The University of New South Wales

Engineering

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 address of the University of New South Wales is:

PO Box 1, Kensington
New South Wales, Australia 2033

Telephone: (02) 6972222
Telegraph: UNITECH, SYDNEY
Telex AA26054
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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.

Note: All phone numbers below are University extension numbers. If you are outside the University, dial 697 2222 and ask for the extension. Alternatively you may dial 697 and then the extension number. This prefix should only be used when you are certain of the extension that you require as callers using 697 cannot be transferred to any other number.
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.

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<td>Term 2 (9 weeks) 7 April to 11 May</td>
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<td>May Recess: 12 May to 18 May</td>
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<td>Study Recess: 16 June to 22 June</td>
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<td>Midyear Recess: 23 June to 27 July</td>
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<td>Examinations 23 June to 9 July</td>
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<td>Session 2</td>
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<td>(14 weeks)</td>
<td>28 July to 24 August</td>
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<td>Term 2 (8 weeks) 24 March to 18 May</td>
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<td>Term 3 (8 weeks) 26 May to 20 July</td>
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<td>Term 4 (8 weeks) 23 August to 21 September</td>
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<td>Term 5 (8 weeks) 29 September to 23 November</td>
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<td>Term 3 (8 weeks) 26 May to 20 July</td>
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<td>Term 4 (8 weeks) 23 August to 21 September</td>
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<td></td>
<td>Term 5 (8 weeks) 29 September to 23 November</td>
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### 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  
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  
Wednesday 14  
Last day for undergraduate students completing requirements for degrees at the end of Session 1 to submit *Application for Admission to Degree* forms

Thursday 15  
Publication of provisional timetable for June/July examinations
<table>
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<tr>
<th>Date</th>
<th>Event Description</th>
<th>Date</th>
<th>Event Description</th>
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<tr>
<td>Sunday 18</td>
<td><strong>May Recess ends</strong></td>
<td>Monday 8</td>
<td>Last day for notification of correction of details published in <em>The Sydney Morning Herald</em> on 3 September concerning October graduation ceremonies</td>
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<tr>
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<td>Last day for students to advise of examination clashes</td>
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<td>Last day for undergraduate students to discontinue without failure subjects which extend over Session 2 only</td>
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<td>Monday 29</td>
<td><em>Confirmation of Enrolment</em> forms despatched to all students</td>
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<td>Tuesday 30</td>
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<td>Queen's Birthday — Public Holiday</td>
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<td>Monday 16</td>
<td><strong>Study Recess begins</strong></td>
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<td>October</td>
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<td>Monday 23</td>
<td><strong>Midyear Recess begins</strong></td>
<td>Wednesday 8</td>
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<tr>
<td></td>
<td>Examinations begin</td>
<td>Thursday 9</td>
<td>Publication of provisional examination timetable</td>
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<td><strong>July</strong></td>
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<td>Friday 10</td>
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<tr>
<td>Wednesday 9</td>
<td>Examinations end</td>
<td>Monday 6</td>
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<td>Monday 21</td>
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<td>Thursday 30</td>
<td>Publication of timetable for November examinations</td>
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<td></td>
<td><em>To Friday 25 July:</em> Students to amend enrolment programs following receipt of June examination results*</td>
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<tr>
<td>Sunday 27</td>
<td><strong>Midyear Recess ends</strong></td>
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<tr>
<td>Monday 28</td>
<td><strong>Session 2 begins</strong></td>
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<td><strong>August</strong></td>
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<tr>
<td>Friday 8</td>
<td>Last day for students to discontinue without failure subjects which extend over the whole academic year</td>
<td>November</td>
<td><strong>Session 2 ends</strong></td>
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<tr>
<td>Monday 25</td>
<td><strong>August Recess begins</strong></td>
<td>Sunday 9</td>
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<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>
<td>Monday 10</td>
<td><strong>Study Recess begins</strong></td>
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<tr>
<td>Sunday 31</td>
<td><strong>August Recess ends</strong></td>
<td>Sunday 16</td>
<td><strong>Study Recess ends</strong></td>
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<td></td>
<td>Monday 17</td>
<td>Examinations begin</td>
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<tr>
<td><strong>September</strong></td>
<td>List of graduands for October graduation ceremonies published in <em>The Sydney Morning Herald</em></td>
<td>December</td>
<td>Examinations end</td>
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<td>Wednesday 3</td>
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<td>Monday 22</td>
<td>Assessment results mailed to students</td>
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<td>Tuesday 23</td>
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<td>Thursday 25</td>
<td>Christmas Day — Public Holiday</td>
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<tr>
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<td></td>
<td>Friday 26</td>
<td>Boxing Day — Public Holiday</td>
</tr>
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## General Information

**1987**

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

| Session 1 | 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 | 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 Monday 20: Easter — Public Holiday

### April
- Saturday 25: Anzac Day — Public Holiday

### 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  

### Public Holiday

- Australia 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, 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 matriculation requirements, the content of courses, the arrangement of syllabuses, the appointment of examiners and the conditions for graduate degrees. Its recommendations on matters of major policy are presented to Council for its consideration and adoption.

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, International House, PO Box 24, 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 6626066).

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) 662 6199.

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) 398 5693.

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 enquires 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 697 4884; Grounds Bookings 697 4876; Tennis Bookings 697 4877; Sports Association 697 4880.

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 697 4884.

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 697 5418 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 697 5470.

Student Health Unit

A student health clinic and first aid centre is situated within the University. The medical service although therapeutically 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 Basser 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 Squareshouse (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.
Each library provides reference and lending services to staff and students and each of the libraries on the Kensington campus is open throughout the year during the day and evening periods. The exact hours of opening vary during the course of the academic year. For recorded hours of opening telephone 6972687.

Staff and students normally use a machine-readable identification card to borrow from the University libraries.

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 newsagency/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.

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.

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."

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.
Deferment of First Year Enrolment
Students proceeding directly from school to University who have received an offer of a place may request deferment of enrolment for one year and will usually receive permission providing they do not enrol at another tertiary institution in that year.

Enrolment Procedures and Fees
Schedules 1986

1. Introduction
All students, except those enrolling in graduate research degree courses (see sections 5. and 6. below), must lodge an authorized enrolment form with the Cashier either on the day the enrolling officer signs the form or on the day any required General Studies electives are approved.

All students, except those enrolling in graduate research degree courses and those exempted as set out in section 17. below, should on that day also either pay the required fees or lodge an enrolment voucher or other appropriate authority.

Such vouchers and authorities are generally issued by the NSW Department of Education and the NSW Public Service. They are not always issued in time and students who expect to receive an enrolment voucher or other appropriate authority but have not done so should pay the student activities fees and arrange a refund later. Such vouchers and authorities are not the responsibility of the University and their late receipt is not to be assumed as automatically exempting a student from the requirements of enrolling and paying fees.

