laboratory reports and related to the syllabus areas of the co-requisite subjects.

7.434 Advanced Mining Laboratory  
Prerequisite: 7.433.
A program of mining laboratory experiments for Year 4 students, requiring the submission of appropriate laboratory reports.

Civil Engineering

8.1130 Engineering Drawing  
Fundamental concepts of descriptive geometry, orthographic drawing, first and third angle drawing, isometric and perspective drawing. Australian standard engineering and drawing practice, application of descriptive geometry to common problems in civil engineering, graphic communications, introduction to computer graphics.

8.6110 Structures  

8.6130 Properties of Materials  

Wool and Pastoral Sciences

9.001 Project  
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.

9.002 Seminar  
Seminars deal with research and/or development work being undertaken or recently completed by members of the School of Wool and Pastoral Sciences, other University schools and research organizations. There are also seminars on communication in wool and pastoral sciences and on problems facing rural industries.
9.101 Biology of Grazing Sheep and Cattle F L2T4
The biology of wool growth and fibre structure; production and use of
pastures; principles of the nutrition of grazing ruminants; the biology of
reproduction of sheep and cattle.
Field excursions and laboratory work are integral parts of the course.

9.111 Livestock Production 1 F L2
Prerequisite: 9.101.
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.
A field excursion of the one week's duration is held in Session 1.

9.112 Livestock Production 2 S1 L2T1
Prerequisite: 9.111.
The scope for intensification of ruminant production. The behaviour,
nutrition, environmental physiology and health of intensively managed
animals. Housing and environmental control of facilities. Examples of
intensification, eg feed lots, sea transport.

9.113 Livestock Production 3 F L1T2
Principles of livestock production applied to reproduction and fertility:
growth and development. The meat industry. Carcass conformation and
composition. Pre and post mortem factors affecting meat quality.
Meat marketing.

9.131 Animal Health 1 S2 L2T1
Prerequisite: 9.111.
Managerial prevention and control of grazing livestock health, the
animal species involved, the concept of economic approach to animal
health. Introductory immunology. Skin health; sheep and cattle. Control
of external parasites, particularly by insecticides. Reproductive
health; sheep and cattle. Internal parasites; flukes, cystercerosis and
tapeworms, nematodes. Legal and Public Health responsibilities; Acts of
Parliament relating to animal health.

9.132 Animal Health 2 S1 L2T1
Prerequisite: 9.131.
Use and misuse of products used in animal health work. Internal
Problems causing disease and death. Health of horses and dogs
used in livestock management.

9.201 Agronomy F L2T1
Prerequisite: 9.101.
Agricultural climatology, soil science, and soil conservation. Pastures
in land use and land development. Principles of tillage, crop rotation,
irrigation, conservation of fodder and fertilizer usage. Weeds and
weed control. Practical work in the systematics of selected plant families.

9.202 Pastoral Agronomy F L2T1
Prerequisite: 9.201.
Pasture ecology. Establishment, management and utilization of pas-
tures and fodder crops. Pasture-animal relationships, stocking rates,
mixed stocking. Vegetation management in arid and semi-arid areas.
Pasture evaluation and pasture research techniques.

9.203 Crop Agronomy S2 L2T1
Prerequisite: 9.201.
Field crop production associated with the pastoral industries. Crop

9.204 Range Management S2 L1T2
Basic range ecology and rangeland ecosystems. Plant physiology —
growth and development of rangeland plants. Rangeland manage-
ment practices. Monitoring of long-term trends in productivity. Ap-
lications of remote sensing and ground truth sampling. Wild life re-
sources and feral animals and their management. Sheep and beef
cattle production in arid and semi-arid environments. Administration
of rangelands (eg the functions of the Western Lands Commission,
the National Parks and Wildlife Service, and the Soil Conservation
Service in New South Wales).
Involves one week of instruction at Fowlers Gap Research Station.

9.301 Agricultural Economics and Management 1 F L2T1
The subject covers two broad strands: basic economic principles,
and applied methods for farm management planning. The material on
economic principles centres on 1. the theory of production econom-
ics, which provides the background for many of the tools of applied
farm management; and 2. price theory with emphasis on agricultural
markets.
The management planning strand emphasizes basic farm planning
procedures such as partial, whole-farm and parametric budgeting,
and gross margins analysis. As necessary background for the appli-
cation of such methods, the course also includes coverage of valua-
tion principles, land tenure, systems of title, discounting procedures,
depreciation methods, tax and credit structures, and discussion of
the design and use of farm record systems.

9.302 Agricultural Economics and Management 2 F L2T1
Prerequisite: 9.301.
Analysis of agricultural policies: agricultural marketing concepts; and
an introduction to international trade theory. Investment appraisal and
cost-benefit analysis.
Quantitative methods in agricultural economics and farm manage-
ment with emphasis on 1. response surface estimation and analysis;
2. linear programming methods, with an introduction to other mathe-
matical programming methods; 3. systems analysis and simulation
methods.
9.421 Animal Nutrition  S2 L3T1

While particular emphasis is given to nutritional requirements of sheep, those of other farm livestock are dealt with in this section.

9.501 Wool Science 1  F L3T3
Prerequisite: 9.101.
Raw materials and fibre identification; yarn manufacture; fabric manufacture; dyeing and finishing; testing and quality control. Wool biology; wool growth; wool fibre properties. Physical fleece characteristics; clip preparation; fleece defects; wool marketing procedures.

9.502 Wool Science 2  F L1T2
Prerequisite: 9.501.
The effect of clip preparation on textile processing; wool metrology (raw wool); distribution of fibre parameters.

9.503 Wool Science 3  F L2T2
Co- or prerequisite: 9.502.
Evaluation and typing; organizational structure of the wool industry. Marketing schemes; commercial (reserve price; AWC marketing plan); technical (traditional, sale by sample, sale by description). Wool metrology, advanced appraisal and evaluation; current wool outlook; research developments.

9.601 Animal Physiology 1  S2 L2T2
Prerequisite: 17.041.
Physiological 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.

9.801 Genetics 1  S1 L2 S2 L2T1
Prerequisite: 9.111.

Mathematics

10.001 Mathematics 1  F L4T2
Prerequisite: HSC Exam
Percentile Range Required
71-100
21-100
1-100

2 unit Mathematics* or
3 unit Mathematics or
4 unit Mathematics or
10.021B.

Excluded: 10.011, 10.021B, 10.021C.

*This refers to the 2 Unit Mathematics subject which is related to the 3 Unit Mathematics subject. It does not refer to the subject 2 Unit Mathematics (Mathematics in Society).

Calculus, analysis, analytic geometry, linear algebra, an introduction to abstract algebra, elementary computing.
### 10.011 Higher Mathematics 1

**Prerequisite:**

<table>
<thead>
<tr>
<th>HSC Exam</th>
<th>Percentile Range</th>
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<tr>
<td>3 unit Mathematics</td>
<td>71-100</td>
</tr>
<tr>
<td>or 4 unit Mathematics</td>
<td>11-100</td>
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</table>

Excluded: 10.001, 10.021B, 10.021C.

Calculus, analysis, analytic geometry, linear algebra, an introduction to abstract algebra, elementary computing.

### 10.021B General Mathematics 1B

**Prerequisite:**

<table>
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<th>HSC Exam</th>
<th>Percentile Range</th>
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<td>2 unit Mathematics* or 3 unit Mathematics or 4 unit Mathematics or 10.021A</td>
<td>51-100</td>
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</tbody>
</table>

Excluded: 10.011, 10.001.

*This refers to the 2 Unit Mathematics subject which is related to the 3 Unit Mathematics subject. It does not refer to the subject 2 Unit Mathematics (Mathematics in Society).

### 10.021C General Mathematics 1C

**Prerequisite:** 10.021B. Excluded: 10.001, 10.011.

Techniques for integration, improper integrals; Taylor's Theorem; first order differential equations and applications; introduction to multivariable calculus; conics; finite sets; probability; vectors, matrices and linear equations.

### 10.022 Engineering Mathematics 2

**Prerequisite:** 10.001.

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 and their numerical evaluation; vector algebra and solid geometry; multiple integrals; introduction to vector field theory.

### 10.031 Mathematics

**Prerequisite:** 10.001 or 10.011 or 10.021C (CR).

Note A: A unit, together with 10.032, which is available to Faculty of Science students as one of a sequence of two units constituting a terminating service course in mathematics. As such it is mutually exclusive to any other Level II or Level III unit in Pure Mathematics or Applied Mathematics except that 10.412A may be taken with 10.031 and 10.032.

### 10.032 Mathematics

**Prerequisite:** 10.031.

*Note A: As for Note A in 10.031 Mathematics.

### 10.1113 Pure Mathematics 2 — Multivariable Calculus

**Prerequisite:** 10.001 or 10.011. Excluded: 10.1213.

Multiple integrals, partial differentiation. Analysis of real valued functions of one and several variables.

### 10.2111 Applied Mathematics 2 — Vector Calculus

**Prerequisite:** 10.001 or 10.011. Excluded: 10.2211, 4.813.

Vector fields; divergence, gradient, curl of a vector; line, surface, and volume integrals. Gauss' and Stokes' theorems. Curvilinear co-ordinates.

### 10.2112 Applied Mathematics 2 — Mathematical Methods for Differential Equations

**Prerequisites:** 10.001 or 10.011. Excluded: 10.2212, 4.813.

Series solution or ordinary differential equations; numerical methods. Partial differential equations: separation of variables. Fourier series, Bessel functions.

### 10.301 Statistics SA

**Prerequisite:** 10.001 or 10.021C. Excluded: 10.331, 10.311A, 10.311B, 10.321A, 10.321B, 45.101.

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.
Textile Technology

13.111 Textile Technology 1  F L3T5

Prerequisite: 13.111.


13.112 Textile Technology 2  F L5T7

Prerequisite: 13.111.


13.113 Textile Technology 3  F L4½T3

Prerequisite: 13.112.


13.212 Textile Science 2  F L2

Prerequisite: 13.211.


13.213 Textile Science 3  F L2T2

Prerequisite: 13.212.


13.223 Advanced Textile Chemistry  F L2

Co-requisite: 13.213.


13.233 Advanced Textile Physics  F L2

Co-requisite: 13.213.


13.311 Textile Engineering 1  F L1

Mill illumination. Elements of strength of materials — tension, compression, shear, torsion and bending. Dynamics of rotary motion and mechanical power transmission. Industrial electricity.

13.312 Textile Engineering 2  F L1½

Prerequisite: 13.311.


13.313 Advanced Textile Engineering  F L2

Co-requisite: 13.312.

13.411 Project  

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

**Textile Chemistry:** Topics related to the dyeing and finishing of textiles and to the chemistry of fibres.  

**Textile Engineering:** Engineering design work, some engineering aspect of textile processes, or some other topic of an engineering nature.  

**Textile Manufacture:** A topic related to textile processing or a topic of a commercial nature, such as some aspect of marketing, management or economic planning as applied to the textile industry.  

**Textile Physics:** The application of some aspects of physics to textile processing or to fibre, yarn or fabric structure and properties.

13.511 Seminar  

Students prepare and present a seminar before an audience consisting of staff of the School, final year students and other interested undergraduate and graduate students, on a subject of topical and specific interest in the field of textile science, technology or commerce, and subsequently submit it in writing.

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**Economics**

15.001 Microeconomics 1  

Commerce/Arts/Applied Science/Sciences prerequisite: 15.011. Co-requisite: 15.401 or 15.411 or equivalent.  

Revealed preference theory of demand, index numbers and aggregation; externalities, time preference, consumer surplus and compensation concepts. Short and long-run costs, returns to scale, producer surplus and quasi-rents. Monopolistic competition, oligopoly, cartels, public enterprise. Investment criteria, benefit-cost analysis. Efficiency and equity trade-offs, microeconomic policy in a second best framework.

15.002 Microeconomics 2  

Commerce/Arts/Applied Science/Sciences prerequisite: 15.011 plus 15.401 or 15.411 or equivalent.  

Arts prerequisite: 15.011. Co-requisites: 15.401 or 15.411 or equivalent.  

Excluded: 15.012, 15.072.

15.003 Macroeconomics 3  


Macroeconomic theory and policy including an introduction to the theory of economic policy, the structure and dynamic characteristics of macro-models, recent developments in monetary theory and policy, theories of inflation and policy in a dynamic setting.

15.011 Macroeconomics 1  

Commerce/Arts/Applied Science/Sciences prerequisite: 15.001.

The economics of output, employment and inflation, including social accounting, consumption and investment functions, the Keynesian goods market model, supply and demand for money, interactions between the goods and money markets in equilibrium and disequilibrium situations, inflation and the balance of payments.
15.042 Macroeconomics 2  
S2 L2T2

Commerce/Arts/Applied Science/Sciences prerequisite: 15.011 plus 15.401 or 15.411 or equivalent. Co-requisite 15.421 or equivalent. Excluded: 15.052, 15.062.

Extensions to the Keynesian model of income determination to include the government and overseas sectors and a more detailed examination of both demand and supply functions; money and financial institutions; an introduction to dynamic economics.

15.043 Marxian Political Economy  
S1 L2T1

Commerce/Arts/Applied Science prerequisite: 15.011.

Varieties of political economy. Marx and the classics, the Marxian system, Marxian economics since Marx, Marx and socialist planning, Marxian analysis of current economic problems.

15.053 Economics of Developing Countries  
S1 L2T1

Commerce/Arts/Applied Science prerequisite: 15.072 or 15.103 or 15.113.

Aspects of economic development in the less developed countries. Characteristics of these countries and the policies available to them, simplified models of under-development, phenomenon of structural change in the development process, role of industrialization in promoting structural change, international relationships of developing countries and strategies of development based on industry or agriculture.

15.062 Applied Macroeconomics  
S1 or S2 L2T1½


15.072 Applied Microeconomics  
S1 or S2 L2T1½


Structural change in the Australian economy. The effect of different market structures on firms and consumer welfare. The consequences of market failure and the effects of government regulation. Investment decisions in the public and private sectors, including the estimation of future benefits, revenues and costs, the measurement of consumer and producer surplus. The economics of non-renewable and other resources. Australia's international trade and investment and the effects of restrictions on international trade and investment.

15.073 Natural and Environmental Resources Economics  
S2 L2T1

Commerce/Arts/Applied Science/Sciences prerequisite: 15.002 or 15.012 or 15.072.

Classification of renewable and non-renewable resources: reserves, resources and resource base; the concept and measurement of resource scarcity, costs, prices and rents; exhaustion of resources, ore quality, exploration, availability of substitutes; uncertainty of discovery, technical progress, market imperfections; renewable resources, sustainable yield concepts. Policy issues, with particular reference to Australia's role in the international economy.

15.083 Public Finance  
S2 L2T1

Commerce/Applied Science prerequisite: 15.002 or 15.012 or 15.072. Arts prerequisites: 15.002 or 15.072 plus 15.402 or 15.421 or 15.403.

General aspects of public sector expenditure and its financing with special reference to Australia: role of government in the economy; principles and types of public expenditure; tax sharing and revenue systems; economic and welfare aspects of different types of taxes and social service systems; inflation and tax indexation; loan finance and the public debt; fiscal policy, the Budget and the economy.

15.093 Public Sector Economics  
S1 L2T1

Commerce/Arts prerequisite: 15.002 or 15.012 or 15.072. Applied Science prerequisite: 15.002 or 15.072 with the approval of the Head of the Department of Economics.


15.143 Microeconomics 3  
S2 L2T2


General equilibrium approach to micro-economic analysis, including aspects of welfare economics. The effects of various forms of government intervention on prices, output and international trade. Public sector investment and pricing. The implications of property rights and the effects of de-regulation of industries.

15.163 Industry Economics and Australian Industrial Policy  
S1 L2T1

Commerce/Applied Science prerequisite: 15.002 or 15.012 or 15.072. Arts prerequisites: 15.402 or 15.403 or 15.421 plus 15.072 or 15.012 or 15.002.

Structure of industry; inter-relationships between the role of the business firm and industrial structure; multinational corporations; factors affecting size-structure and performance such as economies of scale; barriers to entry; vertical integration, diversification and mergers, patents, the development and transmission of technology; industrial policy in Australia with special reference to competition policy, foreign investment and mergers, and some specific industry policies (eg on motor vehicles, electronics, steel, petroleum).

15.212 Managerial Economics  
S1 L2T1½

Prerequisites: 15.001 and 15.011.

Not offered in 1986.

The application of economic concepts and analysis to managerial decision making. The relevance of opportunity cost and marginal analysis. Introduction to linear programming as a tool for managerial decision making. Production and cost analysis and measurement, with applied examples. Market and demand analysis and forecasting with applied examples. Problems of price setting. The role of non-price competition, such as advertising. The cost of capital and capital budgeting. An introduction to risk.
Biological Sciences

Students must pay the laboratory fee and then use the receipt to obtain a 'course guide' during enrolment from the First Year Registration Centre, Physics Building.

17.031 Biology A

Prerequisite: 17.031. Excluded: 17.021.

The evolution, diversity and behaviour of living things and the ways in which they have adapted to varying environments. Emphasis on the structure and function of flowering plants and vertebrate animals, and their roles in Australian ecosystems. The theory covered in lectures and tutorials is illustrated by observation and experiment in laboratory classes.

17.041 Biology B

Prerequisite: 17.031. Excluded: 17.021.

The basic cell structure; membranes, organelles, prokaryotic and eukaryotic cells; cellular locomotion; basic biological molecules; enzymes: structure and metabolic roles, cellular compartmentalization and enzyme function; diffusion, osmosis and active transport; theory of inheritance, linkage, mutation, information transfer and protein synthesis.

Requirements for Practical Work

Equipment required for practical work is set out in the Course Guide, available during enrolment time at the First Year Registration Centre (Physics Building). Students must purchase this prior to the first week of session.

Industrial Engineering

18.121 Production Management

Prerequisites: 10.031, 10.331.

Engineering Economy: Economic objectives of the firm. Economic measure of performance - net present value, annual equivalent value and the DCF rate of return (including the incremental rate of return) and their application in the selection and replacement of processes and equipment. The Use of Human and Physical Resources: Methods engineering, ergonomics, motion and time study, financial incentives, applications to machine controlled processes, work sampling and data collection. Plant location, factory layout. Production and Quality Control: Control of jobbing, repetitive batch and continuous production. Manufacturing organizations, functions, inter-relationships and information flow. Sampling techniques in quality control, control charts. Introduction to Inventory Control: Analysis of some engineering planning decisions.

18.131 Operations Research

Introduction to Operational Research: The formulation and optimization of mathematical models of industrial processes. The development of decision rules. Some techniques of operational research and applications, eg mathematical programming, queueing theory, inventory models, simulation.

18.551 Operations Research

Prerequisites: 18.603 or 18.121, 5.072 or 10.031 or 10.331.

The formulating and optimization of mathematical models. The development of decision rules. Some techniques of operations research such as mathematical programming, queueing theory, inventory models, replacement and reliability models; simulation. These techniques applied to situations drawn from industrial fields, eg production planning and inventory control. Practical problems of data collection, problem formulation and analysis.

Centre for Petroleum Engineering

20.301 Properties and Phase Behaviour of Petroleum Reservoir Fluids

Prerequisites: 10.031, 10.331.

Chemical, physical and thermodynamic properties of petroleum and reservoir fluids. Phase behaviour of multicomponent hydrocarbon systems. Use of computers to predict complex phase behaviour, real gas law, liquid mixtures, flash calculations, pressure, volume and temperature calculations for reservoir fluids. Application of these concepts to the prediction of gas and gas-condensate reservoir behaviour.


20.303 Well Drilling and Completions

Well drilling methods and elements of rock mechanics. Rheology of Newtonian and non-Newtonian fluids, chemical properties and carrying capacity of drilling fluids, rotary drilling hydraulics, bit hydraulics and factors affecting rate of penetration. Prediction and control of abnormal pressures. Casing and tubing design, principles of cementing, well completion materials, well perforating, equipment and operational standards, acidizing, fracturing, problem well analysis and remedial treatment design.

20.304 Reservoir Engineering I

Prerequisite: 20.301, 20.302.

Classification of reservoirs by type and recovery mechanism, reserve and production rate estimates based on material balance calculations. Introduction to displacement processes in petroleum reservoirs. Design of reservoir development.

20.305 Drilling and Production Lab


Properties of drilling fluids. The design, composition and measurement of the properties of drilling fluids. Measurement of basic rock properties such as porosity, permeability and capillary pressure.

20.306 Petroleum Production Economics

Basic elements of profitability analysis. Depreciation, financial statements, interest, time value of money. The financial plant, outside share, planning and scheduling, pricing and costs. Profitability. Criteria, applications of present value profiles, risk and risk adjustment.

20.307 Petroleum Thermodynamics


20.401 Reservoir Engineering II

Prerequisite: 20.304.

Basic unsteady-state flow for single phase fluids in porous media. Diffusivity equation and solutions. Application to practical well test analysis methods. Pressure build-up, drawdown, interference and pulse testing to evaluate reservoir properties. Extension to multiphase flows and introduction to displacement processes in petroleum reservoirs.

20.402 Reservoir Fluids Laboratory

Prerequisite: 20.301.

Physical properties of petroleum and its products, gravity, viscosity, surface tension, chromatography, PVT analysis of reservoir fluids.

20.403 Production Engineering

Prerequisite: 20.304.


20.404 Formation Evaluation

Prerequisite: 20.301, 20.302.

Principles of well logging methods and relationships between measured properties and reservoir properties. Interpretation and analysis of log suites for reservoir analysis and completion design. The use of computers in log analysis and interpretation. A course of lectures and practical problem solving.

20.405 Oil and Gas Law and Regulation


20.406 Reservoir Simulation Fundamentals

Prerequisite: 20.401, 10.032, 48.032.


20.407 Advanced Recovery Mechanisms

Prerequisite: 48.041, 20.401.


20.408 Natural Gas Engineering

20.409 Petroleum Engineering Project
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.

20.410 Well Pressure Testing

Applied Geology

Field tutorials are an essential part of these subjects, and are held during weekends and/or recesses. Dates and costs are available during the first week of the subject. Attendance is compulsory.

25.110 Earth Materials and Processes

25.120 Earth Environments and Dynamics
Prerequisites:

<table>
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<th>HSC Exam</th>
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</thead>
<tbody>
<tr>
<td>2 unit Mathematics* or</td>
<td>71-100</td>
</tr>
<tr>
<td>3 unit Mathematics or</td>
<td>21-100</td>
</tr>
<tr>
<td>4 unit Mathematics</td>
<td>1-100</td>
</tr>
</tbody>
</table>

and

| 2 unit Science (Physics) or | 31-100 |
| 2 unit Science (Chemistry) or | 31-100 |
| 4 unit Science (multistrand) | 31-100 |

and

25.110.

*This refers to the 2 Unit Mathematics subject which is related to the 3 Unit Mathematics subject. It does not refer to the 2 Unit Mathematics (Mathematics in Society).


25.211 Earth Materials 1
Prerequisite: 25.120.


25.212 Earth Environments 1
Prerequisite: 25.120.


25.221 Earth Materials 2
Prerequisite: 25.211.


25.223 Earth Physics
Prerequisite: 25.110.


25.2261 Mathematical Geology 1 S2 L2T1
Prerequisite: 25.120.

Geological Statistics: Measurement scales in geology. Probability distributions and their properties; sampling and test of significance. Application of these techniques using geological data. Geological Computing: FORTRAN programming; text editing; control language for VAX and CYBER.

25.311 Earth Materials 3 S1 L2T4
Prerequisite: 25.221.


25.312 Earth Environments 2 S1 L3T3
Prerequisite: 25.212 (note: it is desirable that students taking this unit have also taken 25.223).


25.314 Mineral and Energy Resources 1 S1 L3T3
Prerequisite: 25.221.

Metallic Resources: Classification and origin of the ore deposits, geochemical processes, research methods. Orthomagmatic, hydrothermal, porphyry, volcanic-sedimentary, Mississippi Valley type, chromite, iron, manganese ores, residual and mechanical ores. Introduction to mineral exploration. Laboratory study of hand specimens, thin sections and polished sections of various ore types; study of selected mining areas representing various genetic types of ore. Economic Mineralogy: Nature of reflected light. Ore textures and their interpretation. Phase relations and paragenesis of ore minerals. Practical work in optical properties of ore minerals, hardness and reflectivity measurements; study of selected ores and ore minerals under the microscope including textual studies. Field Work of up to three days is a compulsory part of the subject.

25.3162 Mathematical Geology 2 S1 L2T1
Prerequisite: 25.2261.

Application of the mathematical techniques listed below to geological data processing and analysis. Analysis of variance. Introduction to matrix algebra. Regression analysis; trend surface analysis; time series analysis; Markov chain analysis. Introduction to nonparametric statistics. Introduction to multivariate statistics. Practical work based on the use of SPSS, BMDP and other library programs.

25.321 Earth Materials 4 S2 L3T3
Prerequisite: 25.221.


25.324 Mineral and Energy Resources 2 S2 L3T3
Prerequisite: 25.212 or 25.5212.


25.325 Engineering and Environmental Geology S2 L4T2

25.3261 Geochemical Analytical Techniques  S2 L1T1

Prerequisite: 25.311.


25.3271 Advanced Structural Geology  S2 L1T1

Prerequisite: 25.221.

Advanced Structural Geology: Analysis of structural elements at the microscopic, mesoscopic and macroscopic scales. Detailed studies of the analysis of metamorphic terrains, e.g. Cooma Complex, Broken Hill. Field Work of up to four days is a compulsory part of the subject.

25.333 Exploration Geophysics  S1 L3 and S2 L1T1

Prerequisite: 25.120.

Physical properties of rocks and soils. Introduction to seismic, gravity, magnetic, electrical, electromagnetic and radiometric methods of geophysical exploration. Application of these methods in the search for mineral deposits, petroleum, coal and groundwater and in civil and mining engineering projects. Interpretation of geophysical data. Field Work of up to three days is a compulsory part of the subject.

25.4101 Topics In Advanced Geology  S1 L3

Topics in geology selected from a list of subjects available from the Head of School.

25.4121 Advanced Sedimentology  S1 T6

Detailed field and laboratory study of sedimentary textural and structural characteristics of a sedimentary sequence and determination therefrom of its palaeogeographic setting.

25.4122 Seismic Stratigraphy and Log Analysis  S1 L1T1

Structural and stratigraphic interpretation of seismic records at both regional and prospect scales. The application of wire-line logs to stratigraphic analysis and formation evaluation and the integration of log and seismic data in sedimentary basin analysis.

25.4123 Geology of Selected Oil and Gas or Coal Fields  S1 L1T1

Literature study and seminars on typical Australian and, in particular, overseas productive regions and fields.

25.4124 Palynology or Foraminifera Micropaleontology  S1 L1T1

Laboratory based studies in the application of palynology to geological problems; or, use of foraminifera in dating, correlation and stratigraphical subdivision; also diagnostic techniques as applied to principle zonal species.

25.4141 Mineral Exploration  S1 L1½ T1

The use of geology in mineral exploration and area selection involving the development of conceptual models, the organization of exploration programs, radiometric methods, exploration ground tenure in New South Wales and exploration drilling.

25.4142 Geological Sampling and Analytical Methods  S1 L1T1

Methods of collection of samples in exploration geochemistry including waters, soils, drainage sediments and rocks. Methods in estimating and monitoring sampling and analytical errors. Determination of selected elements in soil and stream samples by atomic absorption, fluorometric, specific ion electrode and colorimetric methods.

25.4143 Research Project  S1 L1T1½

An integrated study involving literature review and laboratory analysis of an appropriate mineralized environment.
25.4151 Hydrogeology S1 L1T2

25.4152 Engineering Geology S1 L1T2

25.4153 Environmental Geology S1 L1T2
Geological factors in waste disposal — domestic, industrial and radioactive. Environmental parameters of coasts and beaches.

25.4154 Engineering Project S1 L1T3
A field and laboratory project in an aspect of engineering geology.

25.420 Field Project S2
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.

25.510 Geology for Geomorphologists and Pedologists S2 L2T3
Prerequisites: 25.211, 25.221, 25.212.

25.5112 Geology for Civil Engineers S1 L2T1
An introduction to mineralogy, petrology, structural geology, stratigraphy and geomorphology. Weathering of rocks and development of soils. The role of the geologist in civil engineering.

25.520 Geology for Mining Engineers 1 F L1T1
Outline of the main branches of geology and their application to Mining Engineering. Introduction to geomorphological processes and resulting landforms. Fundamentals of the atomic structure of minerals including major rockforming minerals and ore minerals, their crystal symmetry, their physical and chemical properties. Igneous Rocks: formation, texture, composition and classification of the more important igneous rocks. Sedimentary Rocks: processes of formation and depositional environment, composition and classification. Metamorphic Rocks: metamorphic processes and metamorphic structures, classification and description of metamorphic rocks. Physical properties of rocks including porosity, permeability and capillarity. Weathering processes of rocks and minerals. Deformation of rocks and the resulting effects such as folds, faults, joints and foliation. An introduction to modern theories of tectonism. Integration of geological observations. Practical Work: Laboratory work consists of exercises related to the Lecture course: geological mapping including structure contour problems. Study of minerals and rocks in hand specimens. Field Tutorials: Two field tutorials are conducted at which attendance is compulsory. Satisfactory reports must be submitted. Note: Total hours: 56. The subject is divided equally between lectures and laboratory work. Field Tutorial hours are additional.

25.5212 Sedimentology S1 L1T1
Prerequisite: 25.120. Excluded: 25.212.
As for Sedimentology in 25.212 Earth Environments 1. Available only to Course 3145.

25.523 Mineralogy F L1T1
Crystallography, crystalline state and crystal growth of minerals. Fundamentals of the atomic structure of minerals, with examples of Bravais lattices and introduction to space lattice group theory. Physical properties of crystals; cleavage, gliding, secondary twinning, elasticity. Elements of crystal optics in polarized light. Classification, descriptive mineralogy and occurrence of primary and secondary minerals with special emphasis on economic metallic and non-metallic minerals. Introduction to petrology: Mode of formation of minerals and ores in the igneous, sedimentary and metamorphic cycles. Examples of principal types of economic mineral deposits, their mode of formation, paragenesis, textures and intergrowths. Elements of fluid geology, construction and refractory materials. Laboratory: Crystallography — Examination of minerals and crystal models for symmetry. Stereographic projection of crystals. Optical Mineralogy — Examination of minerals and rocks in transmitted and incident light using the polarizing microscope. Determination of refractive indices of crystal fragments by the immersion method. Descriptive and Determinative Mineralogy — Macroscopic examination of common minerals with emphasis on economic minerals. Study of texture and intergrowths of common mineral parageneses including the principal rock types in which they occur.

25.530 Geology for Mining Engineers 2 F L2T2
Palaeontology and Stratigraphy: principles of stratigraphy; the use of fossils in stratigraphic correlation and bore logging. Structural Geology: elements of structural geology; stereographic projection and fracture analysis applied to mining operations. Geology of Fuels: Origin of coal, oil and natural gas; stratigraphic and structural considerations of oil and coalfields. Hydrogeology: principles of hydrogeology. Transmission of ground water in rocks and soils applied to mining operations. Ore Deposits: mineralogy of industrially important metallic and non-metallic minerals, theories of ore formation including secondary enrichment processes. Exploration Procedures; theories and application of exploration techniques in mineral and coalfield exploration including geological and geophysical methods. Field Tutorial: a geology field excursion is held at the end of Session 1, attendance is compulsory.