If a student is unable to pay the fees the enrolment form must still be lodged with the Cashier and the student will be issued with a 'nil' receipt. The student is then indebted to the University and must pay the fees by the end of the second week of the session for which enrolment is being effected.

Penalties apply if fees are paid after the time allowed (see section 16. below) unless the student has obtained an extension of time (see section 13. below) in which to pay fees from the Student Enquiry Counter, the Chancellery. Such an application must be made before the fee is due. Payment may be made through the mail, in which case it is important that the student number be given accurately. Cash should not be sent through the mail.

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 Enquiries 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 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 — i.e., 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 697 3095).

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 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 enrolling 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 $40

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...
approval 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 a refund of one half of the fees shall be made if such cancellation or suspension takes place between the end of the fourth 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 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; and 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 unless written approval to withdraw from the subject without failure has been obtained from the Registrar.

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 Professional 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
seek to transfer for work done in the course from which they 
transfer.

Where the identity between the requirements for any award of 
the University already held and that of any other award of 
the University is such that the requirements outstanding for 
the second award are less than half the requirements of that 
award, students who merely complete such outstanding re-
quirements shall not thereby be entitled to receive the second 
award but shall be entitled to receive a statement over the 
hand of the Registrar in appropriate terms.

Resumption of Courses

Students who have had a leave of absence for twelve months 
and wish to resume their course should follow the instructions 
about re-enrolling given in the letter granting leave of ab-

cence. If these instructions are not fully understood or have 
been lost, students should contact the office of the Admis-
sions Section before November in the year preceding the one 
in which they wish to resume their course.

If students have not obtained leave of absence from their 
course and have not been enrolled in the course over the 
past twelve months or more, they should apply for admission 
to the course through the Universities and Colleges Admis-
sions Centre before 1 October in the year preceding that in 
which they wish to resume studies.

Examinations

Examinations are held in June/July and in November/ 
December.

Timetables

Provisional timetables indicating the dates and times of ex-
aminations are posted on the University noticeboards in May 
and October. Students must advise the Examinations Section 
(the Chancelleriy) of any clash in examinations.

Final timetables indicating the dates, times, locations, and 
authorized materials are available for students two weeks 
before the end of each session.

Misreading of the timetable is not an acceptable excuse for 
failure to attend any examination.

Assessment of Course Progress

In the assessment of a student's progress in a course, 
consideration may be given to work in laboratory and class 
exercises and to any term or other tests given throughout the 
year as well as to the results of written examinations.

Examination 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 sub-
ject 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 notice-
boards 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 ad-
versely 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 (eg 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 examination.

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>
</thead>
<tbody>
<tr>
<td>Applied Science</td>
<td>Half the program</td>
<td>3000-3220</td>
<td>One-session subjects: UV 1</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Two-session subjects: UV 2</td>
</tr>
<tr>
<td>Architecture</td>
<td>Half the program</td>
<td>3270, 3275, 3275, 3300</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>3320</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></td>
<td></td>
<td></td>
<td>All other subjects: UV equal to the allocated hours*</td>
</tr>
<tr>
<td>Arts</td>
<td>18 Level 1 credit points</td>
<td>3400-3420</td>
<td></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 Friday 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, 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.

Release of Information to Third Parties

The University treats results of assessment and information it receives from a student as confidential and will not reveal such information to third parties without the permission of the student except at the discretion of senior officers in circumstances considered of benefit to the student and when it is either impossible or impracticable to gain the student’s prior permission. This happens rarely. This policy is considered so important that it often involves officers of the University in very difficult situations, for example, when they must refuse to reveal the address of a student to parents or other relatives.

In spite of the policy, all students should be aware that students’ addresses are eagerly sought by various commercial agents and that subterfuges of various kinds can be used to obtain them. From time to time, for example, people claiming to be from the University telephone students or their families and ask for information (usually another student’s address) which is often given, unsuspectingly. There is evidence that this is a technique used by some commercial agents.

It would be generally helpful if students (and their families and friends) are cautious in revealing information, making it a practice to ask the name, position, and telephone extension of any caller claiming to be from the University and, if suspicious, returning the call to the extension given.

Change of Address

The Student Records and Scholarships Office of the Department of the Registrar should be notified as soon as possible of any change of address. Failure to do this could lead to important correspondence (including results of assessment) going astray. The University cannot accept responsibility if official communications fail to reach students who have not given notice of their change of address. Change of Address 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 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.
Foreword

This handbook provides information on courses offered by the Faculty of Engineering together with descriptions of the subjects available. It is important that each student in the Faculty becomes well acquainted with the information presented here. Details of courses in Chemical Engineering, Ceramic Engineering, Metallurgy, Mining Engineering and Textile Engineering are available from the Faculty of Applied Science Handbook. For information on other courses please consult the University Calendar.

The Faculty consists the Schools of Civil Engineering, Electrical Engineering and Computer Science, Mechanical and Industrial Engineering, Nuclear Engineering, Surveying and the Centres for Biomedical Engineering and Remote Sensing.

The School of Civil Engineering consists of five departments: Civil Engineering Materials, Engineering Construction and Management, Structural Engineering, Transport Engineering and Water Engineering.

Civil Engineering Materials includes the fields of soil mechanics, rock mechanics, concrete technology, plastics and timber, metals and welding technology and pavement engineering. Engineering Construction and Management is responsible for the fields of civil engineering systems, engineering economy, project planning and management and civil engineering construction. Structural Engineering covers the fields of structural analysis and structural design. Transport Engineering is concerned with the planning, design, construction and operation of transport systems, statistical analysis, land use and transport modelling, economic evaluations and environmental impact studies. Water Engineering encompasses the fields of hydraulics, hydrology, water resources and public health engineering.

The School of Electrical Engineering and Computer Science comprises five departments: Communications, Computer Science, Electric Power Engineering, Electronics, and Systems and Control. Communications is concerned with all aspects of theory, applied electronics and engineering relating to communication systems such as telephones, broadcasting and television. Electric Power is concerned mainly with electrical machines and the generation, distribution and utilization of electric energy. Electronics includes electronic circuits, devices, microelectronics and applications of electronics to such areas as solar power generation. Computer Science involves the design of computer devices and the handling of information in all forms, eg numeric, alphabetic, pictorial, verbal. Systems and Control is concerned with the development of theories for the control of complex systems and the application of these theories including computer simulation. The School also houses the Joint Microelectronics Research Centre.
The School of Mechanical and Industrial Engineering contains the departments of Applied Mechanics, Fluid Mechanics and Thermodynamics, and Industrial Engineering. Applied Mechanics includes agricultural engineering, automatic control, biomechanics, engineering design, engineering mechanics and mechanics of solids. Fluid Mechanics and Thermodynamics includes power generation, refrigeration and air conditioning, gas and liquid handling, aeronautical engineering and naval architecture. Industrial Engineering is concerned with economic analysis, production planning and control, product and process design, methods engineering and operations research.

The School of Nuclear Engineering operates at the graduate level in the Faculty. A fourth year undergraduate subject in Nuclear Power Technology is provided as an elective for other Schools. Special research interests in the School include the general field of fluctuation phenomena and noise in nuclear reactors, the coupled thermomechanical, fluid dynamics and nuclear aspects of reactor fuel elements and coolant channels, and the subject of reactor utilization and reactor strategy.

The School of Surveying is concerned with the following areas of activity: Cadastral Surveying: knowledge of the laws relating to land and property boundaries; Geodetic Surveying: measurement of the earth's surface and crustal movement; Mapping: integration of data from field surveys, air photography and other sources to produce topographic maps; Land Management and Development: design of subdivision, environmental assessment, the use and conservation of land resources and land information systems; Photogrammetry: measurement of 3-dimensional position from photographs and other images.

The Centre is an interdisciplinary unit which promotes and co-ordinates biomedical engineering studies and research being conducted by a number of schools within the University and teaching hospitals. Biomedical engineering involves the application of engineering techniques to biomedical problems with particular emphasis on clinical medicine.

The Centre for Remote Sensing is a joint enterprise of the Faculties of Applied Science and Engineering which promotes and co-ordinates remote sensing studies and research being conducted by various schools within the University. Remote sensing is the science of obtaining information about the earth's surface (in particular) using electromagnetic imaging systems mounted on aircraft and space platforms.

Schools within the Faculty offer undergraduate courses leading to the award of the degree of Bachelor of Engineering (BE) or Bachelor of Surveying (BSurv). These may be taken either on a full-time basis, normally over four years, or on a part-time basis, normally over six or seven years, or by a combination of these. Some courses may be taken on a sandwich basis. Combined degree courses are available which lead to the award of two degrees: Bachelor of Engineering and Bachelor of Science or Bachelor of Engineering and Bachelor of Arts. A major in Computer Science is available in the three-year BSc degree course in the Faculty of Science. Details of the various courses are presented later in this Handbook.

The basic objectives which are incorporated in the various engineering and surveying courses are as follows:

- Technical and scientific and creative skills required to solve all aspects of engineering problems.
- An understanding of human interaction with the environment so that the impact of engineering activity can be assessed.
- The ability to direct and manage engineering activities.
- The ability to communicate with other members of the profession, with industrial personnel, administrators and with members of the public.
- The desire and ability for continuing self-education and reappraisal of current practice including the ability to innovate.
- The ability to evaluate independently and to criticise constructively their own work and the work of other engineers.

The Faculty hopes to do much more than merely impart a body of knowledge to its graduates. Appropriate attitudes and skills for professional engineers operating into the twenty-first century must also be developed. Technology has come under increasing criticism from other sectors of society. It is no longer accepted that advances in technology are necessarily synonymous with the betterment of society, and future engineers must be prepared not only to take account of the ramifications of their work but also to vindicate them to an increasingly doubtful public.
As part of their training for the profession, students are required to write reports and make verbal presentations during the undergraduate course. Therefore a high level of competence in written and spoken English expression is expected.

It is also important for students to join in the development of themselves as professional engineers. Engineering is a co-operative profession where teamwork is very important. Whilst at university students should take as many opportunities as possible to join in the activities which help to develop the whole person. Student clubs and professional institutions provide many opportunities for gaining knowledge and experience which will be valuable in their work as engineers.

The Faculty offers an active postgraduate program. Formal graduate courses are available which lead to the award of the degrees of Master of Engineering Science or Master of Surveying Science, or of the award of a Graduate Diploma. Supervision is also available for candidates undertaking research degrees leading to the awards of Master of Engineering, Master of Science or Doctor of Philosophy. Each of the Schools and the Centre for Remote Sensing offer programs which lead to the award of these postgraduate qualifications. The Centre for Biomedical Engineering offers a course for the award of the degree of Master of Biomedical Engineering as well as the Graduate Diploma and research degrees. Graduate studies leading to the award of the degree of Master of Safety Science or of a Graduate Diploma in Safety Science may also be undertaken.

Details of graduate courses and research areas are presented later in this Handbook.
Faculty Information

Some People Who Can Help You

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

**School of Civil Engineering:** Mr R. W. Prior, Room 406, School of Civil Engineering.

**School of Electrical Engineering and Computer Science:** Dr H. S. Blanks, Room G6, or Ms R. C. Horwood, School Office, School of Electrical Engineering and Computer Science.

**School of Mechanical & Industrial Engineering:** Dr J. E. Baker, Room 105, or Mr G. Dusan, Room 107, School of Mechanical & Industrial Engineering.

**School of Nuclear Engineering:** Professor J. J. Thompson, Room 205, Mechanical Engineering Building.

**School of Surveying:** Mr L. Daras, Administrative Assistant, School Office, Room 529, Geography & Surveying Building.

**Centre for Biomedical Engineering:** Associate Professor P. C. Farrell, 34-36 Botany Street, Randwick, NSW 2031.

**Centre for Remote Sensing:** Dr J. A. Richards, Room 613, Geography and Surveying Building.

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

Faculty of Engineering Enrolment Procedures

All students re-enrolling in 1986 or 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.

Faculty of Engineering Library Facilities

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

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, serials and microforms 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 prefix 'PJ' are not for loan, but self-service photocopying facilities are available 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 always available on Level 7 to assist readers with their enquiries.

Physical Sciences Librarian  Marian Bate

Undergraduate Services

- The undergraduate collection caters for the needs of students in Years 1 and 2 and other groups where large numbers require mass teaching. Levels 3 and 4.
- The Open Reserve Section houses books and other materials which are required reading. Level 2.
- The Audio Visual Section contains cassette tapes, mainly of lectures and other spoken word material. The section has wired study carrels and cassette players for student use. Level 3.
- The Reader Education program provides orientation tours and introductory library research method lectures to students.

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.

The following societies serve the interests of students in the various courses in the Faculty of Engineering: Biomedical Engineering Society (BioEngSoc); Civil Engineering Society (CIVSOC); Computing Science Association (CSA); Electrical Engineering Society (ELSOC); Mechanical Engineering Society (MECHSOC); Naval Architecture Students' Association (NASA); Surveying Society (SURVSOC).

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

Location of Laboratories outside Kensington Campus

Randwick
The Transport Engineering Laboratory, the Water and Pollution Control Laboratory and the Structures Laboratory of the School of Civil Engineering occupy buildings on the site of the old Tramway Depot at King Street, Randwick.

Manly Vale
The Water Research Laboratory of the School of Civil Engineering is located at King Street, Manly Vale.

International Association for the Exchange of Students for Technical Experience — IAESTE

IAESTE is an organization to facilitate overseas work in technical areas in 53 different countries throughout the world for students or recent graduates. It organizes visas, work periods for as little as 6 weeks or up to 12 months, lodging and an initial welcome.

In Australia IAESTE has a National Committee in Melbourne and local committees in the capital cities including Sydney. The UNSW local committee is made up of interested students and is run in association with the Careers and Appointments Service at Sydney University.