25.5301 Physical Geology S1 L3
Introduction to earth science dealing with the fundamentals of the scientific method, the constitution and construction of the earth and the physical processes at work on the earth's crust.
25.5302 Structural Geology  
S2 L3 T3  
**Prerequisite:** 25.301. 
Study of the origin and properties of geologic structures. Emphasis is placed upon the mechanics of formation of local and regional structures. Laboratory work deals with the solution of common structural problems, employing mathematical, graphical and stereonet methods of solution.

25.5311 Aqueous Geochemistry  
S1  
**Prerequisite:** 25.221. 
As for *Aqueous Geochemistry* in 25.311 Earth Materials 3. Available only to Course 3145. Note: Tutorials comprise 10 hours total in Session 1 only.

25.5312 Geological Field Mapping  
S1 L2  
**Prerequisite:** 25.5212. Excluded: 25.312. 
As for *Field Mapping* in 25.312 Earth Environments 2. Available only to Course 3145.

25.5313 Stratigraphy  
S1 L2  
**Prerequisite:** 25.5212. Excluded: 25.312. 
As for *Stratigraphy*, in 25.312 Earth Environments 2.

25.542 Mining Geology Project  
S2  
**Note:** Comprises 18 hours total in Session 2.

25.9311 Gravity and Magnetic Methods  
S1 L2T1  
**Prerequisites:** 1.001 and 10.001. It is desirable that students taking this unit have a background in geology. 
Fundamental principles. Field procedures and instruments. Reduction of field data. Regional and residual effects. Sources of simple geometrical shapes and generalized two and three-dimensional distributions. Applications. *Field Work* of one day is a compulsory part of the subject.

25.9312 Seismic Methods  
S1 L2T1  
**Prerequisites:** 1.001 and 10.001. It is desirable that students taking this unit have a background in geology. 

25.9313 Electrical Methods  
S1 L2T1  
**Prerequisites:** 1.001 and 10.001. It is desirable that students taking this unit have a background in geology. 
Introductory theory and field practice of resistivity, self-potential, induced polarization and airborne and ground electromagnetic methods. Geological interpretation of field data. Geophysical logging. *Field Work* of one day is a compulsory part of the subject.

25.9315 Regional Geophysics  
S1 T15  
Qualitative and quantitative appraisal of geophysical data for a selected area.

**Servicing Subjects**

These are subjects taught within courses offered by other faculties.

For further information regarding the following subjects see the Combined Sciences Handbook.

25.412 Sedimentary Basin Resources  
See Sedimentary Basin Resources strand in Applied Science Course 3000 Applied Geology Year 4. Available only to programs 2501, 5831.

25.414 Mineral Resources  
See Mineral Resources strand in Applied Science Course 3000 Applied Geology Year 4. Available only to programs 2501, 5831.

25.415 Engineering and Environmental Geology  
See Engineering and Environmental Geology strand in Applied Science Course 3000 Applied Geology Year 4. Available only to programs 2501, 5831.

25.434 Geology Honours (Single Major)

25.621 Marine Geology 1  
F L1T2  
**Prerequisites:** 25.601 or both 25.110 and 25.120. 
The form and nature of ocean basins; the origin, transport, distribution and deposition of suspended matter in ocean water. Principal groups of oceanic index fossils. Igneous and sedimentary rock types of the ocean floor and their significance. Tectonics of ocean basins. *Field Work* of two days is a compulsory part of the subject.

25.622 Hydrological and Coastal Surveying  
F L1T2  
**Prerequisites:** Nil. 
General principles of surveying, with particular reference to coastlines and off-shore techniques. Optical and electronic methods of distance measuring and position fixing. Methodology for short-term and long-term measurement of tides and flow currents. Bathymetric surveys in shallow and deep water conditions. Coastal morphologies and their relationship to the behaviour of water masses. Analysis of sedimentary systems in deltaic, estuarine and near-shore environments. Data collecting, processing and storage. Shallow-water investigations for bedrock morphologies. *Field Work* of five days is a compulsory part of the subject.
25.631 Marine Geology 2 F L1T2

Pre requisite: 25.621.

Sedimentary and tectonic processes of the ocean basins and continental margins; ocean basin stratigraphy and the environmental and chronological utility of the principal groups of index fossils. Stratigraphical history and correlation of sedimentary rocks in the deep ocean basins and on continental shelves. Changes of sea level. The Quaternary history of the oceans. Reefs and carbonate sedimentation. Deep sea consolidated sediments. Magnetism and palaeomagnetism. Field Work not exceeding two days is a compulsory part of the subject.

25.632 Estuarine Geology F L1T2

Pre requisite: Nil.


25.634 Marine Mineral Deposits and Oceanic Minerals S1 L1T1


25.6342 Exploration and Seismic Methods S2 L2T1

Geophysics of ocean basins and off-shore areas and the techniques of their study. Seismic refraction, reflection and computational methods, instrumentation of seismic and acoustic sources, recording systems and signal processing. Geological and physical interpretation of results. Practical work on instrumentation, recording and interpretation of field data.

25.635 Marine Resources F L1T2


Resources important to human civilization of a biological, fluid and mineral nature. Mining of ocean resources. Geological aspects of waste disposal and engineering works in the ocean. Tidal energy: Off-shore drilling.

25.9314 Geological Applications S1 L1T1

Pre requisite: 25.120.

A subject of ten weeks duration. Structural Geology: Elements of structural geology, stereographic projection and fracture analysis. Geology of Fuels: Origin of coal, oil and natural gas; stratigraphic and structural consideration of oil and coalfields. Hydrogeology: Principles of hydrogeology; transmission of groundwater in rocks and soils. Field Work of one day is a compulsory part of the subject.

25.931 Geophysics

See Geophysics strand of Applied Science Course 3000 Applied Geology Year 4. Available only to programs 2501, 5831.
27.133 Pedology S1 L2T3
Prerequisites: 27.111 or any two units from 2.111, 2.121, 2.131, 2.141, and 27.811 or 27.111 or 27.828 or 27.311 or 25.012 or 25.022 or 27.172.

Methodology of pedogenic studies and the application of these studies to the understanding of soil-landform 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.

27.143 Biogeography S1 L2T3
Prerequisites: 27.311/811 or 27.828 or 17.031 and 17.041 or 27.111 or 27.172.


27.153 Climatology S2 L2T3
Prerequisites: 1.001 or 27.311/811 or 27.828 or 25.110 and 25.120 or 17.031 and 17.041 or 27.111.


27.162 Geographical Statistics and Computing S1 L2T2 S2 L1T1
Fundamental concepts in descriptive statistics and univariate inferential statistics; introduction to bivariate and multivariate statistics. Computer-compatible data assembly and storage; standard analysis with computer packages; simple BASIC and FORTRAN programming, typical case studies in Physical Geography exemplifying the above techniques.

27.175 Introduction to Remote Sensing S1 L2T2
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. Landcover and land-use interpretation procedures in visual image analysis. Basic procedures in machine-assisted image enhancement.

27.176 Remote Sensing Applications S2 L2T2
Prerequisite: 27.175 or 27.1711.

Spectral characteristics of natural phenomena and image formation. Ground truthing, collection and calibration. Introduction to computer classification procedures. Multitemporal 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.

27.172 Environmental Measurements F L2T4
Prerequisites: 27.111; or 27.818 and 27.819 or 27.801 and 27.802; or 27.301 and 27.302.

Sampling strategies and survey methods for the collection of environmental data. Data analyses using laboratory and statistical methods. The collection and analyses of weather and climatic data, and the maintenance of meteorological stations. Methods of field surveying and instrumentation for the study of geomorphic and hydrologic processes. Drainage basin morphometry, dynamics and function, including controls on run-off and sediment transport. The measurement of soil physical and chemical properties in the field and laboratory with special reference to plant growth and soil water and geomorphological processes. The relationships between weathering processes and soil properties. Methods of surveying, classifying and mapping soils. Measurement and description of vegetation. Vegetation survey, sampling and species abundance measure. Monitoring energy and nutrient flow and the effects of humans on ecosystems.

27.183 Geomorphology S2 L2T3
Prerequisites: 25.110 and 25.120 or 27.311/811 or 27.828 or 27.111 or 27.172. Excluded: 27.860.

27.193 Environmental Impact Assessment

Rationale and basic objectives; standardized types of Environmental Impact Assessment (EIA), including matrix approach, adopted methods of EIA in NSW and other Australian states. Frequently used assessment techniques and their limitations for meteorological, hydrological, biological, socio-economic impact. Environmental decision making and planning under conditions of uncertainty. Local case studies exemplifying various techniques and issues. Trends, changes and likely future developments in EIA. Practical exercises representing components of typical EIAs.

27.194 Assessment and Management of Physical and Biological Resources

A core of study relating to methods of assessment of resources and of natural and man-made environments; assessment of land capability and conservational management; evaluation of risk from natural hazards, application of remote sensing for mapping and assessing land, water and biological resources; investigational procedures relating to community and governmental perception and response. This core is supplemented by study in two of the following areas, chosen to suit the project:

2. Soils: Methods of classifying and mapping soils. Movement of water and nutrients through soils and problems of physical and chemical instability with differing land use. Soil properties in relation to the stability of natural or introduced ecosystems.

27.423 Environmental Impact Evaluation

Rationale and basic objectives; principal methods of impact evaluation; techniques for assessing impacts of resource developments on physical and socio-economic environments. Australian and overseas legislation and procedures. Environmental decision making and planning under conditions of uncertainty. Practical work focusses on local case studies exemplifying the use of various techniques and approaches to environmental impact assessment and evaluation.

27.432 Computer Mapping and Data Display

Prerequisites: 27.2813 and 27.2814; or 27.813.

Principles of graphic information processing. Introduction to thematic mapping and automated cartography; theoretical and practical problems in displaying and mapping data by computer. Review and application of computer mapping packages including SYMAP, SYMUV, CALFORM, GIMMS and SURFACE II.

27.494 Assessment of Human and Physical Resources

A core of study relating to methods of assessment of resources and of natural and man-made environments, land capability, and risk from natural hazards. In addition to the core component, students select one area from those listed under 27.194 Assessment and Management of Physical and Biological Resources, and one of the following:
1. Resource Planning and Decision Making: Quantitative methods of resource evaluation in relation to urban and regional development; forecasting the social and economic requirements and impacts of resources projects and policies; planning and conflict resolution methods.
2. Human Resources: Examination of the potential of populations for economic development, and the implications of demographic structure for economic growth, energy needs, and housing and service requirements, stressing the skill potentials or deficiencies of sub-populations, and emphasizing regional aspects.

27.504 Projects

Biogeography or Bioclimatology: study of the vegetation in an area, and detailed consideration of a problem arising from this survey, preferably with an applied aspect, or a study of the climate of some well defined plant or animal habitat as related to characteristics of the vegetative cover and substrate. Economic Geography: a problem in applied economic geography involving experimental design, the acquisition and manipulation of field data and the presentation of a report. Geomorphology or pedology: an area study introducing soils-landscape relationships in a dynamic or chronologic sense; or a systematic study which may be primarily geomorphic or pedologic, but with some interdisciplinary aspect. To include a field element and a supporting laboratory program.

27.514 Practical Applications in Geography

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.

27.611 Applied Economic Geography 1

Consists of four modules each of which emphasizes the acquisition and practical application of basic skills and concepts in the solution of typical problems in economic geography, with particular reference to resources development. Stress on Australian case studies. Laboratory classes emphasize the handling and presentation of data in economic geography, the interpretation of spatial data, and elementary problem solving.

27.612 Applied Economic Geography 2A

Focus on the understanding of problems arising from processes of change in non-metropolitan areas, with particular reference to their effects on the functional structure of country towns in NSW. Topics include: functional classification, service provision, economic base, rural mobility, decentralization and settlement policies, and urban systems.
27.613 Applied Economic Geography 3A  S1 L2T3
Selected topics in applied economic geography with particular reference to urban and regional analysis and planning.

27.622 Applied Economic Geography 2B  S2 L2T3
Analysis of the population dynamics of small towns and regions, with emphasis on the measurement and forecasting of change, and on problems of service provision and infrastructure support for sub-populations with different requirements. Stress on problems and policies in non-metropolitan areas of New South Wales.

27.623 Applied Economic Geography 3B  S2 L2T3
Selected topics in applied economic geography with particular reference to the spatial implications of economic, social and technological change.

27.624 Geographic Thought and Perspectives  S1 T3
Aspects of social science theory and philosophy as they relate to the development of human landscapes and as they enter into planning and policy making. Themes to include: The persistent Utopian element; utilitarianism and positivist economic geography; conflict approaches; value-critical stances; the political economy critique; participation, advocacy and action-research; humanistic and welfare approaches; ideology and planning; theories of the state and the basis for intervention.

27.632 Geographic Data Analysis 2  F L2T2
Focus on inferential statistics and hypothesis testing in the analysis of spatial data and the application of multivariate methods in economic geography. Laboratory work is based on the use of SPSS and other statistical packages with particular reference to the major techniques used in geographical analysis.

27.633 Geographic Data Analysis 3  F L2T4
Principles of research design; field survey methods; numerical taxonomy; non-metric measurement techniques; multivariate methods, introduction to additional computer software. Student projects and development of Year 4 thesis topics.

27.641 Data Processing Systems  F T2
The acquisition of basic knowledge and skills for the effective use of the University's mainframe computer network, including command languages, editing systems, an introduction to FORTRAN, SPSS procedures, and related matters.

27.642 Mathematical Methods for Spatial Analysis  F L1T2
Offered subject to availability of staff.
The application of selected mathematics to spatial problems including: algebra of space and principles of system description using concepts of co-ordinate geometry; quadratic analysis and network theory; matrix algebra and the use of matrices in spatial analysis; differential and integral calculus in modelling geographic systems; optimization methods — constraint maximization; algorithmic methods including linear programming; stochastic processes.

27.644 Seminars in Applied Geography  S1 T4
Seminars on selected topics relating to problems of rural areas; urban land-use; spatial activity systems; and regional problems and planning.

27.652 Geographic Information Systems  S2 L2T1
An introduction to information systems of particular relevance for economic geography with special reference to computer-based systems for resource evaluation. Problems of data structures, geocoding, and spatial identifiers. Model-based information systems. Project work: case study evaluation and the development of information systems for monitoring spatial change.

27.662 Urban Systems  S1 L2T1
The nature of urban systems and urban problems, the extent of urbanization and the links between urban functions and the dimensions of urban systems. Focus on specific theories of the internal structure of cities and associated urban problems. Topics include land-use structure, urban sprawl, speculation, population density models, segregation, slums, urban commercial structure, accessibility, transport and congestion, and welfare issues relating to optimal cities and equity within urban areas.

27.672 Transport and Land Use  S2 L2T1
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. Simple transport-land use models, introduced in laboratory classes.

27.713 Marketing Geography  S2 L2T3
Prerequisite: 28.042. Note: This prerequisite does not necessarily apply to students enrolled in the Faculty of Applied Science.
Spatial reality as a result of consumer and producer decisions. The relationship between consumer spatial behaviour and the pattern and structure of marketing establishments. Organization and operation of the marketing function with emphasis upon the pattern of consumer orientated enterprises and the structure of market areas in intra-urban areas. Spatial behaviour of consumers including search and decision processes. Workshop seminars on analytical techniques and issues raised in lectures.

27.723 Transport Geography  S2 L2T3
Offered subject to availability of staff.
The analysis of the transportation system in terms of its relationship with economic and geographical indicators. Focus is on network analysis, trip generation models, freight movement, transport impact studies and the transport energy problem. Lectures are accompanied by seminars which stress the consideration of major problem areas in transportation in Australia.
27.733 Regional Policy and Planning S2 L2T3
Offered subject to availability of staff.
Regional forecasting and techniques for evaluating regional plans are
emphasized. Topics include: regional information systems and budgets;
exploratory and normative forecasting methods; time series projections;
integrated forecasting models; cost-benefit analysis; planning balance sheets, goals — achievement matrix methods of
evaluation; reviews of plans and programs for regional development
in Australia. Lectures are accompanied by workshop sessions which
concentrate on methodology.

27.743 Regional Population Analysis S1 L2T3
Offered subject to availability of staff.
The primary emphasis is on regional population estimation and
forecasting with reference to Australian conditions and the use of
Australian data. The secondary emphasis is estimation for regions in
adjacent Third World countries. The population forecasting is handled
within the framework of demographic theory and component analysis;
migration analysis is given particular attention because of the impor-
tance of mobility in Australia. The derivation of regional and local
social indicators in the context of population change and service
 provision in Australia.

27.753 Social Welfare and Urban Development S2 L2T3
Prerequisite: 27.829 or 27.812 or 27.312. Note: This prerequisite does
not necessarily apply to students enrolled in the Faculty of Applied
Science.
A consideration of welfare aspects of urban development, including
social policies and urban structure; social costs and benefits of urban
renewal especially in the inner city; growth centres and new towns;
distributional aspects of social services; and spatial disparities in
social well-being.

27.783 Spatial Impacts and Opportunities S1 L2T3
Offered subject to availability of staff.
Selected problems in the location of public services and measure-
ment of spatial opportunity; methods for assessing the local and
regional effects of new facilities; multiplier models; and socio-econo-
mic impact studies, and spatial implications of technological change.

27.793 Models of Spatial Systems S2 L2T3
Offered subject to availability of staff.
The design and development of models of spatial systems, including:
entropy maximization methods; control theory; evaluation of alterna-
tive models; and case studies of models in urban and regional
analysis.

27.794 Urban Analysis S2 L2T3
Offered subject to availability of staff.
An analysis of different urban problems. Lectures to provide
theoretical and methodological perspectives; and to demonstrate
how analysis proceeds in real problems. Problem sets and
workshop exercises are undertaken to develop skills in
researching, writing, and presenting as well as
understanding.

27.795 Physical Geography for Surveyors S1 L2T2
Fundamentals of physical geography. Landscapes of Australasia.
Techniques of landscape appraisal. Laboratory classes to support
the above, including map analysis, air photo interpretation and exam-
ination of soil properties. There is a compulsory one-day excursion.

27.813 Geographic Methods S2 L2T2
Prerequisites: 27.801 and 27.802, or 27.818 and 27.819, or 27.301
and 27.302, or 27.111. Excluded: 27.2813.
Statistical procedures and field methods used in both human and
physical geography. Includes: measures of dispersion; measures of
spatial distribution; samples and estimates; correlation and regres-
sion; tests for distribution in space; data collection and analysis; field
observations.

27.818 Australian Environment and Human Response S1 L2T2
Prerequisite: Nil. Excluded: 27.301/801, 27.295, 27.111.
Themes selected from the mechanisms of the physical environment
with particular reference to Australia and the Sydney region. Land-
scape as an expression of dynamic response: land capability and
land use problems, humans as agents of landscape change. Energy
and Atmospheric Circulation over Australia: local weather patterns
and weather extremes, human responses to fire, flood, and drought
and drainage relationships, problems of soil erosion. Coastal Ecosystems:
problems of demand, risk and management in the coastal zone.
Lectures are supplemented with tutorials, workshops, and field tutor-
rials. Students are required to provide some materials for workshop
exercises and to contribute to the cost of field tutorials.

27.819 Technology and Regional Change S2 L2T2
Prerequisite: Nil. Excluded: 27.302/802.
The impact of technological change on the spatial organization of
human activities and regional development and disparities. The impli-
cations of technological change on population distribution, resource
utilization, and settlement patterns are examined at different scales
emphasizing the social consequences at the community and regional
level. Examples are taken from Third World and modernized coun-
tries, with particular reference to Australian case studies.

27.824 Spatial Population Analysis S2 L2T2
Prerequisite: 27.312/812, or 27.829. Excluded: 27.324, 27.834.
Population growth and structure in an urban and regional context.
The components and processes of population change; fertility, mor-
tality and migration set within the framework of demographic transition
theory. Theories of migration and mobility and of optimal populations.
Demographic and social indicators for urban and regional analysis
and their implications for disparities in living conditions, residential
differentiation and regional growth. The adjustment of immigrant and
migrant populations to the urban environment.
27.825 Urban Activity Systems  S1 L2T2
Prerequisite: 27.312/812, 27.829. Excluded: 27.835, 27.325.
The understanding of problems arising from processes of change in non-metropolitan areas, with particular reference to their effects on the functional structure of country towns in NSW. Topics include: functional classification, service provision, economic base, rural mobility decentralization and settlement policies, and urban systems.

27.826 Urban and Regional Development  S2 L2T2
Prerequisite: 27.312/812, or 27.829. Excluded: 27.836, 27.326.
Theories of urban and regional change leading to assessment of the role of planning. Emphasis on resource allocation, conflict resolution and evaluation techniques including cost-benefit analysis and environmental impact assessment. Lectures accompanied by seminars and workshop sessions which concentrate on methodology.

27.827 Environment and Behaviour  S1 L2T2
Prerequisite: 27.312/812, or 27.829. Excluded: 27.837, 27.327.
Socio-economic and behavioural issues relating to urban development, with special reference to social impact studies and the external effects of service provision. Examples selected from inner city and suburban districts, in metropolitan areas and new towns.

27.828 Australian Natural Environments  S2 L2T2
Prerequisite: 27.801 or 27.301 or 27.818. Excluded: 27.111, 27.311/811.

27.829 Australian Social Environments  S1 L2T2
Prerequisite: 27.802 or 27.302 or 27.819. Excluded: 27.312/812.
Focus is on the interaction between human communities and the built environment in Australia: the effects of the natural environment on the evolution of settlement patterns; detailed analysis of rural and metropolitan social environments. Emphasis on inner city, suburbia, behavioural and social area approaches, and to managerialist and structural theories of social change on areas and their communities.

27.844 Honours Geography  F
Prerequisites: Arts students must satisfy Faculty requirements for entry to the Honours Level program and must have obtained at least 54 credit points in Geography subjects, including 12 Level 1 credit points. A minimum cumulative average at Credit level is required for all Upper Level subjects taken which must include 27.884.
Details of Honours Geography for science students are available from the School of Geography office.
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 as notified by the School of Geography.

27.860 Landform Studies  S1 L2T2½
Prerequisite: 27.301/801 or 27.111. Co-requisite: 27.311/811. Excluded: 27.183, 27.870.
Not offered in 1986.
The study of landforms, with particular reference to Australian examples. Geomorphic regions. Planation surfaces and processes and associated weathering features. The evolutionary and dynamic approaches to landforms, with particular reference to fluvial landforms. Coastal processes and forms. Desert landforms. Landforms as evidence of climatic change.

27.862 Australian Environment and Natural Resources  S1 L2T2
Prerequisite: 27.111 or 27.311/811 or 27.312/812 or 27.828 or 27.829. Excluded: 27.872, 27.362.
Continental and regional patterns of land, water and energy resources in Australia and its territorial waters, and natural factors affecting their development, including climate, soils and terrain; problems of limited surface and underground water resources and of conflicting demands, exemplified through particular basin studies; comparable reviews of energy, minerals and forest resources, human resources and development.

27.863 Ecosystems and Man  S2 L2T2
Prerequisite: 27.111 or 27.311/811 or 27.312/812 or 27.828 or 27.829. Excluded: 27.873, 27.363.
The structure and functioning of ecosystems, humans' interaction with ecosystems; Australian case studies of ecosystem management, including pastoral, cropping, forestry, coastal and urban ecosystems.

27.883 Special Topic  S1 or S2 L4
Prerequisite: Nil.
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.

27.884 Advanced Geographic Methods  S1 L2T2
Prerequisites: 27.813 or both 27.2813 and 27.2814.
Additional quantitative research techniques normally taken by Honours students in their third year. Research organization; computer analysis; collection and organization of data; statistical description; hypothesis testing and sampling; simple and multiple association analysis; nonparametric methods.
## Marketing

### 28.012 Marketing Systems  
**Prerequisite:** Nil.

Conceptual introduction to marketing from the systems viewpoint. Evolution and characteristics of marketing systems, buyer behaviour, marketing channel flows (equalizing supply and demand, communication, ownership, finance, physical distribution); marketing activities in the firm (planning and marketing program, co-ordination and control of marketing activities, problem solving, product planning, promotion and pricing, physical distribution management), resources allocation by competition, the expanding role of government, social performance of marketing and social efficiency of marketing.

### 28.052 Marketing Research  
**Prerequisite:** 15.421 or approved substitute.

Sources and types of marketing information. Design, conduct, analysis and reporting of market surveys and experiments. Technique of statistical inference.

## Town Planning

### Core Subject

### 36.411 Town Planning  
**Prerequisite:** 11.4308 and 100 credit points.


## Landscape Architecture

Students should contact the Head of School before enrolling in any of the following subjects.

### 37.1606 Land Systems  
**Prerequisite:** 37.5003.


### 37.1707 Land Management  
**Prerequisite:** 37.1606.

An investigation of resources and their management, with reference to managed landscapes, both cultural and natural. Conservation and rehabilitation methods are studied in relation to rural and urban landscapes, including coastal processes. Rehabilitation methods are related to land use types with studies of specific examples, following investigations of human impacts and their assessment.

### 37.3015 Environment Impact Assessment 1  
**Prerequisite:** 156 credit points, or as otherwise approved by Subject Authority.

2 credit points. Not offered in 1986.
37.3016 Environmental Impact Assessment 2

2 credit points. Prerequisite: 37.3015.
Not offered in 1986.

The environment defined in terms of bio-physical and socio-economic factors. Introduction to the general principles of environmental survey and analysis and the assessment of impact. Specific methodologies are reviewed on a comparative basis. The importance of communication between the environmental sciences and professions and the problems of objectivity. Emphasis upon the role that environmental impact assessment should play as part of the planning process; landscape assessment methodologies reviewed with specific reference to their adaptability for use as a 'before and after' technique for comparatively assessing impact in relation to visual/aesthetic factors.

The student undertakes a specific study of current social significance on a group basis in two phases over two consecutive sessions, in the same year. Each phase is used as a partial assessment of progress.

37.9105 Landscape Planning 1

Prerequisite: 37.1504.
Basic methods and techniques of resource data collection, analysis and valuation. History of landscape planning in Australia and overseas with reference to pioneering case studies. Projects include the use of maps, air photos and simple computer programs.

37.9206 Landscape Planning 2

Prerequisite: 37.9105.
Classification of planning methods. Study of complex methods and techniques used in recent landscape planning models. Development of land use suitability models for recreation, residential, industrial, commercial, grazing, agriculture, forestry and conservation. Projects include the use of remote sensing techniques and advanced computer programs.

38.131 Principles of Food Preservation

S1 L4
Prerequisites: 38.122, 38.421, 38.521.

38.132 Plant Food Science

S1 L3
Classification, distribution, production and trade of world plant foods. The science and technology of Fruit and vegetables: genetic and environmental effects on composition and quality: biology of development, maturation and ripening; harvesting: concept of deterioration of fresh fruit and vegetables; technology of wine production; technology of juice and beverage production; chemical and sensory quality control: procedures. Cereals: structure, composition and uses of wheat, rice, rye, corn, sorghum: wheat milling, flour properties: technology of bread, pasta, biscuit and cake manufacture: starch-gluten separations and derived products.

Plant-derived products. Sugars: sources, types, composition, use with other foods; sugar milling, refining; confectionery manufacture, control of spoilage. Lipids: sources, composition, extraction, purification processes, chemistry, processing of cooking oils, margarine, shortenings; use with other foods. Proteins: sources, extraction procedures, nutritional and toxicological factors, texturizing processes, use with other foods.

Methods of pest control.

38.133 Animal Food Science

S2 L2

Marine products: nature and distribution of world resources: harvesting of teleostean and elasmobranch species: spoilage reactions, their control and quality assurance, chilling, freezing, salting, drying, smoking and fermentation of fishery products, fish meal and fish protein concentrates.

Egg products: structure, composition of the avian egg, quality assessment and microbiology of intact and liquid egg products. Egg pulping, freezing and drying with reference to functional and microbiological qualities.

Milk and dairy products: chemical and physical properties of milk components: proteins in colloidal and soluble fractions, enzymes, fat globules and lactose. Manipulation of these properties during production of milk-based foods: heat treatment, homogenization, coagulation.
An integrated program of laboratory and pilot plant exercises designed to illustrate the principles and procedures presented in the subjects 38.131, 38.132, 38.133, 38.331 and 38.431. Includes examination and use of food processing equipment; food packaging materials; the evaluation of unit processes used in the preservation and modification of foods of plant and animal origin including fruit and vegetables, cereals, sugars, lipids, meat, fish, eggs and dairy products; their properties, uses, microbiological, chemical, biochemical, and nutritional status and changes undergone during processing and storage.

Food quality; review of characteristics of food quality; review of instrumental assessment of food quality. Sensory assessment of food: review of theories of sensory perception; practical aspects of sensory assessment such as experimental design, questionnaire design, laboratory design, choosing a test method; outline of test methods, their execution and results analysis; sensory interactions; consumer testing methodology; correlation of subjective and objective methods; case studies; field studies involving evaluation of the role of sensory assessment in the Australian food industry; laboratory exercises.

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

Food legislation: State and NHandMRC food standards and mechanisms; Codex standards; case studies in food standards development; food and nutrition policy; Food additives: functions and modes of action of various classes of food additives; consequences of their use; National, State and International attitudes and standards; principles of toxicological testing and evaluation of results. Product development: needs for new food products; role of market research, advertising and food technology in the generation of new product ideas; steps in the development of a new product; new product failure and success; practical exercises in new product development. Microbiological quality control; good manufacturing practice; in-plant testing; microbiological sampling; sampling plans; decision criteria; microbiological criteria for foods, hazard analysis and critical control point (HACCP) concepts, case studies.

History and nature of grape wines; grape and wine statistics; concept of cultivars within Vitis vinifera; other Vitis species; vine and grape physiology and biochemistry; maturity assessment and significance; influence of climate, soil, and other factors on wine quality; harvesting procedures; oenological procedures including crushing, sulphiting, pressing and draining; fermentation; maturation and storage, stabilisation and clarification, bottling, packaging, and distribution; wine types and composition; quality assessment; quality control and analytical procedures; distillation and production of fortified spirit and brandy; world wine industry, wine organizations, wine literature; social uses of alcohol.

A treatment in greater depth of the following topics dealt with in graduate and undergraduate courses: production, storage, marketing and quality of cereal grains; current trends in these areas, technology of bread, biscuit and cake manufacture; chemical, physical and biochemical interactions in wheat flour doughs; flour milling and assessment of flour quality. Additional topics include cereal protein analysis, properties and behaviour; wheat variety identification; meat-cereal combinations; cereal enzymes; non-food uses of cereals; preparation and uses of cereal protein, starches and lipids.


Fish species, quality control and operations used in fish canning, problems encountered with canned marine products. Fish farming, processing of carp and fish roe. Preparation of individual fish portions and utilization of commercially unattractive species. Harvesting, handling, processing and spoilage of molluscs and crustaceans. Utilization of unusual marine organisms. Industrial fishery products.
38.171 Special Topics in Meat Science S1 T2
Prerequisite: 38.133 or equivalent.