For more information write to the local committee President, IAESTE (UNSW), Union Box 43, UNSW, PO Box 1, Kensington 2033, or contact the local committee through the Students' Union.

The Institution of Engineers, Australia

The professional body for engineering in Australia is the Institution of Engineers, Australia, which has as its first objective 'to promote the science and practice of engineering in all its branches'.

The Institution functions through a series of divisions, the local one being the Sydney Division. Within each division are branches representing the main interests within the profession, eg civil, mechanical, electrical, chemical and transportation.

Students of an approved school of engineering may join the Institution as a student member (StudIEAust).
Student members receive the fortnightly publication *Engineers, Australia* advising of site tours, conferences, technical meetings of all branches, harbour cruises, film nights, etc. For a small fee they also receive *The Transactions* which contains articles on a particular branch of engineering.

Student members are also free to use the comprehensive library and reference facilities maintained by the Institution. The library is a handy place to obtain a rare book or periodical.

For more information and membership application forms, write to The Secretary, The Institution of Engineers, Australia, Sydney Division, PO Box 138, Milsons Point NSW 2061.

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The Institution of Surveyors, Australia

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

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The Rupert H. Myers Award in Materials Engineering

The University, in conjunction with the Department of Civil Engineering Materials in the School of Civil Engineering, makes an award, known as the Rupert H. Myers Award in Materials Engineering, which recognizes contributions made by individual engineers and scientists of international repute to the science of materials engineering. The selected candidate receives a silver medal and delivers the Rupert H. Myers Lecture as a key feature of a symposium concerned with the most recent developments in this field.
Undergraduate Study

The Faculty of Engineering consists of five Schools — Civil Engineering, Electrical Engineering and Computer Science, Mechanical and Industrial Engineering, Nuclear Engineering, Surveying, the Centre for Biomedical Engineering and the Centre for Remote Sensing. The Schools of Civil Engineering, Electrical Engineering and Computer Science, and Mechanical and Industrial Engineering offer full-time courses leading to the award of the degree of Bachelor of Engineering, and part-time courses leading to the award of the degree of Bachelor of Engineering. Courses are also offered for the award of the combined degrees of Bachelor of Engineering, Bachelor of Science and Bachelor of Engineering, Bachelor of Arts. The School of Surveying offers full-time courses, which may also be taken in a sandwich form, leading to the award of the degrees of Bachelor of Engineering, Bachelor of Science and Bachelor of Engineering, Bachelor of Surveying Science. The School of Nuclear Engineering, the Centre for Biomedical Engineering and the Centre for Remote Sensing offer graduate courses only.

All the graduate activities of the Faculty are co-ordinated under the Graduate School of Engineering. For details of the graduate activities of the Faculty please see Graduate Study section later in this book.

First Year Programs

A student who has completed the first year of an undergraduate course in one school may apply for a transfer to a course in another school of the Faculty with credit for relevant subjects completed. However, as there are considerable differences in the various Year 1 programs, students are not granted complete exemption from Year 1 of the course to which the transfer is made.

General Rules for Progression

Progression in all undergraduate courses in the Faculty of Engineering is now permitted by subject. However:

1. Course programs will continue to be stated and timetabled by year or stage and it cannot be guaranteed that non-standard programs can be completed in the minimum number of years.

2. Students must satisfy the rules governing re-enrolment; in particular, these require students enrolled in the first year of a degree program to pass in at least half that program. Students are also required to show cause why they should be allowed to repeat a subject which has been failed more than once.

3. A student must satisfy the relevant prerequisite and co-requisite requirements. This will usually necessitate a student completing or attempting all subjects of a particular year or stage before proceeding to a subject in the next part of a course. Further details are available from the appropriate school.

4. Only in exceptional circumstances will a student be permitted to enrol in subjects extending over more than two years of the course or for more than twenty-eight hours of course work per week if a full-time student or fourteen hours per week if a part-time student. Students repeating subjects are required to choose a program which limits their hours of course work to twenty-two per week if a full-time student, and to eleven per week if a part-time student, unless they have the express permission of the Head of School to exceed these hours.

5. Notwithstanding the above, before a student can enrol in any non-standard program such program must meet with the approval of the Head of School. A non-standard program is one which involves enrolment in subjects from more than one year or stage, or comprises subjects which do not normally constitute a particular year's course work.
Prerequisites and Co-requisites

- A prerequisite unit is one which must be completed prior to enrolment in the unit for which it is prescribed.

- A co-requisite unit is one which must either be completed successfully before or be studied concurrently with the unit for which it is prescribed.

Full-time Study

Courses leading to the award of the degrees of Bachelor of Engineering in Civil, Electrical, Mechanical, Industrial and Aeronautical Engineering, and Naval Architecture may be taken by full-time study over a period of four years. Courses are also offered for the award of the combined degrees of Bachelor of Engineering, Bachelor of Science and Bachelor of Engineering, Bachelor of Arts. Four-year full-time courses in Surveying and Surveying Science are offered by the School of Surveying leading to the award of the degrees of Bachelor of Surveying and Bachelor of Surveying Science.

The award of the degree of Bachelor of Engineering is recognized by the Institution of Engineers, Australia, as meeting the examination requirements for admission to graduate and corporate membership. Substantial or complete recognition is accorded to these courses by overseas engineering institutions.

The award of the degree of Bachelor of Surveying is recognized by the Surveyors' Board of New South Wales as giving complete exemption from written examinations of the Board.

In the case of Bachelor of Surveying Science degree the New South Wales Surveyors' Board may require additional subjects for registration.

Industrial Training Requirements

All full-time engineering courses incorporate industrial training and reference should be made to the entries under each School heading for details of the arrangements applicable. All students are strongly recommended to gain further industrial experience in those long vacations where such training is not already prescribed.

The staff of the University will, where possible, assist students to obtain this employment, but it is emphasized that the primary responsibility for obtaining suitable industrial experience rests with each student. Progression to succeeding years of the course and the award of the degree are dependent on the completion of the requisite periods of industrial employment at a standard approved by the University.

Part-time Study

Courses leading to the award of the degrees of Bachelor of Engineering in Civil, Electrical, Mechanical, Industrial and Aeronautical Engineering and Naval Architecture may be taken by part-time study over a period of six or seven years, depending upon the course, or by an approved combination of part-time and full-time study.

Part-time study usually involves a combination of day-time and evening attendance. However it may not be possible to offer evening classes in later year subjects.

Part-time courses leading to the award of the degree of Bachelor of Science (Engineering) in these six fields may be taken over a period of six years, but these courses are being phased out and new enrolments are no longer accepted.

The award of the degree of BSc(Eng) is recognized at present by the Institution of Engineers, Australia, as meeting the examination requirements for admission to graduate and corporate membership.

Recognition by overseas engineering institutions varies in the different branches of engineering, and enquiries on this matter should be addressed to the Head of the appropriate School.