Students will be allocated a specific area of study on an aspect of meat science involving a literature survey, industrial visits and the presentation of a seminar and a written report on the specific area of study.

38.331 Food Microbiology 1 S1 L3
Prerequisites: 44.101 and 44.121 or other equivalent introductory Microbiology subjects.


38.341 Food Microbiology 2 S2 L2T4
Prerequisite: 38.331.

A detailed theoretical and practical treatment of the ecology, taxonomy and biochemistry of bacteria, yeasts, fungi and viruses involved in food spoilage, food-borne disease and food fermentations. Emphasis on specific methodologies for the detection, enumeration and identification of food associated bacteria, yeasts and fungi. Problems of enumerating microorganisms in foods: techniques of food and surface sampling, formulation, performance and evaluation of selective-differential media, sublethal injury; the value of indicator organisms. Rapid methods for microbial enumeration and identification. Control of microorganisms in foods, microbiological quality control in food production; sanitation and disinfection; food legislation and microbiological standards.

38.344 Yeast Technology S1 L2T1
Prerequisite: 38.331.


38.421 Food Engineering 1 S2 L2T1
Prerequisite: 38.421.

Raw materials, markets, organization of the Australian food processing industries, food processing equipment, use of computers and automated control; dimensions, units, dimensionless groups, thermal and physical data of foods; material and energy balances. Includes appropriate factory inspections.
38.544 Nutritional Evaluation of Foods S2 L1T5

Prerequisites: 2.043L, 38.134.

Analytical methods for nutrients in foods, including advanced analytical techniques. Evaluation of nutrients in specific food groups, and the effect of processing and preparation on nutrient value of foods.

Biochemistry

41.101 Biochemistry S1 L4T8

Prerequisites: 17.041, and 2.121 and 2.131, or 2.141. Excluded: 2.003J.

The chemical properties of amino acids, peptides and proteins, carbohydrates, nucleic acids and lipids and the biological roles of these compounds. The nature and function of enzymes. The intermediary metabolism of carbohydrates, lipids and nitrogenous compounds. The molecular mechanism of gene expression and protein synthesis. Photosynthesis. Practical work to amplify the lectures.

41.111 Biochemical Control S2 L2T4

Prerequisite: 41.101.

The relationship between structure and function of enzymes, selected protein systems and hormones. Metabolic networks and control mechanisms. Practical work to amplify the lectures.

Biotechnology

42.102A Biotechnology A S1 L2T4

Prerequisites: 41.101 and 42.101 or 44.101 (Pass Conceded (PC) or Terminating Pass (TP) awarded prior to Session 2, 1983, is not acceptable).

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 sterilization; 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 fermenter operation, microbial enzyme isolation, visits to industrial fermentation plants and industrial seminars.

42.102B Biotechnology B S2 L2T4

Prerequisite: 42.102A (Pass Conceded (PC) or Terminating Pass (TP) awarded prior to Session 2, 1983, is not acceptable).

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 optimization techniques. The economics of microbial processes are considered and comparison made with alternative modes of production or treatment. The economics of agro-industry 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.

42.114 Fermentation Processes

Factors governing the use of microorganisms in industrial processes, including the selection, maintenance and improvement of microorganisms, the control of environmental factors, batch and continuous flow operational patterns, product recovery, process optimization and waste disposal. Demonstrations of the operation and control of fermenter systems and of microbial process simulation.

Botany

43.111 Flowering Plants S1 L2T4

Prerequisites: 17.031 and 17.041.

Plant cell structure, structure and functions of the major organs in angiosperms (flowers, roots, stems and leaves), secondary thickening and arborescence, transport systems in plants, seeds and germination. Variation in structure and function in relation to environment. Introduction to taxonomy and identification of major Australian plant families. A short field excursion is part of the subject.

43.112 Taxonomy and Systematics S2 L2T4

Prerequisite: 43.111.

The assessment, analysis and presentation of data for classifying organisms both at the specific and supra-specific level.
43.121 Environmental Physiology  
Prerequisites: 17.031, 17.041, 2.121 and 2.131, or 2.141.

How plants function in relation to the constraints imposed on them by soil and atmospheric environments. Includes: germination, growth and development, particularly photosynthesis, respiration, inorganic nutrition, water relations, transport processes and reproductive physiology. Important practical applications of various physiological mechanisms.

43.142 Environmental Botany  
Prerequisites: 17.031 and 17.041.

The soil and atmospheric environments in which plants live and a study of the interaction of plants with their environment. Energy and mass transfer. Emphasis is placed on the role of environmental science in food production.

43.152 Plant Community Ecology  
Prerequisites: 43.111 and 17.012 or 27.111.

Recognition and delimitation of plant communities. Ecology of selected Australian vegetation types. Use of numerical methods and application of community concepts to palaeoecology. Field work an integral part of this course.

Microbiology

44.101 Introductory Microbiology  
Prerequisites: 17.031 and 17.041.

The general nature, occurrence and importance of microorganisms. A systematic review of the major groups of microorganisms: the eucaryotic protista (micro-algae, protozoa and fungi); procaryotic protista (blue-green algae, "higher" bacteria, typical unicellular bacteria and small bacteria-like forms); plant, animal and bacterial viruses. The relationship between microorganisms and their environment, ecological considerations. Interactions between microorganisms and higher organisms.

44.121 Microbiology 1  
Prerequisites: 44.101 and 41.101 or 2.003J.

The balanced structure of this unit makes it suitable for students majoring in microbiology and also for students who wish to enlarge their knowledge and skills in microbiology beyond those obtained in

44.101 Introductory Microbiology or equivalent units at other institutions.


Zoology

45.122 Animal Behaviour  
Prerequisites: 45.101, and 45.201 or 45.301.

An introduction to Ethology, the biological study of behaviour. Physiological, ecological, developmental and evolutionary aspects of behaviour are examined as important elements in the analysis of behaviour, particularly social behaviour. Both field and laboratory work are included.

45.152 Population and Community Ecology  
Prerequisites: 17.041 and 10.001 or 10.011 or both 10.021 B and 10.021C.

Examination of the dynamics of one, two or more interacting populations. Systems analysis and simulation in ecology. Theoretical and mathematical analysis of the dynamics and stability of ecosystems. Topics in the optimal management of renewable resources. Unifying concepts in ecology.

45.201 Invertebrate Zoology  
Prerequisites: 17.031, 17.041.

A comparative study of the major invertebrate phyla with emphasis on morphology, systematics and phylogeny. Practical work to illustrate the lecture course. Obligatory field camp.

45.301 Vertebrate Zoology  
Prerequisites: 17.031 and 17.021, or 17.041.

A comparative study of the Chordata, with particular reference to the vertebrates, including morphology, systematics, evolution and natural history, with reference to selected aspects of physiology and reproduction. Practical work to supplement the lecture course. Field excursions as arranged.
45.302 Vertebrate Zoogeography and Evolution

Prerequisite: 45.301.

A geographic approach to the current distribution, abundance and types of vertebrate species in the Australian region. Particular emphasis is placed on the basic principles of speciation, the history of the Australian continent, vertebrate adaptations and changes in the distribution and abundance of the Australian vertebrate fauna under the influence of humans. Field excursions as arranged.

45.422 Economic Zoology

Prerequisite: 45.201 or 45.402.

A study of the biology, ecology and control of vertebrate and invertebrate animals which harm humans and their possessions. Human and domestic animal parasitology, pests on plants, diseases caused or spread by animals, chemical, biological and physical control, and side effects.

Faculty of Applied Science

46.001 Introduction to Mining and Mineral Engineering


46.211 Mineral Engineering Science 1

Application of the principles of stoichiometry and thermodynamics to mineral processing and extractive metallurgy. Review of the laws of thermodynamics, material and energy accounting, the thermodynamic data sources, chemical and phase equilibria in pyrometallurgical systems, computer methods, theory of metal solutions, slags, fused salts and mattes. Application to combustion of fuels, roasting, chlorination, reduction of oxides, smelting of sulphides and refining of metals.

46.212 Mineral Engineering 1

Unit 1 Physical Operations in Mineral Processing

Basic theory and applications to unit design of the physical operations in mineral beneficiation, breakage and comminution, screening, classification, flotation, gravity concentration, minor separation processes and de-watering. Integration of equipment into complete flowsheets, case studies of operating plants to illustrate the factors that influence the flowsheet design.

Unit 2 Process Design for Mineral Extraction

Mineral extraction processes in terms of mechanics and achievements. Overall extraction schemes. Quantitative analysis and computation in the solution of mineral engineering problems involving fluid flow, heat transfer, statistics, and mineralogy. End uses of minerals, the technical aspects of the market requirements and how these influence mineral processing and extractive metallurgy.

46.213 Mineral Engineering Laboratory 1

Laboratory exercises relevant to both mineral and metallurgical processing covering: experimental design, the gathering and interpretation of data used for the assessment of ores and minerals in order to determine the processes most suitable for their beneficiation and subsequent refinement or utilization.

46.301 Mineral Engineering Science 2

Unit 1 Physical and Chemical Characterisation of Mineral Particles

Physico-chemical and electrical characteristics of surfaces. Surface phenomena in flotation. Fluid particle dynamics and the characteristics of ores and ore pulps in relation to the handling of these materials. Fine particle statistics in mineral beneficiation.

Unit 2 Aqueous Thermodynamics and Hydrometallurgical Processes

Application of principles of aqueous thermodynamics, electrochemistry, chemical and electrochemical kinetics, to hydrometallurgical processes: leaching of minerals and concentrates, solution purification, precipitation, and other separation processes, ion-exchange and liquid-liquid extraction.

Unit 3 Elements of Geomechanics

Elements of geomechanics in relation to the classification, testing, handling and disposal of rocks and soils.

46.302 Mineral Engineering 2

Prerequisite: 46.202.

Unit 1 Plant Performance

Plant performance monitoring and the analysis, computation and reporting of operating data. Analysis and evaluation of mineral processing operations and extractive processes.

Unit 2 Process Design 1

Integrated design of mineral processing and extraction circuits. The application of reaction engineering principles to the design and evaluation of mineral and metallurgical reactors and processes with consideration of unsteady state processes. Identification of the information required to select and design processes, dealing with deficiencies in information. Development of communication skills through the collection and presentation of technical information.
46.303 Mineral Engineering Laboratory 2  F T3
Prerequisite: 46.203.
Exercises in mineral processing and extractive metallurgy designed to develop investigational skills for: obtaining quantitative relations for process phenomena, testing the performance of a machine or reactor, simulating a process by a computer programme. Instrumental analysis, quantitative measurements of the properties of minerals and particles, solutions and gases. Collection and interpretation of data from operating plants. Development of proficiency in technical report writing, and communication.

46.402 Mineral Engineering 3  F L3T3
Prerequisite: 46.302.
Unit 1 Control and Simulation
Problems in the automatic control and on-line analysis of mineral and metallurgical processes.

Unit 2 process Design 2
Methodologies and mineral engineering investigations, including statistical design of testwork, development of quantitative empirical relationships, sensitivity analysis, and development of theoretical relationships. Development of a systematic approach to technical decision-making, with industrial case studies.

Unit 3 Environmental Engineering

46.403 Mineral Engineering Projects and Laboratory  S1 T6 S2 T9
Prerequisite: 46.303.
One major investigation based on a selected problem in mineral engineering. A second problem in process selection and design based on quantitative data for various options. A third project may be included as an exercise in selection and evaluation of information from the literature for a specific case study. Seminars.

46.501 Chemical and Extractive Metallurgy 1  S2 L2T1
Prerequisite: 2.002A.

46.502 Chemical and Extractive Metallurgy 2  S1 L2T1½
Prerequisite: 46.501.

46.503 Advances in Pyrometallurgy  S1 or S2 L2
Prerequisite: 46.502. Co- or prerequisite: 4.614.
Advances in pyrometallurgy related to extraction and refining processes used for recovery of ferrous and non-ferrous metals.

46.504 Advances in Hydrometallurgy  S1 or S2 L1T1
Prerequisite: 4.623B, 46.502
A critical analysis of: recent industrial and research developments in extraction metallurgy; major problems that are the subjects of current research and development in extractive metallurgy: the variety of methods available for research and development.

46.505 Technical Decision Making  S1 or S2 L1T1
A systematic approach to technical decision-making involving problem analysis, identification of options, data collection, selection of criteria, application of criteria and implementation. Case studies in decision-making based on specific, topical projects in industry.

Chemical Engineering and Industrial Chemistry

General
Students are expected to possess a calculator having exponential capabilities (ln and exp x or 'x to the y'), and this will normally be allowed to be used in examinations. However, it should be noted that calculators with very much greater capabilities than the above might not be allowed in examinations, because they could give the user an unfair advantage over other candidates. Further information may be obtained from the Head of the School.

Students of Chemical Engineering 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.
48.001 Introduction to Chemical Industry
Unit 1 Flow of Fluids
Prerequisite: 10.001.

Unit 2 Material and Energy Balances
Prerequisite: 48.001.
A revision and extension of material and energy balance calculations with more complex examples, including those arising from stagewise operation of extraction equipment. Graphical solution of multi-stage calculations.

Unit 3 Dimensions and Dimensional Analysis
Prerequisites: 1.001 and 10.001.
Units and measures. Conversions of units and equations. Dimensions and Dimensional Analysis. Basic principles of modelling.

48.022 Chemical Engineering 1B
Prerequisite: 48.021.
Unit 1 Heat Transfer 1
Introduction to steady state heat transfer including conduction, convection, radiation, boiling and condensation with an emphasis on problem solving. Resistance concept in heat transfer with series and parallel combinations.

Unit 2 Computation 1
A review of the fundamentals of FORTRAN, with extension to formatting, dimensioned variables and sub-routines. Application to the solution of selected problems involving heat and mass balances, fluid flow and pumping. This course is intended to be complementary to other material in 48.021 and 48.022.

Unit 3 Pumps and Pumping
Types of piping and fittings. Blow cases. Air lift pumps. Reciprocating pumps, centrifugal pumps and gear pumps. Blowers and compressors.

48.025 Chemical Engineering for Ceramic Engineers
Consists of Units 1 and 3 of 48.022.

48.031 Chemical Engineering 2A
Unit 1 Mass Transfer (Theory)
Prerequisites: 10.102A, 48.021.
Molecular diffusion in gases, liquids and solids and the measurement and calculation of diffusion coefficients. Diffusion at an interface — one component unidirectional diffusion and equimole counter-diffusion under steady state conditions. Mass transfer coefficients. Estimation and application of chemical and phase equilibria. Stage calculations applied to liquid/liquid, vapour/liquid and other mass transfer operations. The two film theory and the transfer unit concept in gas/liquid, vapour/liquid, and other operations.

Unit 2 Heat Transfer 2 (Theory)
Prerequisite: 48.022 Unit 1. Co-requisite: 10.032.
An extension of the work covered in 48.022, Unit 1, with an emphasis on the fundamentals of conduction, convection and unsteady state heat transfer.

Unit 3 Plant Layout
Factory Layout: Factors governing location of processing plant. Typical dispositions of process batteries, central utilities, laboratories, workshops, amenities, storage areas, effluent treatments. Distribution of electricity, steam, process and reticulated cooling water. Boiler plants and cooling towers, steam turbine versus electric motors, local versus central location of particular utilities. Provision for expansion. Piping and Fittings: Fabrication, standards, most used sizes and types, welded, screwed and bolted connections. Common valve types, their flow and serviceability characteristics, relative costs and integrity; blinds and blanking valves. Practical assessment of pressure loss and line sizing in straight runs and simple networks involving pumps, or blowers, valves and bends. Process Battery: Considerations of accessibility for maintenance, operator convenience and safety. Distribution of utility fluids. Methods of erecting major process units.

Unit 4 Process Engineering 1

Unit 5 Safety and Failure Tolerance
48.032 Chemical Engineering 2B

Unit 1 Solids Handling  
Prerequisite: 48.021 Unit 1.

Classification of granular solids and powders according to properties which affect their storage and movement. Storage in and retrieval from stacked piles, silos and hoppers, rules for their design. Feeders and their suitability to various kinds of granular solids. Mechanical conveyors and elevators, distance limitations; host height limitations. Rules for design of mechanical conveyors and elevators. Fluid-particle conveyors. Introduction to hydraulic and pneumatic conveyors, feeders and fluid-particle separation systems. Rules for design of simple slurry transportation and dilute phase pneumatic transportation systems. Practical and economic considerations determining choice of system.

Unit 2 Computation 2  
Prerequisites: 10.301 or 10.331, 48.022 Unit 2.

Extends material given in Computation 1, and places emphasis on efficient use of FORTRAN and BASIC, and use of job control language, files and programme packages. Numerical methods are considered for solving linear and non-linear algebraic equations, systems of linear equations (in particular those connected with regression analysis), ordinary and partial differential equations and simple optimization problems. Examples will be drawn from problems arising in chemical process industries; these applications will include formulation and solution of computer models of physical processes, and analysis of laboratory and plant results and fitting of empirical equations to data.

Unit 3 Engineering Thermodynamics  
Prerequisite: 48.135.

Engineering applications of thermodynamics. Heat engines, refrigeration.

Unit 5 Surface Separation Processes  
Prerequisite: 48.031 Unit 1.

Principles of membrane processes, reverse osmosis, ultrafiltration, dialysis and electrodialysis. Design calculations for batch and continuous operation of reverse osmosis and ultrafiltration equipment. Principles of sorption processes, such as adsorption ion exchange and molecular sieves. Design of fixed-bed sorption equipment. Principles and design of other surface separation processes such as foam and bubble fractionation.

48.033 Chemical Engineering 2C

Unit 1 Mass Transfer (Design)  
Prerequisite: 48.031 Unit 1.

The design of equipment for absorption, distillation and liquid-liquid extraction. Selection of column type. Design of sieve and other types of plate for plate columns. Design of packed columns. Performance characteristics of plate and packed columns. Selection of equipment for liquid-liquid extraction. Design of mixer settlers and column-type extractors. Factors affecting the performance of liquid-liquid extraction equipment. Other mass transfer equipment.

Unit 2 Heat Transfer 2 (Design)  
Prerequisite: 48.031 Unit 2.

Thermal design procedures for shell and tube heat exchangers and fin-fan coolers. Service fluids for heating and cooling duties.

Unit 3 Process Vessels  
Prerequisite: 8.6110.

Mechanical design and fabrication of pressure vessels. Code and legal requirements. Design of supports for vertical and horizontal cylindrical vessels. Visualization, freehand sketching and presentation of formal drawings and specifications for pressure vessels and equipment components. Relief valves, bursting discs, venting and draining systems.

Unit 4 Fluid-particle Systems 1  
Prerequisite: 48.021 Unit 1.

Interaction between particles and fluids: drag, terminal velocity, sedimentation. Flow through porous media; pressure gradient, filtration, fluidization, dispersion; multiphase flow, irrigated packed columns.

48.036 Chemical Engineering Laboratory 1

Unit 1 and 2  
Prerequisites: 48.021, 48.022, 2.102A.

An integrated chemical engineering laboratory incorporating experiments in fluid flow, heat transfer, mass transfer, thermodynamics and kinetics, instrumentation, process dynamics and control. The objectives of this laboratory are: to demonstrate, reinforce and extend the principles of chemical engineering which are covered in Chemical Engineering 1A and B and 2 A-C, 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.
48.039 Chemical Engineering 2J

Comprises four optional units of which students must take two. These units are 48.0391 Electrochemical Engineering, 48.0392 Mineral Process Engineering, 48.0393 Computer Simulation and 48.0394 Reservoir Engineering. 48.0391 provides a broad introduction to electrochemistry and its use in the process industries, including caustic/chlorine manufacture and aluminium production. 48.0392 is the subject 7.023 Mineral Process Engineering augmented by an additional tutorial hour. 48.0393 provides an introduction to the use of large scale computer packages for process design and plant management. 48.0394 is the first half of Unit 1, Petroleum and Reservoir Engineering in 48.048 Advanced Chemical Engineering.

48.040 Chemical Engineering Project

The design of plant for the production of chemicals and the estimation of product costs or an experimental investigation of some aspect of chemical engineering.

48.041 Chemical Engineering 3A

Prerequisite: 48.031.

Unit 1 Convective Mass Transfer

Models for convective mass transfer are fixed and free interfaces. Calculation of mass transfer rates at surfaces with simple geometry. Mass transfer in dispersions and in systems involving chemical reaction.

Unit 2 Simultaneous Heat and Mass Transfer

Psychrometry, principles of design calculations for cooling towers and for humidification-dehumidification operation. Topics selected from: drying of solids, crystallization, sublimation, molecular distillation, gaseous and thermal diffusion.

Unit 3 Multicomponent Separation

Prerequisites: 48.031 Unit 1, 48.135.


Unit 4 Transport Phenomena

A generalized treatment of the continuum approach to momentum, energy and mass transport. Application of the conservation equations to chemical engineering problems. Discussion of the advantages and limitations of the transport approach.

48.042 Chemical Engineering 3B

Prerequisites: 10.032, 48.163.

Unit 1 Process Dynamics and Control

Analysis of dynamic systems: derivation of equations for lumped parameter systems, linearization, reduction to transfer functions, numerical solutions. Control hardware: basic measuring instruments, control valves, analog controllers, digital computer-based controllers. Process control: analysis and synthesis of single feedback loops, using root-locus techniques, stability criteria, and criteria for satisfactory control.

Unit 2 Optimization

An introduction to some of the techniques of optimization and their application to problems from the process industries. The methods covered will include single and multiple dimensional search, linear programming and dynamic programming.

48.043 Chemical Engineering 3C

Prerequisites: 48.031, 48.032.

Unit 1 Design Workshop

Consideration of the ways and means of attempting a design project, emphasizes to students the need 1. to study the history and alternatives to the design project, and 2. to use proper design techniques for the assigned process and equipment. Students are each given a design project or some aspect of it and are expected to produce an appropriate report on their assignments.

Unit 2 Industrial Pollution Control


48.044 Chemical Engineering Laboratory 2


An integrated chemical engineering laboratory at a more advanced level than the 48.036 laboratory and with an emphasis on open-ended experiments.

48.046 Chemical Engineering Project

A workshop comprising exercises and case studies to introduce the human and organizational aspects of managing process or engineering enterprises. Includes discussion of typical organization structures and reasons for choosing them; problems of managing people in organizations, industrial relations questions.
Unit 2 Process Engineering 2 S2 L1T1


Unit 3 Process Dynamics and Control 2 S2 L1T1

Frequency response analysis and synthesis techniques. Control of dead time and distributed systems. Cascade feedforward and other multiloop systems. Introduction to analysis of multivariable systems. Identification and estimation techniques. Digital implementation of control algorithms.

48.048 Advanced Chemical Engineering

Unit 1 Petroleum and Reservoir Engineering F L2T1


Unit 2 Mineral Chemistry F L2T1

This subject includes part of 4.121 Principles of Metal Extraction (F L1T1) plus a sub-unit entitled Stabilities of Inorganic Aqueous Systems containing: sources of equilibrium stability data, methods of presenting stability data for application to interpreting the chemical reactions and mechanisms of aqueous processes.

48.049 Automation and Optimization for Ceramic Engineers S1 L2½T2½

Consists of 48.165 Laboratory Automation Science and Unit 2 — Optimization of 48.042 Chemical Engineering 3B.

48.090 Industrial Experience

Students are expected to accumulate, by the end of the four year course, twelve weeks of industrial experience gained during recesses.

48.113 Chemistry of Industrial Processes F L1T2

Prerequisite: 2.102A. Co- or prerequisites: 2.102B, 2.102C.

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, aluminium 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. Laboratory: Students are required to attend lectures on Report Writing, carry out laboratory assignments and attend factory inspections at local and country centres as required.

48.115 Industrial Electrochemistry S1 or S2 L2

Prerequisites: 48.113, 48.138.

Fundamentals of electrodes, the Butler-Volmer equation, current/power laws in relationship to reaction mechanism. Electrocatalysis, gas evolution and co-deposition. Technological aspects of electrochemistry: energy conversion systems, storage systems and plating. Industrial processes — cell design and side reactions, gas bubble effect, current distribution and mass transfer effects. Developments in electrode technology, diaphragms and cell construction.

48.116 Water Chemistry S1 or S2 L2


48.121 Corrosion in the Chemical Industry S2 L2

Prerequisite: 2.102A.

Chemical and electrical aspects of corrosion and their application to corrosion problems encountered in the chemical process industries. Selection of materials for chemical plant. Design factors for corrosion prevention. Methods of corrosion prevention.

48.122 Instrumental Analysis S1 L1T2 S2 L1T2

Prerequisites: 1.001, 2.121, 2.131.

Basic principles of volumetric and gravimetric analysis and the application of spectrometric and selected techniques to the analysis of process streams and quality control.

48.124 Applied Kinetics S1 L1T1

Prerequisites: 48.138, 48.136.

Adsorption theory, kinetics of catalytic and non-catalytic fluid-solid reactions, rates of surface reaction, kinetics of heterogeneous reactions affected by diffusion, catalyst characterization.

48.125 Industrial Chemistry 1A S1 L1½T2½ S2 L½T½

Comprises 48.021 Units 1 and 2.

48.126 Industrial Chemistry 1B S1 L1 and S2 L3

Comprises 48.022 Units 1 and 2.
48.134 Applied Thermodynamics S1 L1T1
Prerequisites: 48.135, 48.171.
Calculation of thermodynamic properties for non-ideal liquid and solid solutions. Development of statistical models for real solutions of industrial importance. Thermodynamics of interfaces. Phase equilibria in binary and ternary systems. A study of chemical equilibria in multicomponents, polyphase systems including appropriate computational methods.

48.135 Thermodynamics S1 L2T1
Co- or prerequisite: 2.102A.
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.

48.136 Reactor Design 1 S1 L1 S2 L2
Introduction to reactor design: ideal batch, steady state mixed flow; steady state plug flow, size comparisons of ideal reactors optimization of operating conditions. Multiple reactor systems; reactors in series and parallel, mixes flow reactors of different sizes in series, recycle reactor, autocatalytic reactions. Multiple reactions; reactor design for reaction in parallel and reactions in series, series-parallel reactions. Temperature effects; heat of reaction, equilibrium constants, optimum temperature progression, adiabatic and non-adiabatic operation, product distribution and temperature. Kinetics of rate processes. Significance of the rate laws and models for distributed and lumped parameter systems. Experimental measurement and correlation of process rates.

48.137 Industrial Chemistry 2A S1 L2T1
Selected aspects of unit operations for industrial chemistry students such as distillation, liquid-liquid extraction, gas absorption, filtration evaporation and crystallization.

48.138 Industrial Chemistry 2B S2 L2T1
Consists of Computation 2, normally given to chemical engineering students in 48.032, and a course on chemical kinetics to complement material given in 48.136.

48.139 Experimental Design S2 L1T1
Design of experiments, correlation and regression, quality control. Use of graphical methods, fitting empirical equations to experimental data. Preparation of nomograms using constructional determinants.

48.143 Introduction to Analog Computation S1 L1T1
Not offered in 1986.
Eight two-hour periods devoted to lectures, demonstrations and laboratory exercises. Analog computation, theory and application of analog computing elements, analog computer programming, solution of linear differential equations with constant coefficients, equation ordering and the elementary principles of modeling. Illustration by examples.

48.146 Microprocessors in Analytical Instrumentation S1 or S2 L1T1
Prerequisite: 1.9222. Co-requisite 48.165.
Computer interfacing to analytical instrumentation at a more fundamental level than that encountered in 48.165, Laboratory Automation Science, and is suited to students who envisage working in a research and development environment, where greater flexibility and a more innovative approach are needed in data acquisition and control operations. Transducers. Instrumentation amplifiers. Signal filtering, conditioning, and processing. Data conversion systems. Principles of instrument interfacing. Interface hardware. Typical analytical instrumentation interfaces.

48.171 Chemistry of High Temperature Materials S2 L2
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.

48.172 Instrumental Analysis 2 S1 L1T2

48.174 Seminars F T3
Students are required to deliver two lecturers 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.
48.194 Project (Industrial Chemistry)  S1 T8 S2 T16
An experimental or technical investigation related to some aspect of industrial chemistry. Prerequisites and/or co-requisites will be determined depending on the nature of the project.

Servicing Subjects
These are subjects taught within courses offered by other faculties.

For further information regarding the following subjects see the Combined Sciences Handbook.

48.023 Chemical Engineering
Science 1  S1 L3T2 S2 L2½T2½
Prerequisites: 1.001, 10.001.

48.037 Chemical Engineering
Science 2  F L5T2
Prerequisites: 2.102A, 48.023.


48.398 Chemical Engineering
Principles 2  S1 L3T1 S2 L1T1
Prerequisite: 48.024.
The following topics, from 48.037: Mass Transfer (Theory), Heat Transfer 2 (Theory), Fluid-particle Systems, Surface Separation Processes.

48.412 Polymer Materials  S1 2 S2 4
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.
48.211 Biological Process Engineering

**Prerequisite:** 44.101.


48.240 Biological Process Engineering Project

Project in Biological Process Engineering for students in Chemical Engineering.

Department of Fuel Technology

48.301 Fuel Engineering (for Mining Engineers) F L2T1

An elective introductory subject in fuels and energy for Mining Engineering students based on the subject 48.311 Fuel Engineering 1, supplemented by appropriate laboratory exercises (consisting of 28 lectures and 14 hours of laboratory classes per session, taught over two sessions).

48.302 Fuels and Energy S2 L2T2

A servicing subject for students in Electrical Engineering which deals with sources and properties of fuels (with particular emphasis on coal, crude oil and natural gas), principles of combustion including combustion calculations and the technology of boilers and other fuel plant. Other energy sources including solar energy and nuclear energy are discussed. The national and global situation is reviewed.

48.303 Fuel Science for Industrial Chemists S1 or S2 L2

Units 1 and 4 of 48.321 Fuel Engineering 2.


48.311 Fuel Engineering 1

**Prerequisites:** 1.001 or 1.011, 2.121, 2.131, or 2.141, 5.010, 5.030, 10.001 or 10.111.

**Unit 1 Fuels and Energy Sources and Properties**

Fossil Fuels: coal, oil, gas; origin, occurrence in Australia; storage, sampling and analysis, properties and their significance, classification. Other energy sources: nuclear, solar, wind, water, etc.

**Unit 2 Energy Conversion**

Principles of combustion of solid, liquid and gaseous fuels. Limits of inflammability, burning velocity, ignition temperature. Design principles of burners, combustion efficiency, excess air, air supply.

**Unit 3 Fuel Processing**


**Unit 4 Fuel Plant Technology**

Design principles of boilers. Boiler water conditioning. Introduction to furnaces, ovens, kilns, etc.

48.321 Fuel Engineering 2

**Unit 1 Combustion — Fundamentals and Science**

S1 or S2 L1


**Unit 2 Principles of Gasification**

S1 or S2 L1

Thermodynamics of basic reactions and calculation of equilibrium compositions. The production of fuel and synthesis gases, controlled furnace atmospheres; gas purification.

**Unit 3 Radiation Heat Transfer and Engineering Applications**

S1 or S2 L1

Unit 4 Measurements in Flames and Furnaces


Unit 5 Laboratory

Analysis and characterization of solid, liquid and gaseous fuels.