Students completing the BSc(Eng) degree course and wishing to qualify for the corresponding BE degree may, on the recommendation of the Head of the School, transfer to the corresponding full-time BE course provided they do not take out the BSc(Eng) degree. Further, provided they continue as registered students on transfer from one course to the other, they may retain any concession granted in the BSc(Eng) degree course.

Holders of the BSc(Eng) degree are eligible to proceed to the degree of Master of Engineering, Master of Engineering Science or Master of Surveying Science subject to the conditions for the award of these degrees set out in the Calendar.

Courses leading to the award of the BSc(Eng) degree are basically part-time and the prescribed industrial experience should be gained concurrently with the course of study (a minimum of three years of suitable engineering experience is required). Students transferring from full-time courses must, therefore, also satisfy these industrial experience requirements before being admitted to the degree of BSc(Eng).

The BSc(Eng) degree program may in some cases be accelerated by a student attending for one or more years full-time. For example, in all courses of the Faculty it is possible to take the equivalent of the first two part-time years in the full-time first year.

Combined Courses

Full-time courses of five years’ duration are available for the award of two degrees, i.e. Bachelor of Engineering/Bachelor of Science (BE BSc); Bachelor of Engineering/Bachelor of
Arts (BE BA). Courses for the award of the degree of BE BSc are available in Aeronautical, Civil, Electrical, Mechanical and Industrial Engineering and Naval Architecture. Courses are also available for the award of the degree of BE BA in Aeronautical, Electrical, Mechanical and Industrial Engineering and Naval Architecture.

Faculty of Engineering Prerequisite Requirements 1986

Before students can enrol in a number of first year subjects they are required to be placed within a percentile range in specific Higher School Certificate subjects. The following table lists the Higher School Certificate examination prerequisites for first year subjects in the courses offered by the Faculty of Engineering.

<table>
<thead>
<tr>
<th>Course</th>
<th>HSC Prerequisites for First Year Subjects</th>
<th>Percentile Range Required</th>
</tr>
</thead>
<tbody>
<tr>
<td>Engineering</td>
<td>2 u Mathematics* or 3 u Mathematics or 4 u Mathematics</td>
<td>71-100</td>
</tr>
<tr>
<td>Aeronautical</td>
<td>3 u Mathematics or 21-100</td>
<td></td>
</tr>
<tr>
<td>Civil Engineering</td>
<td>2 u Mathematics or 31-100</td>
<td></td>
</tr>
<tr>
<td>Electrical</td>
<td>4 u Science (multstrand) or 31-100</td>
<td></td>
</tr>
<tr>
<td>Industrial</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mechanical</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Naval Architecture</td>
<td>2 u Mathematics* or 3 u Mathematics or 4 u Mathematics</td>
<td>71-100</td>
</tr>
<tr>
<td></td>
<td>and</td>
<td>1-100</td>
</tr>
<tr>
<td></td>
<td>2 u Science (Physics) or 31-100</td>
<td></td>
</tr>
<tr>
<td></td>
<td>4 u Science (multstrand) or 31-100</td>
<td></td>
</tr>
<tr>
<td>Surveying</td>
<td>2 u Mathematics* or 3 u Mathematics or 4 u Mathematics</td>
<td>71-100</td>
</tr>
<tr>
<td></td>
<td>and</td>
<td>1-100</td>
</tr>
<tr>
<td></td>
<td>2 u Science (Physics) or 31-100</td>
<td></td>
</tr>
<tr>
<td></td>
<td>4 u Science (multstrand) or 31-100</td>
<td></td>
</tr>
</tbody>
</table>

*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).

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

The University conducts Bridging Courses to assist in remediating deficiencies in subject levels. Further details are available from the Students' Information Guide published annually by the Universities and Colleges Admissions Centre (UCAC). Introductory subjects are also available to students who do not have the Higher School Certificate prerequisite/s in Mathematics or Physics.

It should be noted that inclusion of these subjects in first year programs could prevent completion of a course in minimum time.

Effective communication is an essential requirement for the Professional Engineer. As part of their training for the profession, students are required to write reports and make verbal presentations during the undergraduate course. Therefore, a high level of competence in written and spoken English expression is expected.

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

The course leading to the award of the degree of Bachelor of Science (Engineering) is normally programmed over six years of part-time study in the University whilst the student is employed in industry. The regulations governing the award of this degree are as follows:

1. A candidate for the award of the degree of 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 training over such period as is prescribed concurrently with attendance in the course. In general, this training must be completed before 31 January in the year in which the degree is to be awarded.

2. During each year a student shall perform laboratory, drawing office and field work, attend demonstrations and excursions to such an extent and in such a manner as is prescribed from time to time by the Professorial Board on the recommendation of the Faculty, and, in addition, undertake industrial training as approved by the Head of the School.

3. A student may be granted advanced standing by the Professorial Board on the recommendation of the appropriate Faculty but in each case a student must follow an approved course for at least three years with such period of approved industrial training as is prescribed before being eligible for admission to the degree.

4. The degree of BSc(Eng) shall be awarded in the pass grade only but in the case of superior performance throughout the course the degree shall be conferred 'with merit'.

5. Students shall be required to conform with the general rules relating to progression in University courses.

6. In special cases the Faculty may approve the variation of any of the preceding conditions.

Note: No new enrolments are being accepted into this course.
Conditions for the Award of the Degree of Bachelor of Engineering

1. A candidate for the award of the degree of 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 training for such periods as are prescribed. In general, this training must be completed before 31 January in the year in which the degree is to be awarded.

2. During each year a student shall perform laboratory, drawing office and field work, attend demonstrations and excursions to such an extent and in such a manner as is prescribed from time to time by the Professorial Board on the recommendation of the Faculty.

3. A student may be granted advanced standing by the Professorial Board on the recommendation of the Faculty, but in each case must complete an adequate period of approved industrial training before being eligible for the degree. In addition to the above requirements a student coming from another institution must comply with the conditions laid down by the Professorial Board for admission with advanced standing.

4. The degree shall be awarded in the pass or honours grade. Honours may be awarded in the following categories:

- Honours Class I
- Honours Class II, Division I
- Honours Class II, Division II

5. In special cases the Faculty may approve the variation of any of the preceding conditions.

Conditions for the Award of the Degrees of Bachelor of Surveying and Bachelor of Surveying Science

1. A candidate for the award of the degree of Bachelor of Surveying or Bachelor of Surveying Science shall:

(1) comply with the requirements for admission;

(2) follow the prescribed course of study in the School of Surveying and satisfy the examiners in the necessary subjects;

2. During each year a student shall perform laboratory, drawing office and field work, attend demonstrations, excursions and field camps to such an extent and in such a manner as is prescribed from time to time by the Professorial Board on the recommendation of the Faculty.

3. A student may be granted advanced standing by the Professorial Board on the recommendation of the Faculty of Engineering. In addition to the above requirements a student coming from another institution must comply with the conditions laid down by the Professorial Board for admission with advanced standing.

4. The degrees shall be awarded in the pass or honours grade. Honours may be awarded in the following categories:

- Honours Class I
- Honours Class II, Division I
- Honours Class II, Division II

5. In special cases the Faculty may approve the variation of any of the preceding conditions.
Undergraduate Study

Course Outlines

School of Civil Engineering

Head of School
Professor T. G. Chapman

Executive Assistant to Head of School
Vacant

Senior Administrative Officer
Mr R. W. Prior

The School of Civil Engineering offers a course (3620) leading to the degree of Bachelor of Engineering (BE), at pass or honours level, which can be taken on a four-year full-time basis, on a part-time basis or on a combined full-time/part-time basis subject to the approval of the Head of School. Intending part-time students are advised that many subjects are offered only in the daytime. Part-time students will normally take two years for each equivalent full-time year.

A five year full-time course (3730) leading to the award of the degrees of Bachelor of Engineering and Bachelor of Science (BE BSc) is offered. Students enrol initially in Course 3620 and apply for transfer to Course 3730 on completion of Year 1.

The requirements for the award of the BE degree include a period of at least sixty working days of approved industrial training prior to enrolment in the final year.

The degree of Bachelor of Engineering may be conferred as a Pass degree or as an Honours degree. There are two classes of Honours, Class I, and Class II in two divisions, and the award and grade of Honours are made in recognition of superior performance throughout the course.

3620
Civil Engineering — Full-time Course
Bachelor of Engineering
BE

A revised curriculum for Year 1 was introduced in 1985. The corresponding curriculum for Years 2, 3 and 4 is being introduced in 1986.

Year 1

<table>
<thead>
<tr>
<th></th>
<th>Hours per week</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>S1</td>
</tr>
<tr>
<td>1.981</td>
<td>Physics*</td>
</tr>
<tr>
<td>2.991</td>
<td>Chemistry 1CE†</td>
</tr>
<tr>
<td>8.1110</td>
<td>Civil Engineering Practice</td>
</tr>
<tr>
<td>8.1120</td>
<td>Computing</td>
</tr>
<tr>
<td>8.1130</td>
<td>Engineering Drawing</td>
</tr>
<tr>
<td>8.1140</td>
<td>Statics</td>
</tr>
<tr>
<td>8.1210</td>
<td>Engineering Construction I</td>
</tr>
<tr>
<td>8.1410</td>
<td>Dynamics and Vibration</td>
</tr>
<tr>
<td>8.1610</td>
<td>Fluid Mechanics</td>
</tr>
<tr>
<td>10.001</td>
<td>Mathematics‡</td>
</tr>
<tr>
<td>25.5112</td>
<td>Geology for Civil Engineers</td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*Students are advised to attempt 1.981 Physics 1CE but if timetabling difficulties arise or other exceptional circumstances prevail permission will be given to attempt 1.001 Physics 1. Students who intend to apply for transfer to the Combined BE BSc degree program involving Level II/III Physics subjects must enrol in 1.001.

†Students who have not satisfied the Chemistry prerequisite for 2.991 Chemistry 1CE are required to take 2.111 Introductory Chemistry in Session 1 and 2.991 in Session 2. Students who intend to apply for transfer to the combined BE BSc programs involving Level II/III Chemistry subjects must enrol in 2.121 in Year 1 and 2.131 in Year 2 instead of 2.991.

‡Students who have achieved a certain standard may attempt 10.011 Higher Mathematics 1.
## Combined Course for BE BSc in Civil Engineering

Students may seek permission to undertake a five-year full-time combined course leading to the award of the degrees of Bachelor of Engineering and Bachelor of Science (BE BSc). The course is administered by the Faculty of Engineering.

Normally, students enrolled in the BE BSc course may be awarded their degrees at the conclusion of five years’ study. However, students who commence the course and do not complete the Civil Engineering component may take out a BSc degree on completion of one of the approved programs of the Science and Mathematics Course.

Similarly, students not wishing to complete the BSc degree course may revert to the Civil Engineering program (3620) with appropriate credit for subjects satisfactorily completed.

The combined course consists of the Civil Engineering program (3620), and at least fourteen units of the Science and Mathematics Course (3970) within an approved program.

There are three approved programs but additional ones may be approved if they are relevant. Approval may be given to change the programs listed below to allow for timetabling and the student’s academic interests.

Although transfer from Course 3620 to Course 3730 is normally made at the end of Year 1, first year students who are considering to apply for transfer should note the requirements for 2.121 Chemistry 1A in the first program, and for 1.001 Physics 1 in the second program.

### Year 2

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>S1</th>
<th>S2</th>
</tr>
</thead>
<tbody>
<tr>
<td>8.2110</td>
<td>Systems Engineering 1</td>
<td>2</td>
<td>0</td>
</tr>
<tr>
<td>8.2120</td>
<td>Systems Engineering 2</td>
<td>0</td>
<td>2</td>
</tr>
<tr>
<td>8.2210</td>
<td>Engineering Construction 2</td>
<td>2</td>
<td>0</td>
</tr>
<tr>
<td>8.2220</td>
<td>Engineering Construction 3</td>
<td>0</td>
<td>2</td>
</tr>
<tr>
<td>8.2310</td>
<td>Materials Technology</td>
<td>0</td>
<td>4</td>
</tr>
<tr>
<td>8.2320</td>
<td>Concrete Technology</td>
<td>4</td>
<td>0</td>
</tr>
<tr>
<td>8.2410</td>
<td>Mechanics of Solids 1</td>
<td>3</td>
<td>0</td>
</tr>
<tr>
<td>8.2420</td>
<td>Mechanics of Solids 2</td>
<td>0</td>
<td>3</td>
</tr>
<tr>
<td>8.2430</td>
<td>Structural Design 1</td>
<td>0</td>
<td>4</td>
</tr>
<tr>
<td>8.2610</td>
<td>Hydraulics 1</td>
<td>2</td>
<td>0</td>
</tr>
<tr>
<td>10.022</td>
<td>Engineering Mathematics 2</td>
<td>4</td>
<td>4</td>
</tr>
<tr>
<td>10.381</td>
<td>Statistics SC</td>
<td>2</td>
<td>0</td>
</tr>
<tr>
<td>29.441</td>
<td>Surveying for Engineers</td>
<td>0</td>
<td>6</td>
</tr>
<tr>
<td>29.491</td>
<td>Survey Camp</td>
<td>0</td>
<td>3</td>
</tr>
</tbody>
</table>

**Total:** 23 28

\*Students are required to attend a one-week Survey Camp, which is equivalent to 3 class contact hours per week in a session.