48.331 Fuel Engineering 3

Unit 1 Combustion Engineering


Unit 2 Furnace Design

Furnace design for continuous or intermittent operation.

Unit 3 Fuel Plant Design


Unit 4 Fuel Conservation and Efficiency

A case history and investigative approach to energy saving in industrial, commercial and domestic applications.

Unit 5 Liquid Fuels


Unit 6 Coal and its Evaluation

Constitution, classification and evaluation of coals. Carbonization: blending, additives, plastic behaviour.

Unit 7 Laboratory

48.340 Fuel Engineering Project

Projects selected involving the design of fuel plant or experimental aspects of fuel science and/or processing and utilization.
Graduate Study:

Course Outlines

Graduate Enrolment Procedures

All students enrolling in graduate courses should obtain a copy of the free booklet *Enrolment Procedures 1986* available from School Offices and the Admissions Office. This booklet provides detailed information on enrolment procedures and fees, enrolment timetables by faculty and course, enrolment in miscellaneous subjects, locations and hours of Cashiers and late enrolments.

Graduate Study

The Faculty provides facilities for students to proceed to the award of the higher degrees of Doctor of Philosophy, Master of Engineering, Master of Science, Master of Applied Science, and Master of Environmental Studies. Courses leading to the award of a Graduate Diploma are also offered. The degree of Doctor of Science is awarded for a contribution of distinguished merit in the fields of science, engineering or applied science.

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 may read for the degree in this Faculty and are normally involved in 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.

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.

The Faculty offers a course leading to the award of the degree of Master of Environmental Studies. 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.

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. The courses available for the Graduate Diploma are Arid Lands Management, Corrosion Technology, Food Technology, Mining and Mineral Engineering, Textile Technology and Wool Technology.

Courses leading to the award of the degree of Master of Applied Science and of Graduate Diplomas are available at Kensington only. Candidates may register for all the research degrees at Kensington subject to adequate research facilities and satisfactory supervision being available in the candidate's particular field of study. Where these special conditions can be met the Professorial Board may grant permission to a candidate to register for the degree of Doctor of Philosophy in these centres.
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.

Faculty of Applied Science

Graduate Programs in Arid Lands Management

General

The University has considerable experience of research and teaching relating to the management of arid environments, gained over many years by several of its schools. This experience is being mobilized in the provision of graduate programs based at the University campus in Kensington, Sydney, but includes significant field studies using the resources at Fowlers Gap Arid Zone Research Station in western New South Wales.

The programs include the following areas of study:

- Hydrogeology
- Land Evaluation
- Terrain Management
- Soil Conservation
- Range Management
- Management of Pastoral Enterprises

For most of the above study areas, programs are available leading to the award of:

Master of Applied Science in Arid Land Management by Course Work
Graduate Diploma in Arid Lands Management

Hydrogeology

These programs involve training in groundwater investigations, including geophysical investigations, and the assessment, development and utilization of groundwater resources. They are suited to geologists, engineers, agricultural scientists, planners and resource managers.

Land Evaluation and Terrain Management

These programs are designed to provide graduate training in the evaluation of land management and in the prediction of the environmental impact of land use. They include the two sectors of land evaluation and terrain management, with a close relationship reflected in overlapping core programs. Terrain management also embraces geopollution management, with reference to groundwater and hydrological processes. Terrain evaluation is envisaged as serving a wide range of land management, including agricultural and biological management.

Soil Conservation

These programs are designed to provide graduate training in soil conservation for land management in arid zones. They are appropriate for personnel engaged in or preparing for positions in conservation or reclamation projects, agricultural advisory services, land-use planning, administration of pastoral lands, or research into problems of arid land management.

Range Management

These programs are designed to provide graduate training in the assessment and management of rangelands, and are also relevant to animal production and soil conservation, national parks and wildlife management, and land evaluation. They are appropriate for personnel engaged in or preparing for positions in project management, pastoral advisory services, and range/land research or administration.

Management of Pastoral Enterprises

These programs are designed to provide graduate training in the production and management of grazing sheep and beef cattle, the production of pasture, range management, and in the economic management of pastoral enterprises.

8025
Arid Lands Management Graduate Course
Master of Applied Science MAppSc

Hydrogeology

Prerequisite: Four-year degree of appropriate standard in geology or in a relevant science.

Compulsory Subject
25.915G Project in Hydrogeology or 25.916G Research Project in Hydrogeology

Recommended Core Subjects
8.842G Groundwater Hydrology
8.860G Investigation of Groundwater Resources 1
8.861G Investigation of Groundwater Resources 2
25.325 Engineering and Environmental Geology
25.702G Hydrogeology
25.711G Arid Zone Engineering Geology*
Candidates must also include additional subjects selected from core subjects in other programs in Water Resources, or from the listed optional subjects, or from other relevant subjects offered within the University, as approved by the Head of the School of Applied Geology and Heads of the other Schools concerned, to complete a program equivalent to an average of 20 hours per week for two sessions of full-time study.

Optional Subjects

8.701G Economic Decision Making in Civil Engineering
8.703G Optimization Techniques in Civil Engineering
8.833G Free Surface Flow
8.839G Advanced Flood Estimation
8.843G Groundwater Hydraulics
8.847G Water Resources Policy
8.848G Water Resources System Design
8.849G Irrigation
8.850G Drainage of Agricultural Land
27.043G Remote Sensing Applications
27.171G Directed Problems in Remote Sensing
27.174G Remote Sensing Instrumentation and Satellite Programs
27.901G Geomorphology for Hydrologists
27.914G Terrain Evaluation
27.910G Geomorphology of Arid Lands
27.911G Soil Erosion and Conservation
27.913G Soil Studies for Arid Lands Management
29.601G Remote Sensing Principles and Procedures
29.604G Land Information Systems

*Includes a field exercise of at least three days duration at Fowlers Gap Research Station.

Land Evaluation

Prerequisite: Four-year degree of appropriate standard in physical geography or related field.

Compulsory Subjects†

27.910G Geomorphology of Arid Lands
27.913G Soil Studies for Arid Lands Management
27.914G Terrain Evaluation
27.915G Project in Land Evaluation or
27.916G Research Project in Land Evaluation

Candidates must also include additional subjects selected from the following listed optional subjects, or from other relevant subjects offered within the University, as approved by the Head of the School of Geography and Heads of the other Schools concerned, to complete a program equivalent to an average of 20 hours per week for two sessions of full-time study.

Optional Subjects

9.205G Range Management‡
25.711G Arid Zone Engineering Geology* or
27.043G Remote Sensing Applications
27.171G Directed Problems in Remote Sensing
27.174G Remote Sensing Instrumentation and Satellite Programs
27.911G Soil Erosion and Conservation
27.912G Arid Zone Climatology
29.601G Remote Sensing Principles and Procedures
29.604G Land Information Systems

†Compulsory subjects jointly include one week of fieldwork, probably at Fowlers Gap Research Station.
‡Includes up to one week of fieldwork, probably at Fowlers Gap Research Station.
*Includes a field exercise of at least three days duration at Fowlers Gap Research Station.

Terrain Management

Prerequisite: Four-year degree of appropriate standard in geology or physical geography, or in a relevant environmental, biological or agricultural science.

Compulsory Subjects†

25.702G Hydrogeology
25.707G Geopollution Management
25.711G Arid Zone Engineering Geology* or
25.712G Project in Terrain Management or
25.713G Research Project in Terrain Management
27.910G Geomorphology of Arid Lands
27.914G Terrain Evaluation

Candidates must also include additional subjects selected from the following listed optional subjects, or from other relevant subjects offered within the University, as approved by the Head of the School of Applied Geology and Heads of the other Schools concerned, to complete a program equivalent to an average of 20 hours per week for two sessions of full-time study.

Optional Subjects

8.837G Hydrological Processes
27.043G Remote Sensing Applications
27.171G Directed Problems in Remote Sensing
27.174G Remote Sensing Instrumentation and Satellite Programs
27.911G Soil Erosion and Conservation
27.913G Soil Studies for Arid Lands Management
29.601G Remote Sensing Principles and Procedures
29.604G Land Information Systems

†Compulsory subjects jointly include one week of fieldwork, probably at Fowlers Gap Research Station.
‡Includes a field exercise of at least three days duration at Fowlers Gap Research Station.

Soil Conservation

Prerequisite: Four-year degree of appropriate standard in physical geography or related field.

Compulsory Subjects†

27.910G Geomorphology of Arid Lands
27.911G Soil Erosion and Conservation
27.913G Soil Studies for Arid Lands Management
27.917G Project in Soil Conservation or
27.918G Research Project in Soil Conservation

Candidates must also include additional subjects selected from the following listed optional subjects, or from other relevant subjects offered within the University, as approved by the Head of the School of Geography and Heads of the other Schools concerned, to complete a program equivalent to an average of 20 hours per week for two sessions of full-time study.
Optional Subjects

8.864G Arid Zone Surface Water Hydrology§
8.865G Arid Zone Water Resources Management
9.205G Range Management‡
25.711G Arid Zone Engineering Geology* 
27.043G Remote Sensing Applications
27.171G Directed Problems in Remote Sensing
27.174G Remote Sensing Instrumentation and Satellite Programs
27.912G Arid Zone Climatology
27.914G Terrain Evaluation
45.900G Ecological Studies in Arid Lands Management

§Co-requisites 8.837G Hydrological Processes 8.838G Flood Design
†Compulsory subjects jointly include one week of fieldwork, probably at Fowlers Gap Research Station.
*Includes a field exercise of at least three days duration at Fowlers Gap Research Station.

5025 Arid Lands Management Graduate Diploma Course
Graduate Diploma GradDip

Hydrogeology
Prerequisite: Degree in engineering or geology or in a relevant science.

Recommended Core Subjects
As for 8025 MAAppSc degree Hydrogeology strand (see earlier this section).

Candidates must also include additional subjects selected from core subjects in other programs in Water Resources, or from other relevant subjects offered within the University, as approved by the Head of the School of Applied Geology and Heads of the other Schools concerned, to complete a program equivalent to an average of 18 hours per week for two sessions of full-time study.

Optional Subjects
As for 8025 MAAppSc degree Hydrogeology strand (see earlier this section).

Land Evaluation
Prerequisite: Degree in physical geography or geology, or in a relevant environmental, biological or agricultural science.

Compulsory Subjects‡
27.910G Geomorphology of Arid Lands
27.913G Soil Studies for Arid Lands Management
27.914G Terrain Evaluation
27.915G Project in Land Evaluation

Candidates must also include additional subjects selected from the following listed optional subjects, or from other relevant subjects offered within the University, as approved by the Head of the School of Applied Geology and Heads of the other Schools concerned, to complete a program equivalent to an average of 18 hours per week for two sessions of full-time study.

Optional Subjects
8.837G Hydrological Processes
25.702G Hydrogeology
25.707G Geopollution Management
27.043G Remote Sensing Applications
27.171G Directed Problems in Remote Sensing
27.174G Remote Sensing Instrumentation and Satellite Programs
27.911G Soil Erosion and Conservation
27.912G Arid Zone Climatology
29.601G Remote Sensing Principles and Procedures
29.604G Land Information Systems
45.900G Ecological Studies in Arid Lands Management

†Compulsory subjects jointly include one week of fieldwork, probably at Fowlers Gap Research Station.
*Includes a field exercise of at least three days duration at Fowlers Gap Research Station.

Terrain Management
Prerequisite: Degree in geology or physical geography, or in a relevant environmental, biological or agricultural science.

Compulsory Subjects‡
25.711G Arid Zone Engineering Geology*
25.712G Project in Terrain Management
27.910G Geomorphology of Arid Lands
27.914G Terrain Evaluation

Candidates must also include additional subjects selected from the following listed optional subjects, or from other relevant subjects offered within the University, as approved by the Head of the School of Applied Geology and Heads of the other Schools concerned, to complete a program equivalent to an average of 18 hours per week for two sessions of full-time study.

Optional Subjects
8.837G Hydrological Processes
25.702G Hydrogeology
25.707G Geopollution Management
27.043G Remote Sensing Applications
27.171G Directed Problems in Remote Sensing
27.174G Remote Sensing Instrumentation and Satellite Programs
27.911G Soil Erosion and Conservation
27.913G Soil Studies for Arid Lands Management
29.601G Remote Sensing Principles and Procedures
29.604G Land Information Systems

†Compulsory subjects jointly include one week of fieldwork, probably at Fowlers Gap Research Station.
*Includes a field exercise of at least three days duration at Fowlers Gap Research Station.
Soil Conservation
Prerequisite: Degree in physical geography or agricultural science, or in a relevant earth science or biological science.

Compulsory Subjects
27.910G Geomorphology of Arid Lands
27.911G Soil Erosion and Conservation
27.913G Soil Studies for Arid Lands Management
27.917G Project in Soil Conservation.

Candidates must also include additional subjects selected from the following listed optional subjects, or from other relevant subjects offered within the University, as approved by the Head of the School of Geography and Heads of the other Schools concerned, to complete a program equivalent to an average of 18 hours per week for two sessions of full-time study.

Optional Subjects
8.865G Arid Zone Water Resources Management
9.205G Range Management†
25.711G Arid Zone Engineering Geology*  
27.043G Remote Sensing Applications
27.171G Directed Problems in Remote Sensing
27.174G Remote Sensing Instrumentation and Satellite Programs
27.912G Arid Zone Climatology
27.914G Terrain Evaluation
29.601G Remote Sensing Principles and Procedures
29.604G Land Information Systems
45.900G Ecological Studies in Arid Lands Management

Compulsory subjects jointly include one week of fieldwork, probably at Fowlers Gap Research Station.
†Includes up to one week of fieldwork at Fowlers Gap Research Station.
*Includes a field exercise of at least three days duration at Fowlers Gap Research Station.

Range Management††
Prerequisite: Degree in agricultural science, or in a relevant biological or earth science.

Compulsory Subject
9.205G Range Management‡

Recommended Subject**
45.900G Ecological Studies in Arid Lands Management

Candidates must also include additional subjects selected from the following listed optional subjects, or from other relevant subjects offered within the University, as approved by the Head of the School of Wool and Pastoral Sciences and Heads of the other Schools concerned, to complete a program equivalent to an average of 18 hours per week for two sessions of full-time study.

Optional Subjects
9.001 Project in Management of Pastoral Enterprises
9.105G Livestock Production
9.205G Range Management‡

Includes up to one week of fieldwork at Fowlers Gap Research Station.

Graduate Programs in Remote Sensing
Programs are available leading to the award of:
Master of Applied Science in Remote Sensing Course 8026
Graduate Diploma in Remote Sensing Course 5026
8026
Remote Sensing Graduate Course
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, physical geography, geology, surveying, or in a relevant environmental biological or agricultural science.

Course requirements Candidates are required to complete a course totalling at least 36 credits, made up of compulsory subjects, elective subjects and a project or research project. Compulsory subjects not offered in a particular year may be substituted by an equivalent subject, approved by the appropriate Head of School. The degree will normally comprise one year of full-time study (two sessions of 18 credits) or two years of part-time study (four sessions of 9 credits each).

Candidates who are not exempted from any of the compulsory subjects and who opt for the Research Project (18 credits), will achieve the required 36 credits without any elective subjects.

Compulsory Subjects

| Credits | 6.580G Image Analysis in Remote Sensing | 3 |
| Credits | 6.587G Computer Techniques in Remote Sensing | 3 |
| Credits | 27.043G Remote Sensing Applications | 3 |
| Credits | 29.601G Remote Sensing Principles and Procedures* | 6 |
| Credits | 29.605G Ground Investigations for Remote Sensing | 3 |

*Includes Group Practical Exercises in Remote Sensing, C3

Project

| Credits | 46.101G Project in Remote Sensing or | 9 |
| Credits | 46.102G Research Project in Remote Sensing | 18 |

Elective Subjects

Candidates are required to include additional subjects selected from the following listed elective subjects, or from other relevant subjects offered within the University, as approved by the appropriate Head of School, to complete a program totalling 36 credits.

| Credits | 6.458G Decision and Syntactic Systems for Digital Pattern Recognition | 3 |
| Credits | 6.468G Computer Display Systems and Interactive Instrumentation | 3 |
| Credits | 6.611 Computing 1 | 4 |
| Credits | 6.621 Computing 2A | 3 |
| Credits | 25.816G Remote Sensing in Applied Geology | 2 |
| Credits | 27.642 Mathematical Methods for Spatial Analysis | 2 |

5026
Remote Sensing Graduate Diploma Course
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 30 credits or equivalent to 15 hours per week for two sessions of full-time study, made up of compulsory subjects (15 credits) and elective subjects (15 credits). 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. One-third of the credits for elective subjects may be from approved undergraduate subjects.

Compulsory Subjects

| Credits | 6.580G Image Analysis in Remote Sensing | 3 |
| Credits | 29.600G Principles of Remote Sensing | 3 |
| Credits | 29.605G Ground Investigations for Remote Sensing | 3 |
| Credits | 27.174G Remote Sensing Instrumentation and Satellite Programs | 3 |
| Credits | 27.043G Remote Sensing Applications | 3 |

Elective Subjects

From the following (or as approved by the relevant Faculty):

| Credits | 6.458G Decision and Syntactic Systems for Digital Pattern Recognition | 3 |
| Credits | 6.468G Computer Display Systems and Interactive Instrumentation | 3 |
| Credits | 6.587G Computing Techniques in Remote Sensing Image Analysis | 3 |
| Credits | 8.837G Hydrological Processes | 3 |
| Credits | 8.849G Irrigation | 3 |
| Credits | 8.861G Investigation of Ground Water Resources 2 | 3 |
| Credits | 8.864G Arid Zone Hydrology | 3 |
| Credits | 8.865G Arid Zone Water Resources Management | 3 |
| Credits | 25.704G Environmental Geology | 3 |
This is an interdisciplinary course 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, management and planning.

The subject matter covers a set of themes: resource use and conservation, pollution abatement, hazard perception and adjustment. Strong attention will be given to environmental impact assessment and conflict resolution.

The course is designed around three broad components for a minimum of 40 credits (1 credit = 1 hour per week per one session):

- Core subjects (10 credits)
- Project (20 credits)
- Electives (10 credits)

The core subjects and electives will consist of subjects specially designed together with appropriate subjects taken from those offered by a number of Faculties and Boards of Studies within the University of New South Wales. Prerequisites shall be determined by the relevant Subject Authority.

Core Subjects

Core Subjects Credits
27.202G Environmental Planning and Evaluation 3
36.945G The Organization of Town Planning 2
46.201G Themes in Environmental Studies 3
46.203G Medical Aspects 1
46.204G Legislative Aspects 1

Project
46.200G Project 20

Elective Subjects Credits

Earth Science — Engineering
8.021 Environmental Aspects of Civil Engineering 3
8.847G Water Resources Policy 3
25.704G Environmental Geology 3
25.707G Geopolllution Management 3
25.710G Coastal Environmental Geology 3
27.043G Remote Sensing Applications 3
27.133 Pedology 5
27.171G Directed Problems in Remote Sensing 3
27.174G Remote Sensing Instrumentation and Satellite Programs 3
27.183 Geomorphology 5
27.902G Meteorological and Hydrological Principles 3

School of Applied Geology

8020
Engineering Geology-Hydrogeology-Environmental Geology Course

Master of Applied Science MAAppSc

The course consists of a Project (Group A) and six subjects chosen from Group B, at least one of which must be 25.702G Hydrogeology, 25.704G Environmental Geology, or 25.708G Engineering Geology. In special cases, eg where students have achieved a satisfactory standard in Geomechanics, those students taking 25.708G Engineering Geology and/or 25.714G Geology of Foundations, may select in place of 25.706G either another subject from Group B, or one subject from another Faculty, provided such a subject is relevant to the course.

The Project normally consists of field and laboratory work, and is related to the student's major interest. Students must
consult the Professor of Engineering Geology for approval of the Project.

### Group A

<table>
<thead>
<tr>
<th>Code</th>
<th>Course</th>
<th>Hours per week</th>
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<td>25.703G</td>
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### Group B

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<th>Code</th>
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<tbody>
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<td>25.702G</td>
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<tr>
<td>25.704G</td>
<td>Environmental Geology</td>
<td>3  0</td>
</tr>
<tr>
<td>25.705G</td>
<td>Engineering Geophysics</td>
<td>3  0</td>
</tr>
<tr>
<td>25.706G</td>
<td>Geological Basis of Geomechanics</td>
<td>3  0</td>
</tr>
<tr>
<td>25.707G</td>
<td>Geopollution Management</td>
<td>3  0</td>
</tr>
<tr>
<td>25.708G</td>
<td>Engineering Geology</td>
<td>3  0</td>
</tr>
<tr>
<td>25.710G</td>
<td>Coastal Environmental Geology</td>
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</tr>
<tr>
<td>25.714G</td>
<td>Geology of Foundations</td>
<td>3  0</td>
</tr>
<tr>
<td>27.904G</td>
<td>Geomorphology for Engineering Geologists</td>
<td>3  0</td>
</tr>
</tbody>
</table>

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**8091**

**Mineral Exploration Graduate Course**

**Master of Applied Science**

**MApSc**

The course is designed to give broad training in techniques of modern mineral exploration to geologists and mining engineers. Practical aspects are emphasized and the field-laboratory project is oriented to current problems of mineral exploration.

The duration of the course is one academic year of full-time study; the course is, however, divided into three units to facilitate part-time study. All students must complete Units A, B and C. Formal course work (Units A and B) accounts for 20-22 hours per week during Session 1. Some students (depending on their qualifications) may be required to take a Special Project, 25.000G, either as a pre- or co-requisite. The courses within the three units may be varied at the discretion of the Head of the School to suit the requirements of individual students.

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**Unit A (Weeks 1-7 Session 1)**

- 25.800G Seminar
- 25.801G Geology in Exploration 1
- 25.802G General Introduction to Exploration Geophysics
- 25.803G Introduction to Exploration Geochemistry
- 25.804G Introduction to Data Processing and Interpretation
- 25.805G Resource Economics 1 and either
- 25.806G Exploration Geophysics or
- 25.807G Exploration Project or
- 7.013* Principles of Mining and
- 7.044* Mining Economics

Seven days of field tutorials are an integral part of Unit A.

*These are one session subjects, ie weeks 1-14.

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**Unit B (Weeks 8-14 Session 1)**

- 25.811G Advanced Geology in Exploration
- 25.815G Resource Economics 2
- 25.816G Remote Sensing
- 25.817G Mining Law and Exploration Management
- 25.840G Seminar 7.001G Exploration Drilling and either
- 7.013* Principles of Mining and
- 7.044* Mining Economics or
- 25.818G Exploration Project

*These are one session subjects, ie weeks 1-14.

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**Unit C (Session 2)**

- 25.819G Field — Laboratory Project

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**8092**

**Exploration Geophysics Graduate Course**

**Master of Applied Science**

**MApSc**

This is a specialized course in the techniques of exploration geophysics relevant to the current needs of the exploration industry. Practical applications are emphasized, and the field-laboratory project is designed to investigate aspects of specific exploration problems.

The duration of the course is one academic year of full-time study; the course is, however, divided into three units to facilitate part-time study. All students must complete Units A, B and C. Formal course work (Units A and B) accounts for 20-22 hours per week during Session 1. Some students (depending on their qualifications) may be required to take
a Special Project 25.000G either as a pre- or co-requisite. The courses within the three units may be varied at the discretion of the Head of the School to suit the requirements of individual students.

Unit A (Weeks 1-7 Session 1)
25.800G Seminar
25.801G Geology in Exploration 1
25.802G General Introduction to Exploration Geophysics
25.803G Introduction to Exploration Geochemistry
25.804G Introduction to Data Processing and Interpretation
25.805G Resource Economics 1
25.807G Exploration Geophysics

Seven days field tutorials are an integral part of Unit A.

Unit B (Weeks 8-14 Session 1)
25.821G Geology in Exploration 2
25.823G Advanced Exploration Geophysics
25.824G Advanced Data Processing and Interpretation
25.827G Laboratory methods
25.840G Seminar
and either
7.013* Principles of Mining
and
7.044* Mining Economics
or
25.808 Exploration Project

*These are one session subjects, ie weeks 1-14.

Unit C (Session 2)
25.839G Field — Laboratory Project

8093 Exploration Geochemistry Graduate Course

Master of Applied Science MAppSc

This is a specialist course in the techniques of exploration geochemistry covering general principles, specific field applications, laboratory techniques, and data display and interpretation. Practical applications are emphasized and the field-laboratory project is designed to investigate aspects of mineral exploration problems.

The duration of the course is one academic year of full-time study; the course is, however, divided into three units to facilitate part-time study. All students must complete units A, B and C. Formal course work (Units A and B) accounts for 20-22 hours per week during Session 1. Some students (depending upon their qualifications) may be required to take a Special Project, 25.000G, either as a pre- or co-requisite. The courses within the three units may be varied at the discretion of the Head of the School to suit the requirements of individual students.

Unit A (Weeks 1-7 Session 1)
25.800G Seminar
25.801G Geology in Exploration 1
25.802G General Introduction to Exploration Geophysics
25.803G Introduction to Exploration Geochemistry
25.804G Introduction to Data Processing and Interpretation
25.805G Resource Economics 1
and either
7.013* Principles of Mining
and
7.044* Mining Economics
or
25.808 Exploration Project

*These are one session subjects, ie weeks 1-14.

Unit B (Weeks 8-14 Session 1)
25.821G Geology in Exploration 2
25.823G Advanced Exploration Geophysics
25.824G Advanced Data Processing and Interpretation
25.827G Laboratory methods
25.840G Seminar
and either
7.013* Principles of Mining
and
7.044* Mining Economics
or
25.828G Exploration Project

*These are one session subjects, ie weeks 1-14.

Unit C (Session 2)
25.829G Field — Laboratory Project

School of Chemical Engineering and Industrial Chemistry

Formal courses in the School of Chemical Engineering and Industrial Chemistry lead to the award of the Master of Applied Science or the Graduate Diploma.

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 graduate courses are available to Master of Applied Science degree course candidates. Candidates may specialize in the following areas:

- Bioprocess Engineering (Course 8000)
- Chemical Engineering and Industrial Chemistry (Course 8015)
- Fuel Technology (Course 8060)

The MAppSc degree courses provide for a comprehensive study of theoretical and practical aspects of many advanced topics. The courses are formal and elective in nature and provide an opportunity for graduates to apply their basic skills in fields in which the School has developed special expertise.

The courses specializing in Chemical Engineering and Industrial Chemistry and Fuel Technology are primarily intended for graduates in Applied Science, Engineering, or Science with principal interests in Chemistry, Mathematics and/or Physics. The course specializing in Bioprocess Engineering is primarily intended for graduates in Agriculture, Applied Science, and Science with principal interests in Biochemistry, Chemistry, and/or Microbiology. They are designed to allow the maximum flexibility consistent with the standing of the award.

Intending candidates are invited to submit proposed study programs 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 (generally designated as subjects without a suffixed G number), 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. Full details of all subjects are listed under Disciplines of the University in the Calendar.

Further, some of these units are designed as bridging material and would not be offered to graduates with previous qualifications in these particular areas.

The units offered are summarized below.

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Hours per week</th>
</tr>
</thead>
<tbody>
<tr>
<td>48.281G</td>
<td>Design of Microbial Reactors</td>
<td>S1: 1, S2: 0</td>
</tr>
<tr>
<td></td>
<td>Unit 1 Rate Processes</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Unit 2 Fundamentals of Microbial Stoichiometry</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Unit 3 Design of Microbial Reactors</td>
<td></td>
</tr>
<tr>
<td>48.282G</td>
<td>Microbial Kinetics and Energetics</td>
<td>S1: 1, S2: 1</td>
</tr>
<tr>
<td></td>
<td>Unit 1 Microbial Kinetics</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Unit 2 Microbial Energetics</td>
<td></td>
</tr>
<tr>
<td>48.283G</td>
<td>Bioprocess Unit Operations and Equipment Design</td>
<td>S1: 2, S2: 2</td>
</tr>
<tr>
<td>48.284G</td>
<td>Heat, Mass and Momentum</td>
<td>S1: 3, S2: 2</td>
</tr>
<tr>
<td>48.285G</td>
<td>Bioprocess Laboratory</td>
<td>S1: 1, S2: 3</td>
</tr>
</tbody>
</table>

This course is designed to provide professional training in the application of chemical engineering principles in the bioprocess industries. It extends over one full-time year or two part-time years and leads to the award of the degree of Master of Applied Science as outlined above.

As the material in this course will be of interest to graduates from a wide range of disciplines, the suggested course outlines consist of a central core selected from the subjects above and a range of background material. This background material can be designed to suit graduates from either of the two groups consisting of firstly Applied Science, Engineering or Science with principal interests in Chemistry, Mathematics, or Physics, or, secondly, Agriculture or Science graduates with principal interests in Biochemistry, Chemistry and/or Microbiology. Graduates with an inadequate background in Mathematics and/or Rate Processes are required to do a bridging course consisting of a specified reading list with associated assignments up to a maximum of 1 hour per week.

Suggested course outlines for graduates from the two primary areas are given below, however these outlines may be modified to suit individual interests within the general requirements for the MAppSc degree course described above.

### Applied Science Graduate or equivalent

#### Core Subjects

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Hours per week</th>
</tr>
</thead>
<tbody>
<tr>
<td>48.281G</td>
<td>Unit 3 Design of Microbial Reactors</td>
<td>S1: 1</td>
</tr>
<tr>
<td>48.282G</td>
<td>Microbial Kinetics and Energetics</td>
<td>S1: 3</td>
</tr>
<tr>
<td>48.283G</td>
<td>Bioprocess Unit Operations and Equipment Design</td>
<td>S1: 2½</td>
</tr>
<tr>
<td>48.285G</td>
<td>Bioprocess Laboratory</td>
<td>S1: 1½</td>
</tr>
<tr>
<td>48.900G</td>
<td>Project</td>
<td>S1: 6</td>
</tr>
</tbody>
</table>

---

*For additional information on the MAppSc degree course see above.*
Plus 6 hours of other material, for example:

1. Students wishing a more complete coverage of the life sciences may select

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
</tr>
</thead>
<tbody>
<tr>
<td>42.211G</td>
<td>Principles of Biology</td>
</tr>
<tr>
<td>42.212G</td>
<td>Principles of Biochemistry</td>
</tr>
<tr>
<td>44.101</td>
<td>Introductory Microbiology*</td>
</tr>
</tbody>
</table>

*Students should note the special proviso for enrolment in this subject as indicated in the Subject Descriptions earlier in this handbook.

2. Students wishing to reinforce other areas in chemical engineering may select

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
</tr>
</thead>
<tbody>
<tr>
<td>44.101</td>
<td>Introductory Microbiology*</td>
</tr>
<tr>
<td>48.281G</td>
<td>Unit 2 — Fundamentals of Microbial Stoichiometry</td>
</tr>
</tbody>
</table>

*Students should note the special proviso in this subject as indicated in the Subject Descriptions earlier in this handbook.