### Year 3

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>S1</th>
<th>S2</th>
</tr>
</thead>
<tbody>
<tr>
<td>8.3110</td>
<td>Engineering Computations</td>
<td>3</td>
<td>0</td>
</tr>
<tr>
<td>8.3210</td>
<td>Engineering Management 1</td>
<td>2</td>
<td>0</td>
</tr>
<tr>
<td>8.3220</td>
<td>Engineering Management 2</td>
<td>0</td>
<td>4</td>
</tr>
<tr>
<td>8.3230</td>
<td>Engineering Construction 4</td>
<td>0</td>
<td>2</td>
</tr>
<tr>
<td>8.3310</td>
<td>Soil Mechanics</td>
<td>3</td>
<td>0</td>
</tr>
<tr>
<td>8.3320</td>
<td>Geotechnical Engineering</td>
<td>0</td>
<td>3</td>
</tr>
<tr>
<td>8.3330</td>
<td>Concrete Technology</td>
<td>0</td>
<td>2</td>
</tr>
<tr>
<td>8.3410</td>
<td>Structural Analysis 1</td>
<td>3</td>
<td>0</td>
</tr>
<tr>
<td>8.3420</td>
<td>Structural Analysis 2</td>
<td>0</td>
<td>3</td>
</tr>
<tr>
<td>8.3430</td>
<td>Structural Design 2</td>
<td>4</td>
<td>0</td>
</tr>
<tr>
<td>8.3440</td>
<td>Structural Design 3</td>
<td>0</td>
<td>4</td>
</tr>
<tr>
<td>8.3510</td>
<td>Traffic Flow Theory</td>
<td>3</td>
<td>0</td>
</tr>
<tr>
<td>8.3610</td>
<td>Hydraulics 2</td>
<td>3</td>
<td>0</td>
</tr>
<tr>
<td>8.3620</td>
<td>Hydraulics 3</td>
<td>0</td>
<td>3</td>
</tr>
<tr>
<td>8.3630</td>
<td>Water Supply and Wastewater Disposal</td>
<td>3</td>
<td>0</td>
</tr>
<tr>
<td>8.3640</td>
<td>Engineering Hydrology</td>
<td>0</td>
<td>3</td>
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</table>

**Total:** 24 26

### Year 4

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>S1</th>
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</thead>
<tbody>
<tr>
<td>8.4110</td>
<td>Industrial Training</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>8.4220</td>
<td>Engineering Management 3</td>
<td>2</td>
<td>0</td>
</tr>
<tr>
<td>8.4320</td>
<td>Metals Engineering</td>
<td>2</td>
<td>0</td>
</tr>
<tr>
<td>8.4330</td>
<td>Pavement Engineering</td>
<td>2</td>
<td>0</td>
</tr>
<tr>
<td>8.4420</td>
<td>Structural Analysis 3</td>
<td>2</td>
<td>0</td>
</tr>
<tr>
<td>8.4430</td>
<td>Structural Design 4</td>
<td>2</td>
<td>0</td>
</tr>
<tr>
<td>8.4440</td>
<td>Timber Engineering</td>
<td>2</td>
<td>0</td>
</tr>
<tr>
<td>8.4520</td>
<td>Transport System Analysis</td>
<td>3</td>
<td>0</td>
</tr>
<tr>
<td>8.4620</td>
<td>Water Resources Engineering</td>
<td>3</td>
<td>0</td>
</tr>
</tbody>
</table>

**Total:** 24 22

### Two of the following:

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>S1</th>
<th>S2</th>
</tr>
</thead>
<tbody>
<tr>
<td>8.4210</td>
<td>Construction Major</td>
<td>0</td>
<td>11</td>
</tr>
<tr>
<td>8.4310</td>
<td>Materials Major</td>
<td>0</td>
<td>11</td>
</tr>
<tr>
<td>8.4410</td>
<td>Structures Major</td>
<td>0</td>
<td>11</td>
</tr>
<tr>
<td>8.4510</td>
<td>Transport Major</td>
<td>0</td>
<td>11</td>
</tr>
<tr>
<td>8.4610</td>
<td>Water Major</td>
<td>0</td>
<td>11</td>
</tr>
</tbody>
</table>

**Total:** 6 0

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>S1</th>
<th>S2</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>One and one half General Studies electives</td>
<td>24</td>
<td>22</td>
</tr>
</tbody>
</table>

**Total:** 24 22
Geography and Environmental Chemistry

Year 1
1.981*
2.121
8.1110, 8.1120, 8.1130, 8.1140
8.1210, 8.1410, 8.1610
10.001***
25.5112

Year 2
2.102A, 2.102C, 2.102D, 2.131
8.2110, 8.2210, 8.2320, 8.2410, 8.2420, 8.2430
10.022
27.111
1 General Studies elective

Year 3
2.043A
8.2220, 8.2610, 8.3110, 8.3410, 8.3420, 8.3430, 8.3440
27.172
29.441, 29.491
2 General Studies electives

Year 4
8.2120, 8.2310, 8.3210, 8.3220, 8.3310, 8.3320, 8.3330, 8.3510, 8.3610, 8.3620, 8.3630, 8.3640
1 General Studies elective

Choose 2 Level II or Level III Mathematics units from Table 1 in the Sciences Handbook.

Year 5
Choose 2 units from Table 1 in the Sciences Handbook at Level II or higher.
8.4110, 8.4220, 8.4320, 8.4330, 8.4420, 8.4430, 8.4440, 8.4450, 8.4620
Two of the following subjects:
8.4210, 8.4310, 8.4410, 8.4510, 8.4610

General Studies elective
Choose 1 unit from Table 1 in the Sciences Handbook at Level II or higher.

Note: All material not in italic typeface refers to the BE degree component of this combined course.

Computing with some Mathematics

Year 1
1.981*
2.991**
8.1110, 8.1120, 8.1130, 8.1140
8.1210, 8.1410, 8.1610
10.001***
25.5112

Year 2
6.621, 6.631, 6.641
8.2110, 8.2210, 8.2320, 8.2410, 8.2420, 8.2430
10.111A or 10.121A, 10.1113 or 10.1213, 10.331, 10.1114 or 10.1214
1 General Studies elective
School of Electrical Engineering and Computer Science

Head of School
Professor N. W. Rees

Executive Assistant to Head of School
Dr H. S. Blanks

Senior Administrative Officer
Mr K. J. Flynn

Administrative Officer
Ms R. C. Horwood

Electrical Engineering has close links with the pure sciences and mathematics. Its technology is changing rapidly, and the School's teaching and research programs are constantly under review to meet the ever changing challenges of present and future needs.

Year 3
6.642, 6.643
8.2120, 8.2220, 8.2310, 8.2610, 8.3110, 8.3410, 8.3420, 8.3430, 8.3440, 8.3640
10.2111 or 10.2211.
29.411, 29.412
29.411, 29.412
29.441, 29.491

Choose 1 Level II or Level III Mathematics unit from Table 1 in the Sciences Handbook.

Year 4
6.646, 6.647
One of 6.613, 6.632, 6.633
8.3210, 8.3220, 8.3230, 8.3310, 8.3320, 8.3330, 8.3510, 8.3610, 8.3620, 8.3630
1 General Studies elective
Choose 1 Level II or Level III Mathematics unit from Table 1 in the Sciences Handbook at Level II or higher.