Science Graduate with a principal interest in the Life Sciences or equivalent

Core Subjects

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
</tr>
</thead>
<tbody>
<tr>
<td>48.281G</td>
<td>Unit 1 Rate Processes</td>
</tr>
<tr>
<td>48.282G</td>
<td>Microbial Kinetics and Energetics</td>
</tr>
<tr>
<td>48.283G</td>
<td>Bioprocess Unit Operations and Equipment Design</td>
</tr>
<tr>
<td>48.284G</td>
<td>Heat, Mass and Momentum Transport</td>
</tr>
<tr>
<td>48.900G</td>
<td>Project</td>
</tr>
</tbody>
</table>

Plus 6 hours of other material, for example:

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
</tr>
</thead>
<tbody>
<tr>
<td>38.159G</td>
<td>Food Process Wastes</td>
</tr>
<tr>
<td>48.063G</td>
<td>Industrial Water and Wastewater Engineering</td>
</tr>
<tr>
<td>48.396G</td>
<td>Unit Operations in Waste Management Reading List (Mathematics)</td>
</tr>
</tbody>
</table>

8060 Fuel Technology Graduate Course*

Master of Applied Science MAppSc

This is a formal course leading to the award of the degree of Master of Applied Science. It is a two-year part-time course designed to provide professional training and specialization in fuel science or fuel engineering for graduates in science, applied science or engineering who have not had substantial previous formal education in these subjects.

The course is based on the general formula for a MAppSc degree program, whereby the subjects 48.311 and 48.321 can comprise the 25% undergraduate component, the project (15% or 30% of the program) is 48.900G, and the remainder of the hours can be taken from the units offered in the 48.38-G and 48.39-G series of subjects. There are also compulsory seminar and laboratory practice subjects.

The course allows reasonable flexibility with a choice of subjects, and units within subjects, subject to the availability of staff.

Provision is made for subjects outside those offered by the Department to be incorporated in the program at either graduate or undergraduate level.

5010 Corrosion Technology Graduate Diploma Course

Graduate Diploma GradDip

The Graduate Diploma course in Corrosion Technology is open to graduates in Engineering, Applied Science or Science who wish to undertake formal studies to promote their careers in industry. At present it may only be taken as a two-year part-time course and is offered every third year.

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 of overcoming it.

For graduates from Engineering (non-chemical) or Science (in a particular major) a bridging course may be necessary.

Year 1 of the course introduces elementary aspects of corrosion technology and suitably orientates students depending on their background.

*For additional information on the MAppSc degree course see earlier this section.
on their initial qualifications. Year 2 of the course contains more detailed instruction at a graduate level in corrosion theory and prevention, together with a suitable project.

**Year 1**

<table>
<thead>
<tr>
<th>Course</th>
<th>Hours per week</th>
</tr>
</thead>
<tbody>
<tr>
<td>48.121 Corrosion in the Chemical Industry</td>
<td>0 2</td>
</tr>
<tr>
<td>48.180G Corrosion Materials</td>
<td>2 2</td>
</tr>
<tr>
<td>48.181G Industrial Coatings for Corrosion Protection</td>
<td>2 0</td>
</tr>
<tr>
<td></td>
<td>4 4</td>
</tr>
</tbody>
</table>

**Year 2**

<table>
<thead>
<tr>
<th>Course</th>
<th>Hours per week</th>
</tr>
</thead>
<tbody>
<tr>
<td>48.171 Chemistry of High Temperature Materials</td>
<td>0 2</td>
</tr>
<tr>
<td>48.182G Non-metallic Materials for Corrosion Resistance</td>
<td>2 0</td>
</tr>
<tr>
<td>48.183G Corrosion Technology</td>
<td>3 3</td>
</tr>
<tr>
<td>48.184G Corrosion Project</td>
<td>6 6</td>
</tr>
<tr>
<td></td>
<td>11 11</td>
</tr>
</tbody>
</table>

---

**School of Food Science and Technology**

The School of Food Science and Technology conducts formal courses leading to the award of the Master of Applied Science degrees and of the Graduate Diploma in Food Technology.

In addition, the School 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 and Doctor of Philosophy.

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

**8030 Food Technology Graduate Course**

**Master of Applied Science MAppSc**

This course provides for a comprehensive study of theoretical and applied aspects of the science and technology of foods. The course is formal and elective in nature, providing an opportunity for graduates to apply their basic skills in areas relevant to this field of applied science, and is particularly relevant to graduates in agriculture, applied science and science with principal interests in chemistry, biochemistry, microbiology, physiology, nutrition and chemical engineering.

Intending candidates are invited to submit proposed study programs 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 20 hours weekly for two sessions full-time or ten hours weekly for four sessions part-time, and which could comprise:

1. A major strand of course material making up 75 per cent of the total program. This would include a project constituting not less than 15 per cent and not more than 30 per cent of the program.

2. A minor strand of broader-based supporting material making up to 25 per cent of the total program.

Undergraduate material may be included in one or both strands but may not exceed 25 per cent of the total program. Approximately 60 per cent of the program (including the project) must be taken in the School of Food Science and Technology. The remainder, subject to approval and availability, may be undertaken in other schools within the University.

Graduate subjects in Food Technology may be selected from:

<table>
<thead>
<tr>
<th>Course</th>
<th>Hours per week</th>
</tr>
</thead>
<tbody>
<tr>
<td>38.151G Introductory Food Science</td>
<td>1</td>
</tr>
<tr>
<td>38.152G Food Process Laboratory</td>
<td>3</td>
</tr>
<tr>
<td>38.153G Food Technology Seminar</td>
<td>1</td>
</tr>
<tr>
<td>38.155G Dairy Technology</td>
<td>2</td>
</tr>
<tr>
<td>38.156G Oenology</td>
<td>1</td>
</tr>
<tr>
<td>38.157G Technology of Cereal Products</td>
<td>1</td>
</tr>
<tr>
<td>38.158G Marine Products</td>
<td>1</td>
</tr>
<tr>
<td>38.161G Food Additives and Toxicology</td>
<td>1</td>
</tr>
<tr>
<td>38.162G Postharvest Physiology and Handling of Fruit and Vegetables</td>
<td>3</td>
</tr>
<tr>
<td>38.164G Elements of Food Preservation</td>
<td>2½</td>
</tr>
<tr>
<td>38.165G Plant Food Products</td>
<td>1½</td>
</tr>
<tr>
<td>38.166G Animal Food Products</td>
<td>1</td>
</tr>
<tr>
<td>38.350G Food Microbiology</td>
<td>2</td>
</tr>
<tr>
<td>38.351G The Microbial Ecology of Foods</td>
<td>3</td>
</tr>
<tr>
<td>38.451G Advanced Food Engineering</td>
<td>1½</td>
</tr>
<tr>
<td>38.452G Drying of Foods</td>
<td>1½</td>
</tr>
<tr>
<td>38.551G Advanced Nutrition</td>
<td>1½</td>
</tr>
<tr>
<td>38.552G Methods of Nutritional Assessment and Analysis</td>
<td>3</td>
</tr>
<tr>
<td>38.553G Principles of Nutrition</td>
<td>2</td>
</tr>
<tr>
<td>38.900G Major Project</td>
<td>6</td>
</tr>
<tr>
<td>38.901G Minor Project</td>
<td>3</td>
</tr>
</tbody>
</table>

*Weekly equivalent of total hours for subject. These hours may be concentrated in one session.

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 co-requisites. A particular subject may not necessarily be conducted in any one year.

8035
Food Engineering Graduate Course
Master of Applied Science
MApSo

This course is designed for graduates who have a degree in Engineering or a related field of study, and an interest in the processing of biological resources.

The formal components of the course provide professional training at an advanced level in food science and in food engineering. The studies in food science deal with nutrition, food chemistry, microbiology, food preservation and the technology of plant, animal and marine foods. These subjects have been specially prepared and no previous experience in these areas is necessary. The studies in food engineering are designed to strengthen and broaden the engineering background of graduates and will emphasize the use of fundamental principles in solving problems associated with food processing.

Problem-solving skills are further developed in a research project devoted to an area of food engineering.

The course requires three sessions of full-time study. The details of the course are as follows:

<table>
<thead>
<tr>
<th>Session A</th>
<th>Hours per week*</th>
</tr>
</thead>
<tbody>
<tr>
<td>38.701G Man's Food</td>
<td>1</td>
</tr>
<tr>
<td>38.702G Food Engineering A</td>
<td>4</td>
</tr>
<tr>
<td>38.703G Food Engineering B</td>
<td>3</td>
</tr>
<tr>
<td>38.704G Food Chemistry and Enzymology</td>
<td>3</td>
</tr>
<tr>
<td>38.705G Introductory Food Microbiology</td>
<td>2</td>
</tr>
<tr>
<td>38.706G Food Storage and Preservation</td>
<td>2</td>
</tr>
<tr>
<td>38.707G Reading Assignment</td>
<td>1</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>16</strong></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Session B</th>
<th>Hours per week*</th>
</tr>
</thead>
<tbody>
<tr>
<td>38.708G Food Engineering C</td>
<td>4</td>
</tr>
<tr>
<td>38.709G Technology of Food Drying</td>
<td>3</td>
</tr>
<tr>
<td>38.710G Science and Technology of Animal Products</td>
<td>3</td>
</tr>
<tr>
<td>38.711G Science and Technology of Plant Products</td>
<td>3</td>
</tr>
<tr>
<td>38.712G Food Engineering Laboratory</td>
<td>3</td>
</tr>
<tr>
<td>38.713G Human Nutrition</td>
<td>1</td>
</tr>
<tr>
<td>38.714G Literature Survey</td>
<td>1</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>18</strong></td>
</tr>
</tbody>
</table>

Session C

<table>
<thead>
<tr>
<th>Hours per week*</th>
</tr>
</thead>
<tbody>
<tr>
<td>38.700G Major Project</td>
</tr>
<tr>
<td>38.715G Food Engineering Field Work</td>
</tr>
<tr>
<td><strong>Elective Material</strong></td>
</tr>
</tbody>
</table>

*Weekly equivalent of total hours for subject. These hours may be concentrated in one session.

Elective material may be selected from any subject offered by the University, subject to approval by the Head of the School of Food Science and Technology. The Australian Government, through the Australian Development Assistance Bureau (ADAB), Department of Foreign Affairs, recognizes and supports this course as an Australian Development Assistance Course. Nominations for Australian awards to overseas graduates are considered only when made by national governments and submitted through the local Australian diplomatic mission.

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 the School.

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 (17 hours/week), or two years of part-time study (8½ hours/week). It involves the following program:

<table>
<thead>
<tr>
<th>Hours per week*</th>
</tr>
</thead>
<tbody>
<tr>
<td>38.151G Introductory Food Science</td>
</tr>
<tr>
<td>38.152G Food Process Laboratory</td>
</tr>
<tr>
<td>38.164G Elements of Food Preservation</td>
</tr>
<tr>
<td>38.165G Plant Food Products</td>
</tr>
<tr>
<td>38.166G Animal Food Products</td>
</tr>
<tr>
<td>38.350G Food Microbiology</td>
</tr>
<tr>
<td>38.553G Principles of Nutrition</td>
</tr>
<tr>
<td><strong>Electives†</strong></td>
</tr>
</tbody>
</table>

*Weekly equivalent of total hours for subject. These hours may be concentrated in one session.

†Electives are to be selected from the following list of subjects according to availability and with the approval of the Head of School.
Graduate Study: Course Outlines

2.271G Chemistry and Analysis of Foods
38.142 Oenology
38.144 Treatment and Utilization of Food Processing Wastes
38.157G Technology of Cereal Products
38.158G Marine Products
38.162G Postharvest Physiology and Handling of Fruit and Vegetables
38.341 Food Microbiology 2
38.344 Yeast Technology
38.432 Food Engineering 2
38.443 Food Engineering 3
38.551G Advanced Nutrition
38.552G Methods of Nutritional Assessment and Analysis
42.102A Biotechnology A
42.211G Principles of Biology
42.212G Principles of Biochemistry
42.213G Biochemical Methods
42.214G Biotechnology
44.101 Introductory Microbiology

or such other electives approved by the Head of School. In all cases the hours devoted to graduate subjects constitute at least 50 per cent of the total course hours.

School of Metallurgy

The School of Metallurgy welcomes enquiries 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, Master of Engineering or Doctor of Philosophy in metallurgy or ceramic engineering.

The Head of the School is pleased to give information about research scholarships, fellowships and grants-in-aid. Graduates are advised to consult him before making a formal application for registration.

School of Mining Engineering

8055 Mineral Engineering Graduate Course
Master of Applied Science MAppSc

The course is designed to provide a comprehensive study of theoretical and practical aspects of mineral processing technology at an advanced level. Formal subjects represent approximately 75 per cent of the program, the remaining 25 per cent being devoted to a project. Election in choice of project work permits specialization in mineral processing or coal preparation. Candidates who do not have an appropriate academic background may be required to enrol in related undergraduate subjects as prerequisites. Consideration is given to full-time or part-time enrolment.

Subjects

<table>
<thead>
<tr>
<th>Hours per week</th>
<th>S1</th>
<th>S2</th>
</tr>
</thead>
<tbody>
<tr>
<td>7.013 Principles of Mining</td>
<td>2</td>
<td>0</td>
</tr>
<tr>
<td>7.361G Minerals Engineering 1</td>
<td>7</td>
<td>0</td>
</tr>
<tr>
<td>7.362G Minerals Engineering 2</td>
<td>8</td>
<td>0</td>
</tr>
<tr>
<td>7.363G Minerals Engineering Laboratory</td>
<td>3</td>
<td>0</td>
</tr>
<tr>
<td>7.364G Minerals Engineering 3</td>
<td>0</td>
<td>8</td>
</tr>
<tr>
<td>7.365G Minerals Engineering Project</td>
<td>0</td>
<td>10</td>
</tr>
<tr>
<td>7.442G Minerals Industry Analysis</td>
<td>0</td>
<td>2</td>
</tr>
<tr>
<td>Total</td>
<td>20</td>
<td>20</td>
</tr>
</tbody>
</table>

1. When appropriate, and subject to the approval of the Head of The School of Mining Engineering, up to 4 hours per week may be selected from approved courses offered within the University in place of units in which students have prior expertise.

2. Undergraduate material may not exceed 20 per cent of the total program.

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

4. Attendance at field trips totalling up to one week may be required.

8056 Mining Geomechanics Graduate Course — Part-time (External)
Master of Applied Science MAppSc

The course is offered to enable graduate mining engineers, geologists and civil engineers stationed in remote locations to carry out advanced theoretical and practical studies in geomechanics applicable to mining operations. Most of the work is completed by correspondence, with the exception of short annual residential schools of two weeks duration at the Kensington campus.

Enquiries from graduates living in the Sydney metropolitan area, as well as from graduates in other disciplines, are welcomed. In the latter case it may be necessary to include supporting subjects at undergraduate level within the Masters' program as approved by the Head of School of Mining Engineering, up to a maximum of 25 per cent of the total program. It may also be necessary in some circumstances to take some prerequisite or co-requisite background undergraduate subjects, as directed by the Head of School.
The program consists of formal study equivalent to nine to ten hours of lectures per week, depending on the subjects chosen, for two years on a part-time external basis. Not less than 20 per cent of the total program consists of a project on an approved topic covering a field or laboratory investigation of a mining geomechanics problem.

Three of the subjects, in addition to the project, form a compulsory core strand. These are augmented by a range of elective, optional subjects. A grouping of five options (including selections from undergraduate subjects, where appropriate) may be selected for study, subject to the approval of the Head of School and availability of the topics.

Assessment is by formal examination (at appropriate country centres where necessary) and by assignment work.

### Core Subjects

<table>
<thead>
<tr>
<th>Code</th>
<th>Subject</th>
<th>Hours per week</th>
</tr>
</thead>
<tbody>
<tr>
<td>7.515X</td>
<td>Rock Mechanics Measurements</td>
<td>3/3</td>
</tr>
<tr>
<td>7.525X</td>
<td>Strata Control Engineering</td>
<td>3/0</td>
</tr>
<tr>
<td>8.776G</td>
<td>Rock Mechanics</td>
<td>0/3</td>
</tr>
</tbody>
</table>

### Optional Subjects

#### Group A

<table>
<thead>
<tr>
<th>Code</th>
<th>Subject</th>
<th>Hours per week</th>
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</thead>
<tbody>
<tr>
<td>7.535X</td>
<td>Mine Fill Technology</td>
<td>2/2</td>
</tr>
<tr>
<td>7.545X</td>
<td>Advanced Rock Cutting Technology</td>
<td>2/2</td>
</tr>
<tr>
<td>7.555X</td>
<td>Blasting Technology</td>
<td>2/2</td>
</tr>
<tr>
<td>7.565X</td>
<td>Rock Slope Stability</td>
<td>2/2</td>
</tr>
<tr>
<td>7.575X</td>
<td>Subsidence Engineering*</td>
<td>2/2</td>
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<tr>
<td>7.585X</td>
<td>Economics and Management of Geomechanics Projects</td>
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</table>

#### Group B

<table>
<thead>
<tr>
<th>Code</th>
<th>Subject</th>
<th>Hours per week</th>
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<tbody>
<tr>
<td>8.777G</td>
<td>Numerical Methods in Geomechanics</td>
<td>0/3</td>
</tr>
<tr>
<td>8.778G</td>
<td>Geotechnical Processes for Energy Resources**</td>
<td>3/0</td>
</tr>
<tr>
<td>25.702G</td>
<td>Hydrogeology</td>
<td>0/3</td>
</tr>
<tr>
<td>25.706G</td>
<td>Geological Basis of Geomechanics</td>
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</tr>
<tr>
<td>25.708G</td>
<td>Engineering Geology</td>
<td>3/0</td>
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</table>

*Subject not available in 1986.
**Offering to be reviewed.

The program is arranged as follows:

### Year 1 — Part-time

<table>
<thead>
<tr>
<th>Code</th>
<th>Subject</th>
<th>Hours per week</th>
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<tbody>
<tr>
<td>7.013</td>
<td>Principles of Mining</td>
<td>2/0</td>
</tr>
<tr>
<td>7.023</td>
<td>Mineral Process Engineering</td>
<td>2/0</td>
</tr>
<tr>
<td>7.033</td>
<td>Mineralogical Assessment</td>
<td>1/0</td>
</tr>
<tr>
<td>7.234</td>
<td>Mineral Economics</td>
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<tr>
<td>7.111G</td>
<td>Mining Engineering</td>
<td>3/3</td>
</tr>
<tr>
<td>7.311G</td>
<td>Mineral Beneficiation</td>
<td>0/3</td>
</tr>
</tbody>
</table>

| Total Hours per week | 9/7 |
Two options are available, allowing candidates to specialize either in the theory and practice of yarn and fabric technology (engineering/physics orientation) or in the science and technology of textile dyeing and finishing (chemistry orientation).

Each of the following programs, which comprises both formal lectures and laboratory work, may be taken as a one year full-time course or two-year part-time course. Variations from these programs may be possible, subject to the approval of the Head of School.

<table>
<thead>
<tr>
<th>Option</th>
<th>Technology of Yarn and Fabric Technology</th>
<th>Technology of Textile Dyeing and Finishing</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hours</td>
<td>13.701G Fibre Science</td>
<td>13.701G Fibre Science</td>
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<tr>
<td></td>
<td>Assurance</td>
<td>Assurance</td>
</tr>
<tr>
<td></td>
<td>13.703G Yarn Technology</td>
<td>13.705G Finishing Technology</td>
</tr>
<tr>
<td></td>
<td>13.704G Fabric Technology</td>
<td>13.706G Dyeing Technology</td>
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<td></td>
<td>13.901G Dissertation</td>
<td>13.901G Dissertation</td>
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<tr>
<td></td>
<td>Electives†</td>
<td>Electives†</td>
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<tr>
<td></td>
<td>6</td>
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</tr>
</tbody>
</table>

*Weekly equivalent of total hours for subject. These hours may be concentrated in one session.
†Electives are to be selected from relevant subjects offered within the University, subject to availability and with the approval of the Head of School.

In certain cases, candidates may replace some of the specified subjects with additional elective material (up to a total of 9 hours elective material), or select subjects from both options, subject to the approval of the Head of the School.

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**School of Wool and Pastoral Sciences**

5081 Wool and Pastoral Sciences Graduate Diploma Course

Graduate Diploma GradDip

The course leading to the award of 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, 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.

Applicants from Colleges of Advanced Education who have obtained credit passes or better in the Diploma of Applied Science (Agriculture) are eligible for consideration for direct entry into the Graduate Diploma course in Wool and Pastoral Sciences.

The following program may be completed either in one year on a full-time basis or over two years on a part-time basis. Students are required to carry out full-time study or its equivalent 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 School.

**Full-time Course**

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

<table>
<thead>
<tr>
<th>Hours per week</th>
</tr>
</thead>
<tbody>
<tr>
<td>Livestock Production 6</td>
</tr>
<tr>
<td>Range Management 4</td>
</tr>
<tr>
<td>Wool Science 6</td>
</tr>
<tr>
<td>Animal Breeding 4</td>
</tr>
<tr>
<td>Quantitative Methods 4</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.
A subject is defined by the Professorial Board as 'a unit of instruction approved by the University as being a discrete part of the requirements for a course offered by the University'.

Each approved subject of the University is identifiable both by number and by name as this is a check against nomination of subject other than the one intended.

Subject numbers are allocated by the Registrar and the system of allocation is based on the following guidelines:

1. The authority offering the subject, normally a School of the University, is indicated by the number before the decimal point.

2. Each subject number is unique and is not used for more than one subject title.

3. Subject numbers which have previously been used are not used for new subject titles.

4. Graduate subjects are indicated by a suffix 'G' to a number with three digits after the decimal point. In other subjects three or four digits are used after the decimal point.

Subjects taught are listed in full in the handbook of the faculty or board of studies responsible for the particular course within which the subjects are taken. Subject descriptions are contained in the appropriate section in the handbooks.

The identifying numerical prefixes for each subject authority are set out on the following page.

Servicing Subjects are those taught by a school or department outside its own faculty. Their subject descriptions are published in the handbook of the faculty which originates the subject and are also published in the handbook of the Faculty in which the subject is taught.

The following pages contain descriptions for most of the subjects offered for the courses described in this book, the exception being the General Studies subjects. For General Studies subjects see the General Studies Handbook which is available free of charge.

HSC Exam Prerequisites
Subjects which require prerequisites for enrolment in terms of the HSC Examination percentile range, refer to the 1978 and subsequent Examinations.

Candidates for enrolment who obtained the HSC in previous years or hold other high school matriculation should check with the appropriate school on what matriculation status is required for admission to a subject.

Information Key
The following is the key to the information which may be supplied about each subject:

- S1 (Session 1); S2 (Session 2)
- F (Session 1 plus Session 2, i.e. full year)
- S1 or S2 (Session 1 or Session 2, i.e. choice of either session)
- SS (single session, but which session taught is not known at time of publication)
- CCH class contact hours
- L (Lecture, followed by hours per week)
- T (Laboratory/Tutorial, followed by hours per week)
- hpw (hours per week)
- C (Credit or Credit units)
- CR (Credit Level)
- DN (Distinction)
<table>
<thead>
<tr>
<th>School, Department etc</th>
<th>Faculty</th>
<th>Page</th>
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</thead>
<tbody>
<tr>
<td>*Graduate subjects also offered for courses in this handbook</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1 School of Physics</td>
<td>Science</td>
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<tr>
<td>2 School of Chemistry*</td>
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<tr>
<td>4 School of Metallurgy</td>
<td>Applied Science</td>
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<tr>
<td>5 School of Mechanical and Industrial Engineering</td>
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<tr>
<td>6 School of Electrical Engineering and Computer Science*</td>
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</tr>
<tr>
<td>7 School of Mining Engineering</td>
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</tr>
<tr>
<td>8 School of Civil Engineering*</td>
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<td>130</td>
</tr>
<tr>
<td>9 School of Wool and Pastoral Sciences</td>
<td>Applied Science</td>
<td>131</td>
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<tr>
<td>10 School of Mathematics</td>
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<td>11 School of Architecture</td>
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<td>21 Department of Industrial Arts</td>
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<td>29 School of Surveying*</td>
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<td>30 Organizational Behaviour*</td>
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<tr>
<td>32 Centre for Biomedical Engineering</td>
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<tr>
<td>36 School of Town Planning*</td>
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<td>37 School of Landscape Architecture</td>
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<td>38 School of Food Science and Technology</td>
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<td>39 Graduate School of the Built Environment*</td>
<td>Architecture</td>
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*Subjects Available from Other Universities

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<td>85 Australian Graduate School of Management</td>
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<td>97 Division of Postgraduate Extension Studies</td>
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</table>
Chemistry

2.251G Toxicology, Occupational and Public Health F/L1T2

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 man. 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.

2.271G Chemistry and Analysis of Foods F/L1T3

Illustrates the bases and application of analytical techniques as applied to foods. Emphasis is placed on the design of methods, on the preparation of material for instrumental analysis and on the interpretation of data. Includes: proteins and flesh foods, carbohydrates and saccharine foods, fats and oils, dairy and fermentation products, vitamins, food additives — preservatives and colouring matters, pesticide residues, metal contaminants — food microscopy.

Electrical Engineering and Computer Science

6.458G Decision and Syntactic Systems for Digital Pattern Recognition C3

Concepts and techniques in decision-theoretic pattern recognition systems with an in-depth study of both non-parametric and parametric methods. Includes: pattern, feature and classification spaces; feature selection, linear discriminant functions and training algorithms; piecewise linear, discriminant functions; decision rules; the Bayes framework, approximation of probability densities, clustering and dimensionality reduction. Structural pattern recognition, including such topics as formal linguistics, primitives, grammar and syntax analysis as a recognition procedure.


The fundamentals of image processing including such topics as visual perception and the image model; uniform and non-uniform sampling and quantization; image transforms; image enhancement, sharpening and smoothing; image restoration and least squares filtering; image encoding, mapping, quantizing and encoding; image segmentation and description, grammars, languages and similarity; Material oriented towards scene analysis and world models for industrial robots including scenes; labelling; shadows; shape information; structural descriptions and representing knowledge; computer vision for robots.

6.468G Computer Display Systems and Interactive Instrumentation C3

Prerequisite: 6.060G.

Man-machine-process communication and control, and associated microprocessor based instrumentation. Review of appropriate analog and digital technology. Microcomputer hardware and programming for interactive communication using both machine and high-level languages. Display devices, operating principles and performance limitations. Hardware and software techniques for computer-generation and processing of pictures, colour and movement. Interactive design and graphics creation. The geometry of transformations and projections. Light pens and other input devices.

6.580G Image Analysis in Remote Sensing C3

Prerequisite: 10.361 or similar.

Techniques for extracting information from remotely sensed data with particular emphasis on satellite imagery. Topics taken from: nature and characteristics of earth resources and related satellites; satellite sensors and data formats; image enhancement techniques; image classification methods, including clustering, classification and feature selection; image classification methodologies; new horizons in remote sensing image analysis.

6.587G Computer Techniques in Remote Sensing Image Analysis C3

Prerequisite: 6.580G or similar.

A detailed treatment of computer methods for implementing analytical techniques used with remotely sensed data. Topics include: software requirements for image enhancement and analysis; structure and capabilities of the software packages LARSYS, ORSER, BICEP, A2 ASP (R-stream); implementation of classification methodologies, introduction to image processing hardware and associated operating systems; interactive image processing.

Mining Engineering

Generally these subjects are of three hours’ duration per week or multiples of that time.

7.001G Exploratory Drilling and Development

7.111G Mining Engineering


7.122G Mining Engineering Technology


7.132G Mining Engineering Laboratory

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.

7.151G Ground Control and Excavation Engineering


7.152G Mining Conservation

The reclamation of excavated land; integration with operational stages of mining. Mining cycles of alluvial, strip, and open cuts, land clearing, stabilizing the mined area; socio-economic aspects of mining, rehabilitation costs, government regulations. Examination and evaluation of a current operation.

7.153G Environmental Conditions in Mines

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.

7.154G Rock Excavation and Transportation

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.

7.311G Mineral Beneficiation

Prerequisite: 7.023.


7.322G Mineral Beneficiation Technology

Prerequisite: 7.311G.


7.332G Mineral Engineering Laboratory

Prerequisite: 7.311G.

Laboratory investigations may be selected from the following according to availability and specialization: metalliferous ore concentration; coal preparation; beneficiation of non-metallics; processing of mineral fluids.

7.351G Mineral Beneficiation

Prerequisite: 7.313 or 7.311G.

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.
7.361G Minerals Engineering 1


7.362G Minerals Engineering 2


7.363G Minerals Engineering Laboratory

A series of laboratory investigations relating to material covered in subjects 7.361G and 7.362G.

7.364G Minerals Engineering 3


7.365G Minerals Engineering Project

Laboratory work to evaluate information necessary for the design of a process for the beneficiation of ore from a metallic ore 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.

7.442G Mineral Industry Analysis


7.455X Mining Geomechanics Project

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.

7.515X Rock Mechanics Measurements


7.525X Strata Control Engineering


7.535X Mine Fill Technology


7.545X Advanced Rock Cutting Technology

7.555X Blasting Technology  

7.565X Rock Slope Stability  

7.575X Subsidence Engineering  
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.

7.585X Economics and Management of Geomechanics Projects  

Civil Engineering  

8.402G Transport, Environment, Community  

8.403G Theory of Land Use/Transport Interaction  
Theoretical aspects of land use transport planning. Basic concepts, data collection methods, systems models and equation of state (functional 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).

8.413G Transport Economics  
Cost and price analysis to each of the transport modes (road, rail, air and sea). Welfare analysis and taxation theory with respect to transport. Economics of location, economics of land use models; regional trade model.

8.701G Economic Decision Making in Civil Engineering  
Review of practical engineering decision-making problems and relevant techniques. Engineering economics, benefit/cost analysis, consideration of inflation and taxation in investment decisions, bidding, decision theory. Microeconomic theory, objectives and criteria, multiple objective planning.

8.703G Optimization Techniques in Civil Engineering  
Search, linear programming, non-linear programming, geometric programming, calculus of variations, maximum principle, applications.

8.776G Rock Mechanics  
Strength and deformation characteristics of rock mass and joints; flow through joints and porous rock; failure criteria, stresses and deformations around underground openings; tunnel lining and rock anchors; stability of rock slopes; stabilization of rock slopes; stability of underground excavations related to mining; foundations of dams in fissured and layered rocks.

8.777G Numerical Methods in Geomechanics  
Fundamentals of finite element and boundary element methods; deformation and flow problems; linear and non-linear analysis; applications to underground openings; stability of slopes, foundations, mining excavation; seepage and consolidation; soil-structure interaction problems; earth pressures, retaining walls and buried pipes; thermal stress analysis.

8.778G Geotechnical Processes for Energy Resources  
Principles of rock fragmentation: blasting patterns; prediction and estimation of ground vibrations; damage criteria; numerical techniques for the prediction of rock fracture; grouting materials and techniques.

8.833G Free Surface Flow  
Theory of water flow in open channels. Application of theory to design of hydraulic structures, spillways, control gates, energy dissipators, channel transitions. Use of hydraulic models.

8.837G Hydrological Processes  
Hydrologic cycle, water and energy balances, atmospheric moisture, precipitation process, evaporation and transpiration, storm runoff process, land use and management, stream gauging, instruments.
8.838G Flood Design

Excluded: 8.846G.

Introduction to flood estimation, design rainfall data, hydrograph analysis, storm runoff, loss rates, rational method, unit hydrographs, introduction to urban drainage design, flood frequency.

8.839G Advanced Flood Estimation

SS C3

Flood routing, catchment characteristics, runoff routing, synthetic unit hydrographs, urban runoff, regional empirical flood estimation methods, advanced unit hydrograph theory.

8.840G Groundwater Hydrology

SS C3

Confined and unconfined aquifers, analogue and digital models of aquifer systems, water movement in the unsaturated zone, recharge, groundwater quality, sea water intrusion.

8.841G Groundwater Hydraulics

SS C3

Mechanics of flow in saturated porous materials, steady and unsteady flow to wells, leaky aquifers, partial penetration, multiple aquifer boundaries, delayed yield from storage, regional studies.

8.842G Groundwater Hydrology

SS C3

Confined and unconfined aquifers, analogue and digital models of aquifer systems, water movement in the unsaturated zone, recharge, groundwater quality, sea water intrusion.

8.843G Groundwater Hydraulics

SS C3

Mechanics of flow in saturated porous materials, steady and unsteady flow to wells, leaky aquifers, partial penetration, multiple aquifer boundaries, delayed yield from storage, regional studies.

8.844G Groundwater Hydraulics

SS C3

Mechanics of flow in saturated porous materials, steady and unsteady flow to wells, leaky aquifers, partial penetration, multiple aquifer boundaries, delayed yield from storage, regional studies.

8.845G Groundwater Hydraulics

SS C3

Mechanics of flow in saturated porous materials, steady and unsteady flow to wells, leaky aquifers, partial penetration, multiple aquifer boundaries, delayed yield from storage, regional studies.

8.846G Arid Zone Hydrology

SS L1½ T1½ C3

Co-requisite: 8.837G, 8.839G.

Arid zone rainfall characteristics, data collection and instrumentation, runoff processes, infiltration, transmission loss, recharge processes, flood characteristics and design; water yield, storage of water; evaporation and evaporation suppression; sediment transport and measurements.

8.865G Arid Zone Water Resources Management

SS L1½ T1½ C3

Water as a resource: demand for and supply of water; works and management to match demand with supply. Special features of the arid zone climate, water uses, quantification of demand quantities and qualities; measurement of flow rate, volume, quality. Engineering works: design, construction, operation and maintenance of works, including excavation tanks, dams, pipelines, pumps, windmills, engines and motors, troughs; costs; reliability; energy sources for pumping. Special practices: water spreading, irrigation including trickle irrigation; evaporation reduction, desalination.

Wool and Pastoral Sciences

9.105G Livestock Production

F L2 T4

Biology of reproduction and reproductive performance of sheep and cattle; growth and body composition; meat production and quality.

9.205G Range Management

F L1 T3


9.424G Minerals and Their Effects on Grazing Animals

C2

The importance of minerals for mammals. The nutritional significance of the important elements and the effect of ingestion, inhalation, or absorption or excessive amounts of these elements will be discussed. Emphasis on grazing sheep and cattle, but with other examples where appropriate.
9.504G Wool Science


9.803G Animal Breeding

Co-requisite: 9.802.

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.

9.813G Quantitative Methods

Selected topics in: biostatistics and economic statistics, with emphasis on experimental design and least squares procedures; response surface estimation and analysis; mathematical programming methods for rural industries; data processing and computer programming; systems analysis and simulation methods.

School of Textile Technology

13.701G Fibre Science

Chemical constitution and reactivity of natural and man made fibres, molecular and morphological structure of textile fibres. Production of textile fibres, addition and condensation polymerization, polymerization kinetics, molecular weights of polymers and copolymers, crystallinity and orientation of polymers. Relationships between molecular structure and mechanical properties of fibres.

14.702G Textile Testing and Quality Assurance


13.703G Yarn Technology

Technical requirements of textile yarns, structural analysis of staple fibre and continuous filament yarns. Principles of yarn forming processes for long and short staple fibres (fibre cleaning, blending, carding, combing, drawing, spinning, twisting, winding) with particular reference to cotton and wool processing systems; man-made staple fibre processing, production and texturing of continuous filament yarns, unconventional techniques of yarn forming. Introduction to yarn mechanics.

13.704G Fabric Technology

Objectives of fabric technology; historical development; structure of the industry; range of fabric types and end-use applications (clothing, furnishings, industrial fabrics). Principles and practice of fabric-forming technology: weaving, knitting and other methods (melt-bonded, needle-punched and resin-bonded non-wovens); elements of fabric design and construction; introduction to clothing technology; recent developments and research, microprocessor and computer applications; evaluation of fabric performance criteria: physical and mechanical properties; introduction to fabric mechanics; recent developments and research, introduction to objective measurement technology.

13.705G Finishing Technology

Objectives of finishing and typical flow diagrams. Principles and technology of textile finishing processes: removal of impurities and discoloration, elimination or minimization of deficiencies in the properties of textile fibres, development of specific properties; production of specified dimensions in textile fabrics, mechanical processes, surface finishes, protective finishes, detergency, properties of surfactant solutions, micelle formation, emulsification. Chemistry of application of specialized finishes such as flameproof finishes, crease-resistant finishes. Recent developments in finishing technology.

13.706G Dyeing Technology


13.901G Dissertation

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 school, and submitted in written form.
Applied Geology

25.702G Hydrogeology S1 L1½T1½
Surface and sub-surface methods of geological and geophysical investigation; ground water exploration of confined and unconfined aquifers. Geological and hydraulic characteristics of rocks; aquifer boundaries, groundwater storage and quality. Hydraulics of wells. Hydrogeological systems analysis, including computer methods, mapping techniques and groundwater resources evaluation. Hydrogeology of arid and semi-arid zones. Case history studies of groundwater fields.

25.703G Project (Engineering Geology Graduate Course) S2
The project is a research investigation consisting of field and laboratory work in any of the disciplines. Engineering Geology, Hydrogeology, Environmental Geology.

25.704G Environmental Geology S1 L1½T1½ C3

25.705G Engineering Geophysics S1 L2T1
Shallow seismic refraction: elastic theory, sources and equipment. Determination of fracture index, rippability. Applications to damsites, highways, depth of weathering, material quality. Seismic reflection. Sparkler and boomer profiling, side scan sonar with application to coastal harbours, sewer outfalls. Electrical methods, direct current geoelectric theory, resistivity sounding and profiling with applications to determination to bedrock depth, location of water table, clay filled dykes, shear zones. Magnetic, electro-magnetic and gravity methods as applied to engineering problems. Geophysical well logging: resistivity, self-potential, gamma ray and sonic logs applied to determination of rock properties and location of clay-filled joints. Field tutorials: Short field tutorials are included.

25.706G Geological Basis of Geomechanics S1 L2T1
25.714G Geology of Foundations

A detailed review of case histories of the geological factors influencing the foundations of dams, buildings, bridges, roads and airfields. The geology of large underground cavities. Methods of geological investigation.

Weeks 1-7 only.

25.800G Seminar

A weekly seminar to present and discuss student papers on exploration topics: speakers from industry are invited to attend and present papers from time to time.

25.801G Geology in Exploration 1

The development of conceptual models in mineral exploration and formulation of exploration programs. Consideration of significant guides to ore including structure, lithology, alteration and gossans.

25.802G General Introduction to Exploration Geophysics

A basic introduction to the theory and practice of exploration geophysics, including treatment of applications and limitations of the main methods of seismic, electric, electro-magnetic, gravity, magnetic and radiometric methods to geological problems in hydrocarbon, coal, ground water, mineral and engineering exploration. Treatment includes fundamental aspects of the method and case histories illustrating applications areas. Field tutorial survey camp: An integrated, geological, geophysical and geological field tutorial survey camp of seven days' duration is an integral part of this subject.

25.803G Introduction to Exploration Geochemistry

Basic principles of exploration geochemistry and the role of exploration geochemistry in the generalized exploration sequence. Principles and problems of anomaly recognition. Examples of main applications.

25.804G Introduction to Data Processing and Interpretation

FORTRAN and computer programming, use of terminal facilities. Basic data storage and retrieval. Simple interpretative procedures for exploration data.

25.805G Resource Economics 1

Interdependence of political, economic and technical factors in mineral resource supplies. Examination of the main factors in reserves and resources estimation.

25.807G Exploration Geophysics

An introduction to the theory and practices of all geophysical methods in exploration for energy, minerals, groundwater and engineering applications. These will include seismic reflections, seismic refraction, electrical, electro-magnetic, magnetic, gravity and radio-metric methods of exploration, including the planning and conduct of field surveys for general and particular applications, and the theory and practice of the interpretation of geophysical results in terms of geological problems, conditions and occurrences.

25.808G Exploration Project

Interpretation of exploration case-history data designed to familiarize students with the type of information normally required by exploration companies.

25.811G Advanced Geology in Exploration

Definition of the geological environment and search techniques for major categories of mineral deposits including porphyry coppers, carbonate- and shale-hosted lead-zinc ores, volcanogenic massive sulphide ores, vein and sandstone uranium. Geological aspects of reserve estimation. Exploration case histories.

25.815G Resource Economics 2

Distribution, production, consumption and trade in minerals. Supply adequacy and resource assessments and projected requirements. Review of the Australian minerals industry in a global context.

25.816G Remote Sensing

The physics of various remote sensing techniques; interpretation of conventional aerial photography in exploration; Infra-red remote sensing techniques; side linking 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.

25.817G Mining Law and Exploration Management

Mining law in Australia with special reference to land tenure and lease acquisition; organization and management of exploration programs.

25.818G Exploration Project

Design and costing of exploration program by students. This may be based on simulated conditions or actual situations.

25.819G Field-Laboratory Project

An individual exploration project that requires the student to acquire field and laboratory data on geological, geochemical and geophysical aspects of an actual exploration problem. As far as possible the project should be designed in consultation with the exploration industry. A report is required.

25.821G Geology in Exploration 2

Specialized search techniques for selected types of metallic ores, with appropriate case histories.

25.823G Advanced Exploration Geochronology

Detailed consideration of the main techniques with emphasis on soil, drainage and rock surveys. All applications and problems will be examined on the basis of case-histories of actual surveys. Special consideration is given to problems of applications under Australian conditions.

*Weeks 1-7 only.

†Weeks 8-14 only.
25.824G Advanced Data Processing and Interpretation S1† L2T2
Advanced concepts of data storage and retrieval; problems of display of geochemical data; multi-variate statistical data interpretation. Students are encouraged to supply their own data sets for processing.

25.827G Laboratory Methods S1† L1T3
Instruction in the main techniques of sample preparation and instrumental analysis appropriate to exploration geochemistry. Practical experience with AAS and XRF. Students are encouraged to supply their own samples.

25.828G Exploration Project S1† T6
Interpretation of exploration data from geochemical surveys; this may be based on data from actual surveys, or data generated by the students themselves.

25.829G Field-Laboratory Project S2
An individual research project designed to contribute to the solution of a practical exploration problem; as far as possible the project should be chosen in consultation with the exploration industry to ensure relevancy to current exploration problems. In general the project involves collection of field data and samples, chemical analysis of samples, and interpretation of the results. A report is required.

25.831G Geological Interpretation S1† T2
The geological interpretation of geophysical data and geophysical models in seismic electrical, electromagnetic, gravity and magnetic methods, including selected case studies from petroleum, coal, mineral and engineering exploration.

25.832G Advanced Exploration Geophysics S1† L16
An extension of, and considerable advanced treatment of the subject matter in 25.807G, in the theory and practice of field and interpretational procedures in all methods and aspects of exploration geophysics, including instrumentation, manual and electronic data processing and interpretation. Specific applications areas for prominent geophysical exploration techniques in the solution of relevant geological problems, are treated in detail in both field and theoretical aspects of the methods.

25.839G Field-Laboratory Project S2
Exploration geophysical project on one or more topics of relevance in energy, water, mineral or engineering exploration. Includes tutorial sessions and seminars on relevant topics of geophysical/geological/geochemistry exploration.

25.840G Seminar S1† T2
A weekly joint seminar of Mineral Exploration, Exploration Geochemistry, and Exploration Geophysics students who present papers on aspects of their own particular specialization. Outside speakers from industry and government organizations are invited to participate in the seminars from time to time.

†Weeks 8-14 only

25.915G Project in Hydrogeology
Small project involving the analysis of hydrogeological data from Fowlers Gap.

25.916G Research Project in Hydrogeology
Research project on some aspect of the hydrogeology of an arid region.

Geography

27.043G Remote Sensing Applications S1 L1T2 C3
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.

27.171G Directed Problems in Remote Sensing S2 L1½T1½C3
A detailed investigation of a particular aspect of remote sensing technology or an area of applications relevant to candidates interests and background.

27.174G Remote Sensing Instrumentation and Satellite Programs S1 L2T1C3
Aircraft and satellite platforms; sensor types; image formation and end products including panchromatic, colour, colour IR and thermal IR photographic products, microwave imagery and computer tape products. The organization, acquisition, processing and analysis of imagery obtained from the following satellite programs: Landsat, Skylab, Heat Capacity Mapper Mission, Geodynamics Experimental Ocean Satellite, NOAA-7, Nimbus Coastal Zone Color Scanner, Seasat, Space Shuttle, Spot and Soyuz-Salyut.

27.202G Environmental Planning and Evaluation C3
Lectures and seminars on environmentalism and political economy, environmental information, impact assessment, and economic evaluation.
27.644G Computer Mapping and Data Display  C2

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.

27.672G Geographic Information Systems  C2

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.

27.901G Geomorphology for Hydrologists  S2 L1½T1½ C3

Offered subject to availability of staff.


27.902G Meteorological and Hydrological Principles  S2 L3 C3


27.904G Geomorphology for Engineering Geologists  S2 L1½T1½ C3

Offered subject to availability of staff.


27.910G Geomorphology of Arid Lands  S2 L2T4 C6


27.911G Soil Erosion and Conservation  S1 or S2 L2T4 C6


27.912G Arid Zone Climatology  S1 L2T4 C6

Definitions of aridity based on climatic data and their relevance at different scales from hydrologic and biologic considerations. Measures of precipitation effectiveness. Meteorological controls of aridity at global and regional scales, and distinctive features of arid climates over the world. Characteristics and physical controls of the radiation, water and heat budgets as commonly found within arid environments. Climate as a fact in resource utilization considered in terms of plant growth and development, animal ecology, insects and diseases, soil erosion, and human adjustments to arid conditions, including problems of comfort, health, buildings design and energy use. Laboratory and field work is directed towards 1. instrumentation and measurements of climatic variables of special interest in arid environments, particularly those important to the radiation, water, and heat budgets; and 2. statistical and other quantitative methods for summarization and interpretation of single and combined climatic elements to provide relevant information required for sound management of arid lands.

27.913G Soil Studies for Arid Lands Management  S1 or S2 L2T4 C6

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 salinization and alkalinization. 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 27.133 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.

27.914G Terrain Evaluation  S1 L2T4 C6

Methods of defining and mapping land units for resource assessment and management. Principles of land capability classification with reference to pastoral, agricultural and irrigation land use in arid and semi-arid regions. Physical indicators of desertification and land degradation in dry regions including accelerated wind and water erosion and secondary salinization.
27.915G Project in Land Evaluation S2 T9 C9

Practical application of a system of land classification in an arid or semi-arid environment as a basis for land management or land-use planning, or a comparative review of existing approaches to land evaluation. Involves fieldwork, probably at Fowlers Gap Research Station, and the preparation of a report. Tutorial hours are equivalent contact hours, but also involve fieldwork out of session.

27.916G Research Project in Land Evaluation F T9 C9

As for 27.915G Project in Land Evaluation, but involving more substantial research over a longer period. Tutorial hours are equivalent contact hours, but also involve fieldwork out of session.

27.917G Project in Soil Conservation S2 T9 C9

A practical investigation of soil degradation associated with the deterioration of rangeland on Fowlers Gap Research Station, or in another part of arid or semi-arid Australia, in relation to soil-vegetation characteristics and land use. May involve investigation of techniques used in combating soil erosion problems. Involves the preparation of a report. Tutorial hours are equivalent contact hours, but also involve fieldwork out of session.

27.918G Research Project in Soil Conservation F T9 C9

As for 27.917G Project in Soil Conservation, but involving more substantial research over a longer period. Tutorial hours are equivalent contact hours, but also involve fieldwork out of session.

29.604G Land Information Systems SS L2T1 C3

Land information as maps and records. Methods of data collection. Integrated surveys and coordinate systems. Legal boundaries. Land tenure. Identifiers. Computerization of land information. Data input methods. Data storage methods. Data processing and manipulation, including management, searching, existing data base languages, and interactive data editing. Data output, including computer graphics, line printer maps, and digital plotters.

29.605G Ground Investigations for Remote Sensing S1 L2T1 C3

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.

Organizational Behaviour

Due to uncertainties in staffing, it is not possible for the Faculty of Commerce to give an assurance that all subjects in Organizational Behaviour listed in the handbook will be offered in future years.

30.935G Organization Behaviour A S1 L3

Organizations are examined as open systems exhibiting a variety of structural patterns within an external, economic, social, political and technological environment which is uncertain and rapidly changing. Against this background the subject lays the foundations for gaining insight into human behaviour in organizations.

30.958G Organizational Communications S2 L3

Prerequisite: 30.935G.

Communication is both an end and a means to an end for members of complex organizations. As an end, the patterned inputting, processing and outputting of information is the network of interdependent relationships that we come to call an organization. Thus communication is organizing. As a means to an end, communication suggests the ways — the meanings, the rules, the procedures — that govern the interaction of organizational members exchanging messages in service of such outcomes as decision making, innovation, etc. Organizational communication therefore is the study of the flow of messages in an information network as well as the uses made of those messages by network participants for the overall attainment of organizational goals.
38.153G Food Technology Seminar

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.

38.155G Dairy Technology

A detailed review of trends in dairy industries at the national and international levels. The microbiology and biochemistry of dairy products with particular reference to the technology of milk, butter and cheese production. The development of new dairy products, the use of dairy products in other foods. Emphasis is placed upon the use and development of new technologies in the broad areas of dairy product processing.

38.156G Oenology

Co- or prerequisite: 38.165G.

History of wine production, statistics and classification. Viticulture, Grape composition. Technology and biochemistry of production of table wines, sparkling wines, vermouths, sherries; quality control procedures. Legal, cultural, climatic factors in French, Spanish, Portuguese, Italian, German, Californian and Australian wine production. Principles of sensory testing and evaluation of wines.

38.157G Technology of Cereal Products

Prerequisite: 38.132 or 38.166G.


38.158G Marine Products

Prerequisite: 38.133 or 38.166G.


38.159G Marine Biology

Prerequisite: 38.165G.

The complex relationships between technological change and organizational participation in societies using advanced technology with particular reference to Australia, California, Japan, Germany and the Nordic nations. Key issues include: the relationship between technological change and sociotechnical systems, skill formation, organizational learning, industrial relations, humanization of work, organizational equity, participation, and power.

38.161G Food Additives and Toxicology


An integrated series of laboratory and pilot plant exercises illustrating the principles and procedures involved in processing and examination of foods.
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 atmospheric control to delay senescence and ripening. Physiological disorders of stored produce; micro-organisms of importance to postharvest tissue; physical and chemical methods of control; postharvest disinfection and quarantine measures. Examination of current commercial storage and marketing operations.

38.164G  Elements of Food Preservation  

38.156G  Plant Food Products  
Fruits and vegetables: significance in world nutrition, trade; harvest, post-harvest deterioration and control; aspects of development, maturation, ripening; technology of juice, wine production, assessment procedures. Cereals: structure, composition, uses; wheat, rice milling; baking technology. Sugars: sources, types, composition, milling, refining; function in foods. Lipids: isolation, purification, chemistry, processing for frying, spreads, shortening, other food uses. Proteins: sources, extraction, texturizing, processing; nutritional and toxicological considerations. Pest control.

38.166G  Animal Food Products  
Meat: technology and biochemistry of meat production, composition and quality, preservation and microbiology. Marine products: types, distribution, harvesting, microbiology, autolytic and chemical changes; measurement and control of spoilage, use of microbiological and chemical methods, low temperature, drying. Eggs: production, preservation, structure, composition, microbiology; functional properties of components; egg quality; freezing and drying processes. Dairy products: chemical and physical properties of milk and their manipulation during processing and production of milk, cheese, butter and ice-cream.

38.350G  Food Microbiology  
Microbiological examination of foods: sampling methods, plans, specifications, standards; enumeration, rapid methods; sub-lethal injury. Food spoilage: ecology, associations, dominant species; biochemistry, physiology of growth, enzyme production; off-flavours, odours and odors. Food fermentations: ecology and biochemistry; fermented milks, vegetable, meat, cereal and marine products; Asian fermented foods; yeast and autolysates; single cell protein. Foodborne microbial disease: foods as vectors of disease, food poisoning, incidence, occurrence of infection and intoxication; ecology and taxonomy of common bacterial pathogens; foodborne viral disease, mycotoxins; methods of detection and enumeration of pathogens, indicator organisms; control and prevention of food-borne disease, standards, legislation, food hygiene.

38.351G  The Microbial Ecology of Foods  
Prerequisites: an introductory subject in microbiology, 38.350G or 38.331.

An integrated lecture and laboratory course covering the ecology, taxonomy and biochemistry of bacteria, yeasts, fungi and viruses involved in food spoilage, food-borne disease and food fermentations. Emphasis on specific methodologies for the detection, enumeration and identification of food associated bacteria, yeasts and fungi. Problems of enumerating microorganisms in foods: techniques of food sampling; formulation, performance and evaluation of selective differential media; sublethal injury; indicator organisms. Rapid methods for microbial enumeration and identification. Control of microorganisms in foods; microbiological quality control, food legislation, microbiological criteria.

38.451G  Advanced Food Engineering  
Prerequisites: 38.421 and 38.432 or an introductory subject in material and energy balances, heat transfer and fluid mechanics.

Mathematical representation using vector calculus of heat and mass transfer and fluid mechanics in foods; numerical methods of solution; thermodynamic analysis of processes; laboratory work on the thermophysical properties of foods.

38.452G  Drying of Foods  
Prerequisite: 38.451G.

Psychrometry; water activity of foods; transport in porous media; spray drying, fluidized bed drying, freeze drying, batch and continuous drying; drying of grain in bulk silos; solar drying of fruit and vegetables.

38.551G  Advanced Nutrition  
Prerequisite: 38.553G.

Detailed treatment of the role of the nutrients in health and disease at different stages of the human life cycle. Nutritional topics of particular relevance to developing countries including population, infection, rehabilitation, productivity, education.

38.552G  Methods of Nutritional Assessment and Analysis  
Co- or prerequisite: 2.271G.

Nutrient assay of foods including bench and instrumental techniques. Human nutritional assessment by anthropometric, dietary and biochemical methods.

38.553G  Principles of Nutrition  
Co- or prerequisite: 42.2120 or an introductory subject in Biochemistry.

The role of the nutrients in human structure and function, including nutritional imbalance states. Includes simple anthropometry and dietary intake study.

38.700G  Master of Applied Science Major Project (Food Engineering)  
Individual research project involving a literature survey, and an experimental research program of relevance to the needs of the candidate’s home country. A detailed thesis embodying the literature survey, the experimental investigation, the results and discussion of results, and proposals for further investigations.
38.701G Man's Food
Foods of developing and developed countries; world food production and trade; world food agencies; food development programs. Food habits, attitudes and beliefs; sensory perception; food choice.

38.702G Food Engineering A

38.703G Food Engineering B
Heat transfer. Steady state analysis of conductive and convective heat transfer in one and two dimensions. Methods of solution of unsteady state problems. Heat transfer equipment. Special heat transfer problems in food processing.

38.704G Food Chemistry and Enzymology
Chemistry and function of carbohydrates, proteins, lipids, vitamins, minerals and pigments; non-enzymic browning reactions and autoxidation; effects of food processing on the functional properties of food components. Characteristics of enzymes: factors affecting enzyme action; the hydrolases and oxidoreductases; respiration, glycolysis, autolysis, enzymic browning and fat decomposition.

Basic laboratory techniques for the analysis of food components.

38.705G Introductory Food Microbiology
An integrated lecture and laboratory program providing an introduction to food microbiology: microorganisms associated with food; factors affecting microbial growth and survival; enumeration of microorganisms in foods; microbial food spoilage; food-borne microbial disease and food hygiene, food fermentations.

38.706G Food Storage and Preservation
Food wastage: dimensions, mechanisms and strategies for control. Food spoilage: mechanisms of spoilage of fresh and processed foods; principles of control. Fresh plant and animal produce storage. Traditional and modern techniques of food preservation by heat, cold, drying and dehydration; use of sugar, salt and chemical preservatives; food irradiation, chemical and microbial stability of preserved foods. Food packaging.

38.707G Reading Assignment
A special reading assignment in an area supporting candidates' major disciplines or commodity interests. Presentation of a seminar may be required.

38.708G Food Engineering C

38.709G Technology of Food Drying

38.710G Science and Technology of Animal Products
Meat and meat products: livestock resources; slaughter, muscle structure, composition and post-mortem changes; meat microbiology; ambient storage and distribution, cold storage, chilling, freezing, drying, curing and smoking, packaging. Egg and egg products: production; egg structure, composition, quality and microbiology; storage and preservation of shell eggs; egg pulping, pasteurization, freezing and dehydration. Milk and dairy products: milk production, composition, properties, microbiology, pasteurization; homogenized, lactose hydrolysed, skim, dried and condensed milks; cream, butter, ice cream, cheese and yoghurt. Marine products: marine and fresh-water resources; harvesting and post-harvest handling; spoilage, control and assessment; chilling, freezing, salting, drying, smoking and fermentation; fish meals and protein concentrates.

38.711G Science and Technology of Plant Products
Classification, structure, composition, production and trade of world plant foods. Traditional and modern practices of post-harvest handling, storage and processing of grains, pulses, fruits, vegetables, nuts, oilseeds, tubers and spices. Use of plant food products and plant-derived products. Causes of post-harvest wastage and deterioration and their control.

38.712G Food Engineering Laboratory
Laboratory and pilot plant exercises illustrating the principles and procedures involved in food processing and food quality assessment.

38.713G Human Nutrition
Introduction to the anatomy and physiology of digestion, absorption, metabolism and excretion. Food components and human nutrition; nutrient requirements and functions. Foodstuffs and nutrition. Nutritional problems of developing countries: undernutrition, malabsorption and natural toxicants in food; strategies for control; public health aspects, supplementation, dietary modification and fortification. Effects of food preparation and processing on nutrients.

38.714G Literature Survey
Students undertake a comprehensive review of the literature as a preliminary to their major project.

38.715G Food Engineering Field Work
Inspection of food processing factories, agricultural and food research establishments and food producing areas.
42.212G Principles of Biochemistry

A condensed treatment of biochemistry comprising the following aspects: the elemental and molecular composition of living organisms; the chemistry and roles of the biological elements and molecules; the thermodynamics and enzymatic catalysis of metabolism; catabolic, anabolic, amphibolic and anaplerotic processes, with emphasis on hydrolysis and synthesis of polymers, glycolysis and gluconeogenesis of glucose, β-oxidation and synthesis of fatty acids, deamination and decarboxylation of amino acids, the tricarboxylic acid cycle, electron transport and oxidative phosphorylation, metabolic regulation and integration.

42.213G Biochemical Methods

A laboratory program in practical biochemistry. The basic instrumentation and methodology of the biochemist will be introduced by practical exercises and demonstrations. A comprehensive treatment of the relevance and applicability of biochemical techniques is covered in tutorials.

42.214G Biotechnology

The selection, maintenance and genetics of industrial organisms; metabolic control of microbial synthesis; fermentation kinetics and models of growth; batch and continuous culture; problems of scale-up and fermenter design; control of the microbial environment; computer/fermentor interactions. Industrial examples will be selected from: antibiotic and enzyme production, alcoholic beverages, single cell protein (SCP), microbial waste disposal and bacterial leaching. Tutorial/practical sessions include: problem solving, instrumentation, continuous culture techniques, and mathematical modelling and simulation of industrial processes.

Zoology

45.900G Ecological Studies in Arid Lands Management

Prerequisite: Degree with background in bioscience or equivalent.

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 Botany are prescribed to cover aspects of vegetation description and plant/environment interactions.
Faculty of Applied Science

Environmental Studies

46.101G Project in Remote Sensing

A minor study of some aspects of remote sensing as it relates to investigations within a particular discipline or subject area offered by Schools within the Faculty of Applied Science.

46.102G Research Project in Remote Sensing

An investigation of a problem in remote sensing 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.

46.200G Project

Research investigation on an approved topic, conducted either individually or as part of a team.

46.201G Themes in Environmental Studies

Lectures and seminars on a set of themes: resource use and conservation, pollution abatement, hazard perception and adjustment.

46.203G Medical Aspects

Aspects of medicine bearing upon physiological consequences of pollutants. Synergism and antagonisms, photosynthesis and phytotoxicity, metabolic mechanisms; morbidity and mortality surveys; exposure indices. Particular pollutants aldehydes, nitro-olefins, carbon monoxide, sulphur dioxide, oxides of nitrogen, hydrocarbons, ozone and oxidants, particulates, carcinogens.

46.204G Legislative Aspects


Chemical Engineering and Industrial Chemistry

General

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

48.063G Industrial Water and Wastewater Engineering

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.

48.070G Process Principles


48.081G Advanced Process Dynamics


48.082G Process Optimization

Multivariable analytical and numerical optimization in free and constrained parameter space. Optimization of functions of a continuous variable. Dynamic programming. Applications of these techniques to specific chemical engineering problems.

48.083G Equilibrium Concepts in Water Systems

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.

48.084G System Simulation and Control

This is a participatory course in which case studies, discussions of recent papers, development of digital simulation programs and analog computer laboratory work play an important part.

Topics are selected from the following areas:
Unit 1 System Simulation

Numerical methods for digital simulation; programming languages and packages for system modelling of distributed parameter systems; use of analog computers in system simulation. Application of these techniques to the study of process plant and equipment, environmental systems, and similar areas.

Unit 2 Advanced Process Control

System identification and parameter estimation; control of multi-loop systems; non-linear systems; digital control and data-logging, sequencing control.

48.085G Interphase Mass Transfer

Advanced theories of mass transfer. The effect of interfacial instability and methods for predicting its presence. Theoretical prediction of mass transfer in dispersed systems. Multicomponent mass transfer.

48.086G Fluid Particle Interactions


48.089G Graduate Colloquia

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.

48.090G Specialist Lectures

48.091G Advanced Thermodynamics


48.092G Computer-aided Design

A workshop type of course with considerable time devoted to discussion, seminars, writing and running of programs. Programming: methods, conventions, and standards; program design, flow-charting, co-ordination and documentation. Design: individual plant units and components, flowsheets, optimization and economic analysis. Physical property estimation. Simulation: continuous change and discrete change systems.

48.131G Catalysts and Applied Reaction Kinetics S1 or S2 L2 T4

Methods of catalyst preparation and characterization; adsorption and desorption mechanisms; general mechanisms for gas-solid reactions catalyzed by solids; poisoning and catalyst decays; effectiveness factors; techniques in catalytic research; special topics in reaction kinetics including gas-solid non-catalytic reactions, polymer kinetics, electrochemical reaction kinetics and electrocatalysis; industrial catalytic processes; application of statistical methods to the solution of complex chemical data.

48.150G Instrumental Analysis for Industry F L1 T2

Role of analysis in process optimization. Accuracies of analytical methods compared to needs for quality control. Frequency of analysis in relation to control and analytical costs. Importance of speed of analysis for information feedback. Case studies for selected processes in relation to selecting the analytical method.

48.161G Electrochemical Techniques for Control and Analysis S1 or S2 L2 T4

In-depth study of selected electroanalytical methods with respect to theoretical principles, instrumentation and practical utilization. The importance of adsorption and reaction mechanism on accuracies and application. Steady state and rapid scan voltammetry, stripping voltammetry, chronopotentiometry, chronocoulometry, classical coulometry and potentiometry. Instrument design and modification for specific needs.

48.180G Corrosion Materials F L2

Metallic: types available, properties and applications for each of the following: cast iron, alloy cast iron, carbon steels, low alloy steels, stainless steel, special alloys. The following metals and their alloys: aluminium, copper, nickel, titanium, lead, zinc, magnesium, tin, cadmium, chromium, cobalt. Refractory metals: molybdenum, tantalum, tungsten, zirconium. Noble metals: gold, platinum, silver.

48.181G Industrial Coatings for Corrosion Protection S1 L2

Special topics on heavy-duty organic, inorganic and metallic coatings used in atmospheric, marine and industrial environments.

48.182G Non-metallic Materials for Corrosion Resistance S1 L2

Thermosetting and thermoplastic polymers; natural and synthetic rubbers; glasses and glass linings; acid resisting ceramics; refractories.

48.183G Corrosion Technology 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.

48.184G Corrosion Project

A substantial project on some aspect of corrosion science or technology.
Department of Biological Process Engineering

General

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

48.281G Design of Microbial Reactors

Unit 1 Rate Processes

Bridging unit designed to provide the background in rate processes in heterogeneous systems required for Unit 3. This unit would not be offered to a graduate with background in advanced processes, the equivalent of 48.0454 Reactor Engineering.

Process rates and rates of change; generalized definition of a process rate. Material balances with reaction — integral balances and balanced differential with respect to time, space, and both time and space. Measurement, interpretation and correlation of process rates. Heterogeneous systems, the influence of diffusion processes, linear and non-linear systems, lumped and distributed systems.

Unit 2 Fundamentals of Microbial Stoichiometry

This is a bridging unit offered to students with little or no background in the life sciences. A prerequisite or co-requisite would be 44.101 Introductory Microbiology or its equivalent. The unit is designed to provide an understanding of the structure of metabolism to allow the student to carry out the overall metabolic balances necessary for quantification of living systems.

Growth of an undifferentiated organism as a physico-chemical process leading to quantification of the growth processes. Overall structure of metabolic processes. Material, energy and redox balances under anaerobic and aerobic conditions. Specific metabolic rates and their quantification.

Unit 3 Design of Microbial Reactors

This unit would normally follow rate processes or fundamentals of microbial stoichiometry and is divided into two strands.

Reactor Design Fundamentals: Ideal and non-ideal reactors, residence time distribution and non-ideal reactor models. The significance of mixing and diffusion in microbial reactors for freely suspended microorganisms. The concept of a microfluid and a macrofluid and its application to the description of two-phase reacting systems — gas-liquid, oil-aqueous and solid-fluid systems will be examined with examples relevant to the biological process industries. Microbial Reactor Calculations: The collection, quantification and interpretation of rate data, and the design of reactors for freely suspended microorganisms; batch, semi-batch and continuous reactors; gas exchange balances. Rate processes in microbial flocs and microbial films. Design for microbial flouc and film reactors.

48.282G Microbial Kinetics and Energetics

Unit 1 Microbial Kinetics

Prerequisite or co-requisite: 48.281G Unit 2 or equivalent.

Significance of entropy and free energy changes in microbial growth. Driven reactions, group transfer potentials, driven reaction sequences and the significance of actual and standard free energy changes in open systems. Application to metabolism, energy requiring pathways, energy producing pathways. Thermodynamic efficiency of growth. Mass, heat and entropy balances in growing cultures, prediction of yield.

Unit 2 Microbial Energetics

Prerequisite or co-requisite: 48.281G Unit 2 or equivalent.

Significance of entropy and free energy changes in microbial growth. Driven reactions, group transfer potentials, driven reaction sequences and the significance of actual and standard free energy changes in open systems. Application to metabolism, energy requiring pathways, energy producing pathways. Thermodynamic efficiency of growth. Mass, heat and entropy balances in growing cultures, prediction of yield.

48.283G Bioprocess Unit Operations and Equipment Design

Prerequisite or co-requisite: 48.284G or equivalent.

Engineering design and operating characteristics of plant and processes normally used, eg sterilization and air purification, dehydration at reduced pressure, reduced temperature preservation, radiation, product isolation, sedimentation, filtration, centrifugation, extraction, absorption, chromatography and ion exchange, absorption with reaction, electrophoresis and dialysis, aseptic design, materials of construction, effluent disposal.

48.284G Heat, Mass and Momentum Transport

A bridging subject designed to provide an introductory understanding of the mechanisms of transport processes. This subject would not be offered to a graduate with a background in chemical engineering principles. Mechanisms of molecular and turbulent transport. Heat, mass and momentum transport as rate processes. Boundary layer theory. Lift and drag coefficients. Introduction to non-Newtonian flow.

48.285G Bioprocess Laboratory

Practical experience in the industrial processing of biological and microbial systems. Small projects in areas of interest to the student.

Department of Fuel Technology

Note: One Session Unit (SU) is equal to 1 hour per week for session of 14 weeks.
48.380G Fuel Seminar
1 (SU) to be given in Session 2, compulsory in MAppSc degree course in Fuel Engineering. Content bias to choice of G subjects.

48.382G Fuel Constitution
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.

48.383G Fuel Processing
Unit 1 (2 SU) Carbonization and gasification processes.
Unit 2 (1 SU) Liquid fuels from coals.
Unit 3 (1 SU) Chemicals from coals.

48.384G Fuel Plant Engineering
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.

48.385G Combustion and Energy Systems
Unit 1 (1 SU) Combustion technology.
Unit 2 (1 SU) Fuel impurities, removal of and deposits from.
Unit 3 (1 SU) Efficiency in energy utilization.
Unit 4 (1 SU) Combined cycles and integrated systems.

48.386G Unit Operations in Waste Management
Unit 1 (3 SU) The unit operations and processes associated with modern waste management practices, ie the origin, nature, characterization, handling, transportation, size reduction and storage of various waste materials; reduction at source and disposal by composting, landfill, incineration and chemical processing; recovery and re-use of marketable products. Legal aspects: case histories.

48.387G Fuel Technology Practice
Compulsory in MAppSc (Fuel) (4 SU). Content bias towards choice of G subjects.

48.391G Atmospheric Pollution and Control (Theory)
S1 or S2 L3
Causes, properties, dispersion, measurement and monitoring, control and legislation of air pollution in ambient and industrial environments.

48.392G Practical Aspects of Air Pollution Measurement and Control
S1 or S2 T3
Prerequisite: 48.391G.
Laboratory and tutorial programs in the measurement and analysis of ambient and industrial air pollutants. Computation tutorials in advanced dispersion models, aerosol dynamics and control equipment design parameters.

Department of Polymer Science

48.400G Polymer Science
F L3T3
Polymer Processes: Classification of polymers, methods of polymerization; bulk, solution, emulsion, suspension, high pressure processes; step growth, chain growth; the chemistry and applications of polymer systems including polyesters, polamides, phenolic condensation resins, vinyl polymers, synthetic elastomers. Natural polymers. Mechanism and Kinetics: Step growth polymerization, kinetics, structure effects; chain growth polymerization. Free radical polymerization, chemistry and properties of free radicals and initiators; kinetics of propagation and termination reactions; co-polymerization; monomer radical structure and reactivity. Cationic and anionic polymerization; stereoregular polymers. Polymer Characterization: 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.

48.410G Analytical Characterization of Polymers
S1 or S2 L3T3
Composition of formulated polymeric material. Group reactions, specific and colour reactions. Instrumental characterization of polymers, and co-polymers and associated additives, eg plasticizers, antioxidants, etc. by UV and IR spectrophotometry and pyrolysis gas chromatography. Analysis of films by transmission and reflectance spectrophotometric methods. Thermal analysis.

48.430G Polymer Engineering
S1 or S2 L4T2

48.440G Polymer Physics
S1 or S2 L4T2

48.900G Major Project
A substantial project on some aspects of chemical engineering, industrial chemistry, polymer science, fuel technology or biological process engineering.

48.901G Minor Project
A minor investigation on some aspect of chemical engineering, industrial chemistry, polymer science, fuel technology or biological process engineering.
Graduate Study

Conditions for the Award of Higher Degrees

First Degrees
Rules, regulations and conditions for the award of first degrees are set out in the appropriate Faculty Handbooks.

For the list of undergraduate courses and degrees offered see Disciplines of the University: Faculty (Undergraduate Study) in the Calendar.

Higher Degrees
The following is the list of higher degrees and graduate diplomas of the University, together with the publication in which the conditions for the award appear.

For the list of graduate degrees by research and course work, arranged in faculty order, see Disciplines of the University: Table of Courses (by faculty): Graduate Study in the Calendar.

For the statements Preparation and Submission of Project Reports and Theses for Higher Degrees and Policy with respect to the Use of Higher Degree Theses see the Calendar.

<table>
<thead>
<tr>
<th>Title</th>
<th>Abbreviation</th>
<th>Calendar/Handbook</th>
</tr>
</thead>
<tbody>
<tr>
<td>Doctor of Science</td>
<td>DSc</td>
<td>Calendar</td>
</tr>
<tr>
<td>Doctor of Letters</td>
<td>DLitt</td>
<td>Calendar</td>
</tr>
<tr>
<td>Doctor of Laws</td>
<td>LLD</td>
<td>Calendar</td>
</tr>
<tr>
<td>Doctor of Medicine</td>
<td>MD</td>
<td>Calendar Medicine</td>
</tr>
<tr>
<td>Doctor of Philosophy</td>
<td>PhD</td>
<td>Calendar and all handbooks</td>
</tr>
<tr>
<td>Master of Applied Science</td>
<td>MAppSc</td>
<td>Applied Science</td>
</tr>
<tr>
<td>Master of Architectural Design</td>
<td>MArchDes</td>
<td>Architecture</td>
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<td>Master of Architecture</td>
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<td>Architecture</td>
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<tr>
<td>Master of Archives Administration</td>
<td>MArchivAdmin</td>
<td>Professional Studies</td>
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<tr>
<td>Master of Arts</td>
<td>MA</td>
<td>Arts, Military Studies</td>
</tr>
<tr>
<td>Master of Biomedical Engineering</td>
<td>MBiomedE</td>
<td>Engineering</td>
</tr>
<tr>
<td>Master of Building</td>
<td>MBuild</td>
<td>Architecture</td>
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<tr>
<td>Master of the Built Environment</td>
<td>MBEnv</td>
<td>Architecture</td>
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<tr>
<td>Master of the Built Environment (Building Conservation)</td>
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<td>Master of Business Administration</td>
<td>MBA</td>
<td>AGSM</td>
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<td>Master of Chemistry</td>
<td>MChem</td>
<td>Sciences*</td>
</tr>
<tr>
<td>Master of Commerce (Honours)</td>
<td>MCom(Hons)</td>
<td>Commerce</td>
</tr>
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<td>Commerce</td>
</tr>
<tr>
<td>Master of Education</td>
<td>MEd</td>
<td>Professional Studies</td>
</tr>
<tr>
<td>Master of Educational Administration</td>
<td>MEdAdmin</td>
<td>Professional Studies</td>
</tr>
<tr>
<td>Master of Engineering</td>
<td>ME</td>
<td>Applied Science</td>
</tr>
<tr>
<td>Master of Engineering without supervision</td>
<td>MEngSc</td>
<td>Engineering</td>
</tr>
<tr>
<td>Master of Engineering Science</td>
<td>MEngSc</td>
<td>Military Studies</td>
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<tr>
<td>Master of Environmental Studies</td>
<td>MEnvStudies</td>
<td>Applied Science</td>
</tr>
<tr>
<td>Master of General Studies</td>
<td>MGenStud</td>
<td>General Studies</td>
</tr>
<tr>
<td>Master of Health Administration</td>
<td>MHA</td>
<td>Professional Studies</td>
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<tr>
<td>Master of Health Personnel Education</td>
<td>MHPEd</td>
<td>Medicine</td>
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<td>Master of Health Planning</td>
<td>MHP</td>
<td>Professional Studies</td>
</tr>
<tr>
<td>Master of Industrial Design</td>
<td>MID</td>
<td>Architecture</td>
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<tr>
<td>Master of Landscape Architecture</td>
<td>MLArch</td>
<td>Architecture</td>
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<tr>
<td>Master of Laws</td>
<td>LLM</td>
<td>Law</td>
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<tr>
<td>Master of Librarianship</td>
<td>MLib</td>
<td>Professional Studies</td>
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<td>Master of Mathematics</td>
<td>MMath</td>
<td>Sciences*</td>
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<td>Master of Music</td>
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<td>Arts</td>
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<tr>
<td>Master of Nursing Administration</td>
<td>MNA</td>
<td>Professional Studies</td>
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<tr>
<td>Master of Optometry</td>
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<td>Sciences*</td>
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<tr>
<td>Master of Paediatrics</td>
<td>MPaed</td>
<td>Medicine</td>
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<tr>
<td>Master of Physics</td>
<td>MPhysics</td>
<td>Sciences*</td>
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<td>Master of Psychology</td>
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<td>Sciences§</td>
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<tr>
<td>Master of Safety Science</td>
<td>MSafetySc</td>
<td>Engineering</td>
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<td>Master of Science</td>
<td>MSc</td>
<td>Applied Science</td>
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<tr>
<td>Master of Science without supervision</td>
<td>MSc</td>
<td>Architecture</td>
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<td>Master of Science (Acoustics)</td>
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<td>Master of Science (Biotechnology)</td>
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<td>Master of Science (Building)</td>
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<td>Architecture</td>
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<td>MSc(IndDes)</td>
<td>Architecture</td>
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<tr>
<td>Master of Science (Psychology)</td>
<td>MSc(Psychol)</td>
<td>Sciences§</td>
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<tr>
<td>Master of Science and Society</td>
<td>MScSoc</td>
<td>Sciences*</td>
</tr>
<tr>
<td>Master of Social Work</td>
<td>MSW</td>
<td>Professional Studies</td>
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<tr>
<td>Master of Statistics</td>
<td>MStats</td>
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<tr>
<td>Master of Surgery</td>
<td>MS</td>
<td>Medicine</td>
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<td>Master of Surveying</td>
<td>MSurv</td>
<td>Engineering</td>
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<tr>
<td>Master of Surveying (without supervision)</td>
<td>MSurvSc</td>
<td>Engineering</td>
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<tr>
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<td>MSurvSc</td>
<td>Engineering</td>
</tr>
<tr>
<td>Master of Town Planning</td>
<td>MTP</td>
<td>Architecture</td>
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<tr>
<td>Master of Welfare Policy</td>
<td>MWP</td>
<td>Professional Studies</td>
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**Graduate Diplomas**

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<th>Graduate Diploma</th>
<th>GradDip</th>
<th>Applied Science</th>
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<tr>
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<td>Architecture</td>
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<td>DipFDA</td>
<td></td>
<td>Engineering</td>
</tr>
<tr>
<td>DipEd</td>
<td></td>
<td>Sciences*§</td>
</tr>
<tr>
<td>DiplM-ArchivAdmin</td>
<td></td>
<td>Sciences*</td>
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<tr>
<td>DiplM-Lib</td>
<td></td>
<td>Professional Studies</td>
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*Faculty of Science.
§Faculty of Biological Sciences.

### Higher Degrees

**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.

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.

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.
Graduate Study: Conditions for the Award of Higher Degrees

(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.

(4) A full-time candidate shall be fully engaged in advanced study and research except that the candidate may undertake not more than five hours per week or a total of 240 hours per year on work which is not related to the advanced study and research.

(5) Before permitting a part-time candidate to enrol, the Committee shall be satisfied that the candidate can devote at least 20 hours each week to advanced study and research for the degree which (subject to (8)) shall include regular attendance at the school on an average of at least one day per week for 48 weeks each year.

(6) A candidate shall be required to undertake an original investigation on an approved topic. The candidate may also be required to undergo such assessment and perform such other work as may be prescribed by the Committee.

(7) The work shall be carried out under the direction of a supervisor appointed from the full-time academic members of the University staff.

(8) The work, other than field work, shall be carried out in a school of the University except that the Committee:
(a) may permit a candidate to spend not more than one calendar year of the program in advanced study and research at another institution provided the work can be supervised in a manner satisfactory to the Committee;
(b) may permit a candidate to conduct the work at other places where special facilities not possessed by the University may be available provided the direction of the work remains wholly under the control of the supervisor;
(c) may permit a full-time candidate, who has been enrolled as a full-time candidate for at least six academic sessions, who has completed the research work and who is writing the thesis, to transfer to part-time candidature provided the candidate devotes at least 20 hours each week to work for the degree and maintains adequate contact with the supervisor.

(9) The progress of a candidate shall be reviewed annually by the Committee following a report by the candidate, the supervisor and the head of the school in which the candidate is enrolled and as a result of such review the Committee may cancel enrolment or take such other action as it considers appropriate.

(10) No candidate shall be awarded the degree until the lapse of six academic sessions from the date of enrolment in the case of a full-time candidate or eight academic sessions in the case of a part-time candidate. In the case of a candidate who has had previous research experience the committee may approve remission of up to two sessions for a full-time candidate and four sessions for a part-time candidate.

(11) A full-time candidate for the degree shall present for examination not later than ten academic sessions from the date of enrolment. A part-time candidate for the degree shall present for examination not later than twelve academic sessions from the date of enrolment. In special cases an extension of these times may be granted by the Committee.

4. (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 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;

*Or department where a department is not within a school.
(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

5. (1) There shall be not fewer than three examiners of the thesis, appointed by the Professorial Board on the recommendation of 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:

(a) the candidate be awarded the degree without further examination; or

(b) the candidate be awarded the degree without further examination subject to minor corrections as listed being made to the satisfaction of the head of the school*; or

(c) the candidate be awarded the degree subject to 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 re-present the same thesis and submit to further examination as determined by the Committee within a period specified by it but not exceeding eighteen months.

(4) 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 be permitted to 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 Applied Science (MAppSc) and Master of Environmental Studies (MEnvStudies)

Qualifications

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 completed a program of advanced study.

2. (1) A candidate for 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

*Or department where a department is not within a school.
Graduate Study: Conditions for the Award of Higher Degrees

(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 of tertiary institution at a level acceptable to the Committee and

(ii) have undertaken appropriate postgraduate studies of one 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.

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.

4. A candidate shall pay such fees as may be determined from time to time by the Council.

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 has demonstrated ability to undertake research by the submission of a thesis embodying the results of an original investigation.

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.

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:

*Or department where a department is not within a school.
(a) full-time attendance at the University;
(b) part-time attendance at the University;
(c) external — not in regular attendance at the University and using research facilities external to the University.

(4) A candidate shall be required to undertake an original investigation on an approved topic. The candidate may also be required to undergo such examination and perform such other work as may be prescribed by the Committee.

(5) The work shall be carried out under the direction of a supervisor appointed from the full-time members of the University staff.

(6) The progress of a candidate shall be reviewed annually by the Committee following a report by the candidate, the supervisor and the head of the school* in which the candidate is enrolled and as a result of such review the Committee may cancel enrolment or take such other action as it considers appropriate.

(7) No candidate shall be granted the degree until the lapse of three academic sessions in the case of a full-time candidate or four academic sessions in the case of a part-time or external candidate from the date of enrolment. In the case of a candidate who has been awarded the degree of Bachelor with Honours or who 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 Professorial Board on the recommendation of the Committee, at least one of whom shall be external to the University unless the Committee is satisfied that this is not practicable.

(2) At the conclusion of the examination each examiner shall submit to the Committee a concise report on the merits of the thesis and shall recommend to the Committee that:

(a) the candidate be awarded the degree without further examination; or
(b) the candidate be awarded the degree without further examination subject to minor corrections as listed being made to the satisfaction of the head of the school*; or
(c) the candidate be awarded the degree subject to 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 re-present the same

*Or department where a department is not within a school.
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.

6. A candidate shall pay such fees as may be determined from time to time by the Council.

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.

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.

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* with regard to the adequacy of the subject matter and its presentation for the degree. A synopsis of the work should be available.

4. (1) A candidate shall submit a thesis embodying the results of the investigation.
   (2) The candidate shall give in writing to the Registrar two months notice of intention to submit the thesis.
   (3) The thesis shall present an account of the candidate's own research. In special cases work done conjointly with other persons may be accepted, provided the Committee is satisfied about the extent of the candidate's part in the joint research.
   (4) The candidate may also submit any work previously published whether or not 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 theses for higher degrees.
   (6) It shall be understood that the University retains the three copies of the thesis submitted for examination and is free to allow the thesis to be consulted or borrowed. Subject to the provisions of the Copyright Act, 1968, the University may issue the thesis in whole or in part, in photostat or microfilm or other copying medium.

5. (1) There shall be not fewer than two examiners of the thesis, appointed by the Professorial Board on the recommendation of the Committee, at least one of whom shall be external to the University unless the Committee is satisfied that this is not practicable.
   (2) Before the thesis is submitted to the examiners the head of the school* in which the candidate is enrolled shall certify that it is prima facie worthy of examination.
   (3) At the conclusion of the examination each examiner shall submit to the Committee 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

*Or department where a department is not within a school.
(c) the candidate be awarded the degree subject to a further examination on questions posed in the report, performance in this further examination being to the satisfaction of the Committee; or

(d) the candidate be not awarded the degree but be permitted to resubmit the thesis in a revised form after a further period of study and/or research; or

(e) the candidate be not awarded the degree and be not permitted to resubmit the thesis.

(4) If the performance at the further examination recommended under (3)(c) above is not to the satisfaction of the Committee, the Committee may permit the candidate to re-present the same thesis and submit to further examination as determined by the Committee within a period specified by it but not exceeding eighteen months.

(5) The Committee shall, after consideration of the examiners' reports and the results of any further examination, recommend whether or not the candidate may be awarded the degree. If it is decided that the candidate be not awarded the degree the Committee shall determine whether or not the candidate may resubmit the thesis after a further period of study and/or research.

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 Science (MSc)  See Master of Engineering above.

Master of Science (MSc)  
without supervision  See Master of Engineering without supervision above.

Graduate Diploma  
Graduate Diploma (GradDip)  
Qualifications  

1. A Graduate Diploma may be awarded by the Council to a candidate who has satisfactorily completed a program of advanced study.

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 prescribe, before permitting enrolment.

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.

4. A candidate shall pay such fees as may be determined from time to time by the Council.
Scholarships and Prizes

The scholarships and prizes listed below are available to students whose courses are listed in this handbook. Each faculty handbook contains in its Scholarships and Prizes section the scholarships and prizes available within that faculty. The General Information section of the Calendar contains a comprehensive list of scholarships and prizes offered throughout the University.

Scholarships

Undergraduate Scholarships

Listed below is an outline only of a number of scholarships available to students. Full information may be obtained from Room G20, located on the Ground Floor of the Chancellery.

Unless otherwise indicated in footnotes, applications for the following scholarships should be made to the Registrar by 14 January each year. Please note that not all of these awards are available every year.

<table>
<thead>
<tr>
<th>Donor</th>
<th>Value</th>
<th>Year(s) of Tenure</th>
<th>Conditions</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bursary Endowment Board*</td>
<td>$200 pa</td>
<td>Minimum period of approved degree/combined degree course</td>
<td>Merit in HSC and total family income not exceeding $6000</td>
</tr>
<tr>
<td>Sam Cracknell Memorial</td>
<td>Up to $3000 pa payable in fortnightly instalments</td>
<td>1 year</td>
<td>Prior completion of at least 2 years of a degree or diploma course and enrolment in a full-time course during the year of application; academic merit; participation in sport both directly and administratively; and financial need</td>
</tr>
</tbody>
</table>

*Apply to The Secretary, Bursary Endowment Board, PO Box 460, North Sydney 2060, immediately after sitting for HSC.
## Undergraduate Scholarships (continued)

<table>
<thead>
<tr>
<th>Donor</th>
<th>Value</th>
<th>Year/s of Tenure</th>
<th>Conditions</th>
</tr>
</thead>
<tbody>
<tr>
<td>Girls Realm Guild</td>
<td>Up to $1500 pa</td>
<td>1 year</td>
<td>Available only to female students under 35 years of age who are permanent residents of Australia enrolling in any year of a full-time undergraduate course on the basis of academic merit and financial need.</td>
</tr>
<tr>
<td>W. S. and L. B. Robinson**</td>
<td>Up to $3800 pa</td>
<td>1 year</td>
<td>Available only to students who have completed their schooling in Broken Hill or whose parents reside in Broken Hill; for a course related to the mining industry. Includes courses in mining engineering, geology, electrical and mechanical engineering, metallurgical process engineering, chemical engineering and science.</td>
</tr>
<tr>
<td>Universities Credit Union</td>
<td>$500 pa</td>
<td>1 year with the possibility of renewal</td>
<td>Prior completion of at least 1 year of any undergraduate degree course. Eligibility limited to members of the Universities Credit Union Ltd of more than one year's standing or members of the family of such members.</td>
</tr>
</tbody>
</table>

### Ceramic Engineering

- **Australian Ceramic Society**
  - Up to $300 pa
  - 1 year renewable for the duration of the course subject to satisfactory progress
  - Permanent residence in Australia and eligibility for admission to Year 1 or Year 2 of the full-time degree course in Ceramic Engineering

- **Australian Consolidated Industries Ltd**
  - Up to $600 pa

- **The Brick Manufacturers' Association of New South Wales**
  - Up to $1000 pa

- **Ceramco Limited**
  - Up to $1000 pa

- **Ferro Corporation**
  - Up to $600 pa

- **Fowlerware**
  - Up to $500 pa

- **Monier Limited**
  - Up to $1000 pa

- **North Sydney Brick and Tile Co Ltd**
  - Up to $1000 pa

- **Plessey Australia Pty Ltd**
  - Up to $1000 pa

- **Proton Industries**
  - Up to $1000 pa

- **The Thomson Family**
  - Up to $1000 pa

- **Zacuba Pty Ltd**
  - Up to $750 pa

**Applications close 30 September each year**
### Undergraduate Scholarships (continued)

<table>
<thead>
<tr>
<th>Donor</th>
<th>Value</th>
<th>Years of Tenure</th>
<th>Conditions</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Chemical Engineering and Industrial Chemistry</strong></td>
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</tr>
<tr>
<td>Australian Waste Disposal Conference Committee</td>
<td>Up to $300 pa</td>
<td></td>
<td>Permanent residence in Australia and eligibility for admission to any year of the full-time degree course in Chemical Engineering (with Fuel Engineering electives)</td>
</tr>
<tr>
<td>Dow Chemical (Australia)</td>
<td>Up to $1000 pa</td>
<td></td>
<td>Permanent residence in Australia and eligibility for admission to Year 2 of the full-time degree course in Chemical Engineering or Industrial Chemistry</td>
</tr>
<tr>
<td>Fielder Gillespie Ltd</td>
<td>Up to $1000 pa</td>
<td>1 year renewable for the duration of the course subject to satisfactory progress</td>
<td>Permanent residence in Australia and eligibility for admission to Year 2 of the full-time degree course in Chemical Engineering or Industrial Chemistry</td>
</tr>
<tr>
<td>ICI Australia Operations Ltd</td>
<td>Up to $1000 pa</td>
<td></td>
<td>Eligibility for admission to Year 4 of the full-time degree course in Chemical Engineering</td>
</tr>
<tr>
<td>Shell Refining (Australia) Pty Ltd</td>
<td>Up to $1500 pa</td>
<td></td>
<td>Eligibility for admission to Year 2 of the full-time degree course in Chemical Engineering</td>
</tr>
<tr>
<td><strong>Food Science and Technology</strong></td>
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<tr>
<td>Coca-Cola Export Corporation</td>
<td>Up to $1500 pa</td>
<td>1 year renewable for the duration of the course subject to satisfactory progress</td>
<td>Permanent residence in Australia. Not more than 22 years of age on 1 December preceding the year in which the award commences and eligibility for admission to Year 1 of the full-time degree course in Food Technology.</td>
</tr>
<tr>
<td>Food Technology Association</td>
<td>Up to $1000 pa</td>
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<tr>
<td>George Weston Foods Ltd</td>
<td>Up to $4000 over 4 years</td>
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<tr>
<td><strong>Fuel Engineering</strong></td>
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</tr>
<tr>
<td>Australian Waste Disposal Conference Committee</td>
<td>Up to $300 pa</td>
<td>1 year with possibility of further extension subject to satisfactory progress</td>
<td>Permanent residence in Australia and eligibility for admission to any year of the full-time degree course in Chemical Engineering (with Fuel Engineering electives)</td>
</tr>
<tr>
<td>Donor</td>
<td>Value</td>
<td>Year of Tenure</td>
<td>Conditions</td>
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<tr>
<td><strong>Metallurgy</strong></td>
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<tr>
<td>Sandvik Australia Pty Ltd</td>
<td>Up to $1250 pa</td>
<td>1 year renewable for the duration of the course, subject to satisfactory progress</td>
<td>Permanent residence in Australia and eligibility for admission to Year 1 or Year 2 of the full-time degree course in Metallurgy or Metallurgical Process Engineering</td>
</tr>
<tr>
<td>Sir Rupert Myers</td>
<td>Up to $1500 pa</td>
<td></td>
<td>Eligibility for admission to Year 1 of the full-time degree course in Metallurgy or Metallurgical Process Engineering</td>
</tr>
<tr>
<td>School of Metallurgy</td>
<td>Up to $1500 pa</td>
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<tr>
<td><strong>Mining Engineering</strong></td>
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<tr>
<td>Stan Sawyer Memorial Scholarship to Coal Mining Students</td>
<td>Up to $200 pa</td>
<td>1 year renewable for the duration of the course, subject to satisfactory progress</td>
<td>Eligibility for admission to Year 3 or Year 4 of the full-time degree course in Mining Engineering</td>
</tr>
<tr>
<td><strong>Textile Technology</strong></td>
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</tr>
<tr>
<td>Australian Wool Corporation</td>
<td>$3581 pa</td>
<td>1 year renewable for the duration of the course, subject to satisfactory progress</td>
<td>Permanent residence in Australia and eligibility for admission to the full-time degree course in Textile Technology</td>
</tr>
<tr>
<td>Bonds Industries Ltd</td>
<td>Up to $2321 pa</td>
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<tr>
<td>Bruck (Australia) Limited</td>
<td>$3100 or $2010 pa</td>
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<tr>
<td>Fibremakers Division of ICI</td>
<td>$3581 or $2321 pa</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Australia Operations Pty Ltd</td>
<td>Up to $1500 pa</td>
<td></td>
<td></td>
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<tr>
<td>Reckitt's Toiletries International</td>
<td>$3100 or $2010 pa</td>
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<tr>
<td>Textile Council of Australia</td>
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<tr>
<td>National Council of Wool Selling Brokers of Australia</td>
<td>Up to $2500 pa</td>
<td></td>
<td>Eligibility for admission to the full-time degree course in Textile Technology</td>
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<tr>
<td>Webco</td>
<td>$500 pa</td>
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<tr>
<td><strong>Wool and Pastoral Sciences</strong></td>
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</tr>
<tr>
<td>National Australia Bank</td>
<td>Up to $1000 pa</td>
<td>1 year renewable for the duration of the course, subject to satisfactory progress</td>
<td>Eligibility for admission to the full-time degree course in Wool and Pastoral Sciences</td>
</tr>
<tr>
<td>National Council of Wool Selling Brokers of Australia</td>
<td>Up to $2500 pa</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Merck, Sharp and Dohme</td>
<td>Up to $1000 pa</td>
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</tr>
</tbody>
</table>

**Applications close 30 September each year.**
Graduate Scholarships

Application forms and further information are available from the Student Enquiry Counter, located on the Ground Floor of the Chancellery. Information is also available on additional scholarships which may become available from time to time, mainly from funds provided by organizations sponsoring research projects.

The following publications may also be of assistance: 1. Awards for Postgraduate Study in Australia and Awards for Postgraduate Study Overseas, published by the Graduate Careers Council of Australia, PO Box 28, Parkville, Victoria 3052; 2. Study Abroad, published by UNESCO*; 3. Scholarships Guide for Commonwealth Postgraduate Students, published by the Association of Commonwealth Universities*.

<table>
<thead>
<tr>
<th>Donor</th>
<th>Value</th>
<th>Year/s of Tenure</th>
<th>Conditions</th>
</tr>
</thead>
<tbody>
<tr>
<td>University of New South Wales Postgraduate Scholarships</td>
<td>Living allowance of $6500 pa. Other allowances may also be paid.</td>
<td>1-2 years for a Masters and 3-4 years for a PhD degree</td>
<td>Applicants must be honours graduates (or equivalent). Applications to Dean of relevant Faculty.</td>
</tr>
<tr>
<td>Commonwealth Postgraduate Research Awards</td>
<td>Living allowance of $7616 pa. Other allowances may also be paid.</td>
<td>1-2 years; minimum duration of course</td>
<td>Applicants must be honours graduates (or equivalent) or scholars who will graduate with honours in current academic year, and who are domiciled in Australia. Applications to Registrar by 31 October.</td>
</tr>
<tr>
<td>Commonwealth Postgraduate Course Awards</td>
<td></td>
<td></td>
<td>Applicants must be graduates or scholars who will graduate in current academic year, and who have not previously held a Commonwealth Post-graduate Award. Preference is given to applicants with employment experience. Applications to Registrar by 30 September.</td>
</tr>
<tr>
<td>Australian American Educational Foundation Travel Grant (Fulbright)**</td>
<td>Amount varies, depending on award</td>
<td>Up to 1 year</td>
<td>Applicants must be graduates, senior scholars or post-doctoral Fellows. Applications close 30 September.</td>
</tr>
<tr>
<td>Australian Federation of University Women</td>
<td></td>
<td></td>
<td>Applicants must be female graduates who are members of the Australian Federation of University Women</td>
</tr>
<tr>
<td>The Caltex Woman Graduate Scholarships</td>
<td>Six State awards of $5000 each One National award valued at $20,000 pa for study at an approved overseas institution.</td>
<td>1 year 2 years</td>
<td>Applicants must be female graduates who will have completed a University degree or diploma this year and who are Australian citizens or have resided in Australia for at least seven years. Selection is based on scholastic and literary achievements, demonstrable qualities of character and accomplishments in cultural and/or sporting/recreational activities. Applications close late September.</td>
</tr>
</tbody>
</table>

*Available for reference in the University Library.
**Application forms are available from The Secretary, Department of Education, AAEF Travel Grants, PO Box 826, Woden, ACT 2606.
<table>
<thead>
<tr>
<th>Donor</th>
<th>Value</th>
<th>Years of Tenure</th>
<th>Conditions</th>
</tr>
</thead>
<tbody>
<tr>
<td>Commonwealth Scholarship and Fellowship Plan</td>
<td>Varies for each country. Generally covers travel, living, tuition fees, books and equipment, approved medical expenses. Marriage allowance may be payable.</td>
<td>Usually 2 years, sometimes 3</td>
<td>Applicants must be graduates who are Australian citizens and who are not older than 35 years of age. Applications close with Registrar in September or October each year.</td>
</tr>
<tr>
<td>The English-Speaking Union (NSW Branch)</td>
<td>$5000</td>
<td></td>
<td>Applicants must be residents of NSW or ACT. Awarded to young graduates to further their studies outside Australia. Applications close mid-April.</td>
</tr>
<tr>
<td>Frank Knox Memorial Fellowships at Harvard University</td>
<td>Stipend of US$6000 pa plus tuition fees</td>
<td>1, sometimes 2 years</td>
<td>Applicants must be British subjects and Australian citizens, who are graduates or near graduates of an Australian university. Applications close with the Registrar mid-October.</td>
</tr>
<tr>
<td>Gowrie Scholarship Trust Fund</td>
<td>$3500 pa. Under special circumstances this may be increased.</td>
<td>2 years</td>
<td>Applicants must be members of the Forces or children of members of the Forces who were on active service during the 1939-45 War. Applications close with Registrar by 31 October.</td>
</tr>
<tr>
<td>Harkness Fellowships of the Commonwealth Fund of New York*</td>
<td>Living and travel allowances, tuition and research expenses, health insurance, book and equipment and other allowances for travel and study in the USA</td>
<td>12 to 21 months</td>
<td>Candidates must be: 1. Either members of the Commonwealth or a State Public Service or semi-government Authority. 2. Either staff or graduate students at an Australian university. 3. Individuals recommended for nomination by the Local Correspondents. The candidate will usually have an honours degree or equivalent, or an outstanding record of achievement, and be not more than 36 years of age. Applications close 31 August.</td>
</tr>
<tr>
<td>The Rhodes Scholarship**</td>
<td>Approximately £3600 stg pa</td>
<td>2 years, may be extended for a third year</td>
<td>Unmarried male and female Australian citizens aged between 19 and 25 who have been domiciled in Australia at least 5 years and have completed at least 2 years of an approved university course. Applications close in mid-September each year.</td>
</tr>
<tr>
<td>Rothmans Fellowships Award†</td>
<td>$20000 pa</td>
<td>1 year, renewable up to 3 years</td>
<td>The field of study is unrestricted. Applicants must have at least 3 years graduate experience in research. Applications close in July.</td>
</tr>
</tbody>
</table>

*Application forms must be obtained from the Australian representative of the Fund, Mr J. T. Larkin, Department of Trade, Edmund Barton Building, Kings Avenue, Barton, ACT 2600. These must be submitted to the Registrar by early August.

**Applications to The Honorary Secretary of the NSW Committee, University of Sydney, NSW 2006.

†Applications to the Secretary, Rothmans University Endowment Fund, University of Sydney, NSW 2006.
Graduate Scholarships (continued)

<table>
<thead>
<tr>
<th>Donor</th>
<th>Value</th>
<th>Years of Tenure</th>
<th>Conditions</th>
</tr>
</thead>
<tbody>
<tr>
<td>General (continued)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sam Cracknell Memorial</td>
<td>Up to $3000 pa</td>
<td></td>
<td>See above under Undergraduate Scholarships, General</td>
</tr>
</tbody>
</table>

Applied Science

<table>
<thead>
<tr>
<th>Donor</th>
<th>Value</th>
<th>Conditions</th>
</tr>
</thead>
<tbody>
<tr>
<td>Australian Pig Industry Research Committee</td>
<td>Up to $3000 pa</td>
<td>1 year subject to satisfactory progress. Renewable annually; maximum tenure of 2 years for a Masters candidate or 3 to 4 years for a PhD degree.</td>
</tr>
<tr>
<td>Postgraduate Awards</td>
<td></td>
<td>1-3 years, varies with course.</td>
</tr>
<tr>
<td>Australian Wool Corporation Research Scholarship in Textile Technology</td>
<td>$7616 pa plus allowances</td>
<td>Applications close 31 August</td>
</tr>
<tr>
<td>Australian Wool Corporation Research Scholarship in Wool and Pastoral Sciences</td>
<td></td>
<td>Applicants must be graduates in applied science, agricultural science or veterinary science</td>
</tr>
<tr>
<td>Australian Meat Research Committee Award†</td>
<td></td>
<td>Awarded for graduate study of the industry leading to the award of a diploma, or Masters or PhD degree. Applications close 31 July.</td>
</tr>
</tbody>
</table>

†Application forms from Executive Officer, Australian Meat Research Committee, GPO Box 4129, Sydney 2001.

Prizes

Undergraduate University Prizes

The following table summarizes the undergraduate prizes for this Faculty awarded by the University. Prizes which are not specific to any School are listed under General.

Information regarding the establishment of new prizes may be obtained from the Examinations Section located on the Ground Floor of the Chancellery.

<table>
<thead>
<tr>
<th>Donor/Name of Prize</th>
<th>Value $</th>
<th>Awarded for</th>
</tr>
</thead>
<tbody>
<tr>
<td>General</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sydney Technical College Union Award</td>
<td>150.00 and medal</td>
<td>Leadership in the development of student affairs, and academic proficiency throughout the course</td>
</tr>
<tr>
<td>University of New South Wales Alumni Association</td>
<td>Statuette</td>
<td>Achievement for community benefit – students in their final or graduating year</td>
</tr>
</tbody>
</table>
### Undergraduate University Prizes (continued)

<table>
<thead>
<tr>
<th>Donor/Name of Prize</th>
<th>Value $</th>
<th>Awarded for</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Faculties of Applied Science</strong></td>
<td></td>
<td><strong>Applied Science</strong></td>
</tr>
<tr>
<td><strong>Institution of Engineers, Australia</strong></td>
<td></td>
<td>Medal and 100.00 The most proficient final year (or last 2 years part-time) student in the Bachelor of Engineering (or Bachelor of Science (Engineering)) degree courses offered by the following Schools:</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Civil Engineering</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Electrical Engineering and Computer Science</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Mechanical and Industrial Engineering</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Chemical Engineering and Industrial Chemistry</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Mining Engineering</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Textile Technology (Engineering option only)</td>
</tr>
<tr>
<td></td>
<td></td>
<td><strong>School of Applied Geology</strong></td>
</tr>
<tr>
<td>F. C. Loughnan — in Applied Geology</td>
<td>340.00</td>
<td>Most outstanding student in Year 3 of the Geology course</td>
</tr>
<tr>
<td></td>
<td></td>
<td><strong>School of Chemical Engineering and Industrial Chemistry</strong></td>
</tr>
<tr>
<td>Abbott Laboratories Pty Ltd</td>
<td>100.00</td>
<td>Bachelor of Engineering degree course in Chemical Engineering — Year 4</td>
</tr>
<tr>
<td>The Australian Gas Light Company’s in</td>
<td>200.00</td>
<td>Subject selected by Head of School</td>
</tr>
<tr>
<td>Chemical Engineering</td>
<td></td>
<td>48.163 Instrumentation and Process Control in Industrial Chemistry</td>
</tr>
<tr>
<td>Australian Paper Manufacturers Ltd</td>
<td>100.00</td>
<td>48.163 Instrumentation and Process Control in Chemical Engineering</td>
</tr>
<tr>
<td></td>
<td>100.00</td>
<td>Subject selected by Head of School</td>
</tr>
<tr>
<td>Chamber of Manufactures of New South Wales</td>
<td>250.00</td>
<td>Best graduate Bachelor of Science degree in Industrial Chemistry</td>
</tr>
<tr>
<td>Chemical Technology Society</td>
<td>25.00</td>
<td>Best graduate Bachelor of Science degree course in Industrial Chemistry, Years 1 and 2 or Stages 1 to 4</td>
</tr>
<tr>
<td></td>
<td>25.00</td>
<td>Subject within the discipline of Industrial Chemistry, selected by Head of School</td>
</tr>
<tr>
<td>CSR Limited</td>
<td>50.00</td>
<td>Best performance in Year 2 Chemical Engineering</td>
</tr>
<tr>
<td>Esso Australia Ltd</td>
<td>200.00</td>
<td>Best result for the thesis in the final year, or equivalent part time stage, of the Bachelor of Engineering degree course</td>
</tr>
<tr>
<td>Institution of Chemical Engineers</td>
<td>100.00</td>
<td>General proficiency in Year 2 or its part-time equivalent in either the Chemical Engineering course or the Industrial Chemistry course</td>
</tr>
<tr>
<td>Shell</td>
<td>100.00</td>
<td>General proficiency in Year 3 or its part-time equivalent in either the Chemical Engineering course or the Industrial Chemistry course</td>
</tr>
</tbody>
</table>

*Shell prizes are continued overleaf*
### Undergraduate University Prizes (continued)

<table>
<thead>
<tr>
<th>Donor/Name of Prize</th>
<th>Value $</th>
<th>Awarded for</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>School of Chemical Engineering and Industrial Chemistry (continued)</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Shell (continued)</td>
<td>100.00</td>
<td>General proficiency in Year 4 or its part-time equivalent in either the Chemical Engineering course or the industrial Chemistry course</td>
</tr>
<tr>
<td></td>
<td>100.00</td>
<td>For a student who, in the opinion of the Head of School, has performed some meritorious activity of note either inside or outside the University</td>
</tr>
<tr>
<td>Simon-Carves Australia</td>
<td>21.00</td>
<td>48.135 Thermodynamics</td>
</tr>
<tr>
<td>Stauffer Australia Limited</td>
<td>100.00</td>
<td>Subject selected by Head of School</td>
</tr>
<tr>
<td>Western Mining Corporation Ltd</td>
<td>150.00</td>
<td>48.036 Chemical Engineering Laboratory 1</td>
</tr>
<tr>
<td></td>
<td>150.00</td>
<td>48.044 Chemical Engineering Laboratory 2</td>
</tr>
<tr>
<td><strong>Department of Fuel Technology</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Australian Institute of Energy</td>
<td>50.00</td>
<td>For a fuel subject or allied subject project</td>
</tr>
<tr>
<td>Shell</td>
<td>150.00</td>
<td>Subject selected by Head of School</td>
</tr>
<tr>
<td><strong>School of Civil Engineering</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Association of Consulting Structural Engineers of New South Wales</td>
<td>225.00</td>
<td>General proficiency – Structures in full-time final year of the Bachelor of Engineering degree course in Civil Engineering</td>
</tr>
<tr>
<td></td>
<td>175.00</td>
<td>General proficiency – Structures in part-time final stage of the Bachelor of Science (Technology) degree course in Civil Engineering</td>
</tr>
<tr>
<td>Australian Conservation Foundation</td>
<td>50.00</td>
<td>Outstanding performance in subjects which develop environmental management concepts</td>
</tr>
<tr>
<td>Australian Welding Institute</td>
<td>Textbooks to the value of 30.00</td>
<td>Best design using a welding process for students in Years 2, 3 or 4</td>
</tr>
<tr>
<td>Chamber of Manufacturers of New South Wales</td>
<td>250.00</td>
<td>Subject selected by Head of School</td>
</tr>
<tr>
<td>Crawford Munro Memorial</td>
<td>150.00</td>
<td>Highest proficiency in 8.582 Water Resources 2</td>
</tr>
<tr>
<td>Department of Civil Engineering Materials Staff</td>
<td>50.00</td>
<td>Best aggregate mark in the subjects: 8.2731 Geotechnical Engineering 1 8.2732 Geotechnical Engineering 2 8.2733 Rock Engineering 8.2741 Concrete Technology 8.2742 Metals Engineering</td>
</tr>
<tr>
<td>Hornibrook</td>
<td>200.00</td>
<td>Proficiency in Engineering Construction and Management</td>
</tr>
<tr>
<td>James Hardie Co Pty Ltd</td>
<td>225.00</td>
<td>Highest proficiency in 8.571 Hydraulics 1</td>
</tr>
<tr>
<td>Water Board Gold Medal</td>
<td>Medal</td>
<td>Public Health Engineering</td>
</tr>
</tbody>
</table>
### Undergraduate University Prizes (continued)

<table>
<thead>
<tr>
<th>Donor/Name of Prize</th>
<th>Value $</th>
<th>Awarded for</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>School of Food Science and Technology</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cottees General Foods</td>
<td>120.00</td>
<td>38.141 Food Regulation and Control</td>
</tr>
<tr>
<td>Wilfred B. S. Bishop</td>
<td>20.00</td>
<td>General proficiency throughout Bachelor of Science degree course in Food Technology</td>
</tr>
<tr>
<td><strong>School of Mathematics</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Applied Mathematics</td>
<td>50.00</td>
<td>Excellence in Level III Applied Mathematics subjects</td>
</tr>
<tr>
<td>Head of School's</td>
<td>50.00</td>
<td>Excellence in at least 5 Mathematics units in Year 2</td>
</tr>
<tr>
<td>IBM</td>
<td>150.00</td>
<td>Final year of an honours degree course</td>
</tr>
<tr>
<td>ICI Theory of Statistics IV</td>
<td>100.00</td>
<td>Best performance in 10.323 Theory of Statistics 4</td>
</tr>
<tr>
<td>I. P. Sharp Associates</td>
<td>75.00</td>
<td>Excellence in Higher Theory of Statistics 2</td>
</tr>
<tr>
<td>J. R. Holmes</td>
<td>50.00</td>
<td>Excellent performance in at least 4 pass-level (up to 1 pass-level unit may be replaced by a higher-level unit) Pure Mathematics Level III units taken over no more than two consecutive years</td>
</tr>
<tr>
<td>Pure Mathematics</td>
<td>50.00</td>
<td>Best performance in Level III Pure Mathematics subjects</td>
</tr>
<tr>
<td>School of Mathematics</td>
<td>30.00</td>
<td>Best performance in 10.011 Higher Mathematics 1</td>
</tr>
<tr>
<td></td>
<td>30.00</td>
<td>Best performance in basic Year 2 Higher Mathematics units</td>
</tr>
<tr>
<td></td>
<td>30.00</td>
<td>Excellence in at least 5 Mathematics units in Year 2</td>
</tr>
<tr>
<td>Statistical Society of Australia (New South Wales Branch)</td>
<td>50.00 and one year's free membership of the Society</td>
<td></td>
</tr>
<tr>
<td>Theoretical Mechanics</td>
<td>50.00</td>
<td>Excellence in Level III Theoretical Mechanics subjects</td>
</tr>
<tr>
<td><strong>School of Metallurgy</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Alcan Australia Ltd</td>
<td>100.00</td>
<td></td>
</tr>
<tr>
<td>Austral Crane</td>
<td>150.00</td>
<td></td>
</tr>
<tr>
<td>Australian Institute of Metals</td>
<td>50.00</td>
<td>Subject selected by Head of School</td>
</tr>
<tr>
<td></td>
<td>and one year's membership of the Institute</td>
<td></td>
</tr>
<tr>
<td>Australian Welding Institute</td>
<td>30.00</td>
<td>Book order</td>
</tr>
<tr>
<td>The Broken Hill Proprietary Co Ltd</td>
<td>150.00</td>
<td></td>
</tr>
<tr>
<td>Chamber of Manufactures of New South Wales</td>
<td>250.00</td>
<td></td>
</tr>
</tbody>
</table>
### Undergraduate University Prizes (continued)

<table>
<thead>
<tr>
<th>Donor/Name of Prize</th>
<th>Value $</th>
<th>Awarded for</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>School of Metallurgy (continued)</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>The Max Hatherly</td>
<td>275.00</td>
<td>Best performance in the final year practical examination or an outstanding effort in Metallography</td>
</tr>
<tr>
<td>The Hugh Muir</td>
<td>275.00</td>
<td>Best performance in the final year seminar class or, as judged by the Head of School, the contribution by a student most of all to the corporate life of the School of Metallurgy</td>
</tr>
<tr>
<td>Western Mining Corporation Ltd</td>
<td>150.00</td>
<td>Best overall performance in Year 3 full-time (or its equivalent part-time) in Bachelor of Engineering (or Bachelor of Science (Technology)) degree course</td>
</tr>
<tr>
<td></td>
<td>150.00</td>
<td>Best overall performance in Year 4 full-time (or its equivalent part-time) in the Bachelor of Engineering (or Bachelor of Science (Technology)) degree course</td>
</tr>
<tr>
<td>Zinc Corp Ltd</td>
<td>100.00</td>
<td>Subject selected by Head of School</td>
</tr>
</tbody>
</table>

| **School of Mining Engineering** | | |
| Joint Coal Board | 125.00 | Bachelor of Engineering degree course in Mining Engineering, Year 2 |
| | 125.00 | Bachelor of Engineering degree course in Mining Engineering, Year 3 |
| | 250.00 | Bachelor of Engineering degree course in Mining Engineering — general proficiency throughout course |
| Western Mining Corporation Ltd | 150.00 | Best overall performance in final year of Bachelor of Engineering degree course |
| | 200.00 | General proficiency throughout the Bachelor of Engineering degree course |
| | 150.00 | Best overall performance in penultimate year of Bachelor of Engineering degree course |

<p>| <strong>School of Physics</strong> | | |
| ETP-Oxford | 200.00 | Student(s) who prepare the most meritorious design study of an optical system in 1.713 Advanced Laser and Optical Applications |</p>
<table>
<thead>
<tr>
<th>School of Physics (continued)</th>
<th>Value</th>
<th>Awarded for</th>
</tr>
</thead>
<tbody>
<tr>
<td>The Gordon and Mabel Godfrey</td>
<td>100.00</td>
<td>Best performance in a selection of Theoretical Physics Level III units chosen from 1.5133, 1.5233, 1.5333, 1.5433, 1.5533</td>
</tr>
<tr>
<td></td>
<td>100.00</td>
<td>Excellence in 1.504 (Year 4 of the honours degree course in Theoretical Physics)</td>
</tr>
<tr>
<td></td>
<td>300.00</td>
<td>Student who has completed Year 3 and is entering the final year of the Honours degree course in Theoretical Physics</td>
</tr>
<tr>
<td>Head of School's in Physics</td>
<td>50.00</td>
<td>Most creditable Year 4 honours thesis</td>
</tr>
<tr>
<td>Australian Institute of Physics</td>
<td>100.00</td>
<td>Highest aggregate marks in three of the units 1.0133, 1.0143, 1.023, 1.0333, 1.0343 and 1.043</td>
</tr>
<tr>
<td></td>
<td></td>
<td>and one year’s membership of the Institute</td>
</tr>
<tr>
<td>Laser Electronics</td>
<td>200.00</td>
<td>Excellence in the laboratory work in 1.763 Laser and Optical Technology Laboratory 1</td>
</tr>
<tr>
<td>Physics Staff for Applied Physics</td>
<td>50.00</td>
<td>Best performance in a selection of Year 3 units chosen from 1.0533, 1.0543, 1.133, 1.3033, 1.3133, 1.3233, 1.3333, 1.3533, 1.713, 1.763</td>
</tr>
<tr>
<td>Physics Staff for Physics 1</td>
<td>50.00</td>
<td>Best performance in 1.001</td>
</tr>
<tr>
<td>Physics Staff for Physics 2</td>
<td>50.00</td>
<td>Highest aggregate mark in 1.002, 1.012, 1.022 and 1.032</td>
</tr>
<tr>
<td>Physics Staff for Physics Honours</td>
<td>100.00</td>
<td>Highest mark in 1.104, 1.304, 1.504 or 1.604</td>
</tr>
<tr>
<td>Monaro Research</td>
<td>200.00</td>
<td>Excellence in 1.713 Advanced Laser and Optical Applications</td>
</tr>
<tr>
<td>Radiation Research</td>
<td>200.00</td>
<td>Excellence in the laboratory work in 1.773 Laser and Optical Technology Laboratory 2</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>School of Political Science</th>
</tr>
</thead>
<tbody>
<tr>
<td>Australian Institute of Political Science</td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td>David Vogel Memorial</td>
</tr>
<tr>
<td>Shell</td>
</tr>
<tr>
<td>Staff of the School of Political Science</td>
</tr>
<tr>
<td>The Sydney Morning Herald</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>School of Textile Technology</th>
<th>Value</th>
<th>Awarded for</th>
</tr>
</thead>
<tbody>
<tr>
<td>J. B. Speakman</td>
<td>20.00</td>
<td>Undergraduate thesis</td>
</tr>
<tr>
<td>R. J. Webster</td>
<td>100.00</td>
<td>General proficiency throughout the Bachelor of Science degree course in Textile Technology</td>
</tr>
</tbody>
</table>
### Undergraduate University Prizes (continued)

<table>
<thead>
<tr>
<th>Donor/Name of Prize</th>
<th>Value $</th>
<th>Awarded for</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>School of Wool and Pastoral Sciences</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Bayer Animal Health</td>
<td>100.00</td>
<td>General proficiency – Wool and Pastoral Sciences degree course, Year 2 and Year 3</td>
</tr>
<tr>
<td>C. R. Lucock</td>
<td></td>
<td>Meat Science</td>
</tr>
<tr>
<td>A book or a voucher to the value of 60.00</td>
<td></td>
<td></td>
</tr>
<tr>
<td>payable to University Co-op Bookshop Limited</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Parkes Wool Promotion Committee</td>
<td>100.00</td>
<td>Bachelor of Science degree course in Wool and Pastoral Sciences, Year 3</td>
</tr>
<tr>
<td>A shield held in the School of Wool and</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pastoral Sciences on which the successful</td>
<td></td>
<td></td>
</tr>
<tr>
<td>student's name is engraved each year</td>
<td></td>
<td></td>
</tr>
<tr>
<td>P. R. McMahon Memorial</td>
<td>100.00</td>
<td>Excellence in Wool Science</td>
</tr>
</tbody>
</table>

### Graduate University Prizes

The following table summarizes the graduate prizes for this Faculty awarded by the University.

<table>
<thead>
<tr>
<th>Donor/Name of Prize</th>
<th>Value $</th>
<th>Awarded for</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>School of Chemical Engineering and</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Industrial Chemistry</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>The Clean Air Society of Australia and New</td>
<td>100.00</td>
<td>48.391G Atmospheric Pollution Control and 48.392G Practical Aspects of Air Pollution Measurement and Control</td>
</tr>
<tr>
<td>Zealand</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
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The University of New South Wales Kensington Campus 1986

Theatres

Biomedical Theatres E27
Central Lecture Block E19
Classroom Block (Western Grounds) H3
Ray Vailles Theatre F17
Keith Burrows Theatre J14
Main Building Theatre K14
Mathews Theatres D23
Parade Theatre E3
Science Theatre F13
Sir John Clancy Auditorium C24

Buildings

Affiliated Residential Colleges
New (Anglican) L6
Shalom (Jewish) N9
Warrane M7

Applied Science F10
Architecture H14
Arts (Morven Brown) C20
Banks F22
Barker Street Gatehouse N11
Basser College C18
Biological Sciences D26
Central Store B13
Chancellery C22
Chemistry
Dalton F12
Robert Heffron E12
Civil Engineering H20
Commerce (John Goodsell) F20
Dalton (Chemistry) F12
Electrical Engineering G17
Geography and Surveying K17
Goldstein College D16
Golf House A27
Gymnasium B5
House at Pooh Corner N8
International House C6
Io Myers Studio D9
John Goodsell (Commerce) F20
Kanga's House O14
Kensington College C17 (Office)
Basser C18
Goldstein D16
Philip Baxter D14
Main Building K15

Maintenance Workshop B13
Mathews F23
Mechanical and Industrial Engineering J17
Medicine (Administration) B27
Menzies Library E21
Metallurgy E8
Morven Brown (Arts) C20
New College (Anglican) L6
Newton J12
NIDA D2
Paking Station H25
Philip Baxter College D14
Robert Heffron (Chemistry) E12
Sam Cracknell College H8
Shalom College (Jewish) N9
 Src Robert Webster (Textile Technology) G14
Squash Courts B7
Swimming Pool B4
Unresearch House L5
University Regiment J2
University Union (Roundhouse) — Stage I E6
University Union (Blockhouse) — Stage 2 G6
University Union (Squash House) — Stage 3 E4
Wallace Wurth School of Medicine C27
Warrane College M7
Wool and Pastoral Sciences B8

Biomedical Library F23
Biotechnology D26
Bookshop G17
Botany D26
Building H14
Careers and Employment F15
Cashier's Office C22
Centre for Biomedical Engineering A28
Centre for Medical Education Research and Development C27
Centre for Remote Sensing K17
Chaplains E16a
Chemical Engineering and Industrial Chemistry F10
Chemistry E12
Child Care Centres N8, O14
Civil Engineering H20
Commerce (Faculty Office) F20
Committee in Postgraduate Medical Education B27
Community Medicine D26
Computing Services Unit F21
Continuing Education Support Unit F23
Economics F20
Education G2
Education Testing Centre E15d
Electrical Engineering and Computer Science G17
Energy Research, Development and Information Centre B8b
Engineering (Faculty Office) K17
English C20
Examinations C22
Fees Office C22
Food Science and Technology F10
French C20
General Staff Office C22
Accountancy F20
Admissions C22
Adviser for Prospective Students F15
Alumni and Ceremonials C22
Anatomy C27
Applied Geology F10
Applied Science (Faculty Office) F10
Architecture (including Faculty Office) H14
Arts (Faculty Office) C20
Audio Visual Unit F20
Australian Graduate School of Management G27
Biochemistry D26
Biological Sciences (Faculty Office) D26

Historical and Philosophy of Science C20
History C20
History and Philosophy of Science C20
Industrial Arts H14
Industrial Engineering J17
Institute of Rural Technology B8b
Japanese Economic Management Studies Centre G14
Kanga's House O14
Kindergarten (House at Pooh Corner) N8
Landscape Architecture K15
Law (Faculty Office) F21
Law Library F21
Library F23
Library E21
Lost Property F20
Marketing F20
Mathematics F23
Mechanical Engineering J17
Medicine (Faculty Office) B27
Metallurgy E8
Microbiology D26
Mining Engineering K15
Music B11b
National Institute of Dramatic Art D2
Nuclear Engineering J17
Off-campus Housing C22
Optometry J12
Organizational Behaviour F20
Pathology C27
Patrol and Cleaning Services F20
Philosophy C20
Physics K15
Physical Education and Recreation Centre (PERC) B5
Physiology and Pharmacology C27
Political Science C20
Psychology F23
Public Affairs Unit C22
Regional Teacher Training Centre C27
Russian C20
Science and Mathematics Course Office F23
Social Work G2
Sociology C20
Spanish and Latin American Studies C20
Sport and Recreation E4
Student Counselling and Research F15
Student Health F15
Student Records C22
Students' Union E4 and C21
Surveying K17
Tertiary Education Research Centre E15d
Textile Technology G14
Theatre Studies B10
Town Planning K15
University Archives C22
University Press A28
University Union (Blockhouse) G6
Wool and Pastoral Sciences B8a
Zoology D26
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