Note: All material not in italic typeface refers to the BE degree component of this combined degree course.

- Students are advised to attempt 1.981 Physics 1CE but if time-tabling difficulties arise or other exceptional circumstances prevail permission will be given to attempt 1.001 Physics 1.
- Students who have not satisfied the Chemistry prerequisite for 2.991 Chemistry 1CE are required to take 2.111 Introductory Chemistry in Session 1 and 2.991 in Session 2.
- Students who have achieved a certain standard may attempt 10.011 Higher Mathematics 1.

The School offers undergraduate and graduate training in all branches of the profession of electrical engineering; there are Departments of Communications, Computer Science, Electric Power, Electronics, and Systems and Control Engineering. A number of inter-departmental and specialized groups (such as Digital Systems, Biomedical Engineering, Measurements, Microelectronics, etc.) are also active.

Summary of Courses

<table>
<thead>
<tr>
<th>Course</th>
<th>Degree(s)</th>
<th>Usual Duration (years)</th>
</tr>
</thead>
<tbody>
<tr>
<td>3640</td>
<td>BE</td>
<td>4 full-time**Note 1</td>
</tr>
<tr>
<td>3650</td>
<td>BSc (Eng)</td>
<td>6 part-time**Note 1</td>
</tr>
<tr>
<td>3720</td>
<td>BE and BA</td>
<td>5 full-time</td>
</tr>
<tr>
<td>3725</td>
<td>BE and BSc</td>
<td>5 full-time</td>
</tr>
<tr>
<td>3970**Note 3</td>
<td>BSc (pass)</td>
<td>3 full-time</td>
</tr>
<tr>
<td></td>
<td>BSc (honours)</td>
<td>4 full-time</td>
</tr>
</tbody>
</table>

Note 1 Course 3640 Full-time/Part-time

A student in course 3640 may with the approval of the Head of School complete the requirements by a combination of full-time and part-time study. To ensure that prerequisites are met and the program can be timetabled, students should consult with the School as early as possible when a change in attendance pattern is envisaged. A part-time student must be able to attend classes one afternoon per week as not all subjects are available in the evenings. From 1985 students commencing the part-time course may be required to attend up to two half-days per week. After Year 1 of the BE, a form of sandwich pattern is possible by arrangement with the Head of School.

Note 2 Course 3650

No new enrolments are being accepted into course 3650. A student already enrolled in this course may complete it and graduate with a BSc (Eng) degree or may request to transfer to course 3640 and graduate with a BE degree.

Note 3 Course 3970

This course is operated by the Board of Studies in Science and Mathematics and is for students wishing to major in Computer Science in a Science and Mathematics context. For more details see the Sciences Handbook. Most of the course is available in evening classes but some day attendance is essential in Year 3.

The undergraduate curriculums are being progressively revisied to provide a flexible training to suit the needs of today and tomorrow. Individual student needs can be further met by quite extensive substitution provisions within the course programs.

Recognition

The degrees of Bachelor of Engineering and Bachelor of Science (Engineering) are recognized by the Institution of Engineers, Australia and the Institution of Radio and Electronics Engineers, Australia, as meeting the examination requirements for admission to graduate and corporate membership.
Honours

In the Bachelor of Engineering Course the same formal program is offered to both pass students and to those aiming at honours. Honours will be awarded for meritorious performance over the course; special attention is paid to a candidate's performance in the final year thesis project. A student with a creditable performance in the Bachelor of Science (Engineering) course may be awarded a degree with Merit. The award of the BA or BSc degree at honours level requires two additional sessions of study. See the Arts and Sciences Handbooks for details.

Substitution of Subjects

To suit the special abilities or needs of individual students a limited amount of substitution is permitted within each course. Any such substitution must have prior approval of the Head of School who will ensure that:

1. The replacement subject is at least the same length and level as the prescribed subject it replaced; and,
2. The resulting overall program of study is suited to the award of the degree as applicable.

Substitution is not permitted in Year 1.

Examples

(i) Replacement of General Studies subjects by subjects approved (by the Head of the Department of General Studies) selected from areas such as Arts; Life Sciences; Earth Sciences; Accounting and Business Administration; Law; Economics; Industrial Management.

(ii) The normal Year 4 of the BE degree program includes 5 units of Electrical Engineering IV. Students may substitute for one of these units, a subject of suitable level and difficulty from an area outside the School of Electrical Engineering and Computer Science. A graduate subject of the School may also be substituted in this way.

(iii) Part-time BE students in full-time employment may request substitution of Industrial Electives (6.931, 6.932, 6.933) for up to three subjects in the BE course. See Industrial Elective subject descriptions for details.

Course Rules

It is the responsibility of students to meet the course requirements applicable at the date of application for the degree.

- Programs and timetables are arranged in preferred year or stage groupings. Progression is, however, by subject.
- Students are not permitted to enrol in subjects with clashing timetables.
- In addition to the specific subject prerequisites a general understanding of the material in the preceding Year or Stage is assumed. Students are not normally permitted to enrol in subjects spread beyond two Years or Stages.
- Students who do not pass their full programs in any year will be limited to a reduced load in the following year. Typically, this is 20 hours per week.
- Previously failed subjects must be included, except that a failed elective may be replaced by another elective.

Course Revision

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

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

Re-enrolment

Students must collect enrolment information from the School Office before the end of Session 2. Re-enrolment forms, giving details of students' proposed 1986 programs must be lodged with the School Office by the end of the first week in January. Enrolment at the University will not be authorized until the re-enrolment form has been checked and the program approved. Students not intending to re-enrol should advise the School. Leave of absence for up to one year is usually granted to students in good standing.

3640
Electrical Engineering — Full-time Course

Bachelor of Engineering

BE

Year 1

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Name</th>
<th>Hours per week</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.961</td>
<td>Physics 1</td>
<td>S1 6, S2 6</td>
</tr>
<tr>
<td>2.121</td>
<td>Chemistry</td>
<td>S1 6, S2 6</td>
</tr>
<tr>
<td>5.006</td>
<td>Engineering E</td>
<td>S1 6, S2 6</td>
</tr>
<tr>
<td>6.010</td>
<td>Electrical Engineering I</td>
<td>S1 6, S2 6</td>
</tr>
<tr>
<td>6.611</td>
<td>Computing I</td>
<td>S1 6, S2 6</td>
</tr>
<tr>
<td>10.001</td>
<td>Mathematics 1*</td>
<td>S1 6, S2 6</td>
</tr>
<tr>
<td></td>
<td>General Studies elective</td>
<td>S1 2, S2 2</td>
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Year 2†

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Name</th>
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<tbody>
<tr>
<td>1.972</td>
<td>Electromagnetism</td>
<td>S1 0, S2 4</td>
</tr>
<tr>
<td>1.982</td>
<td>Solid State Physics</td>
<td>S1 4½, S2 0</td>
</tr>
<tr>
<td>10.111A</td>
<td>Pure Mathematics 2 (Linear Algebra)*</td>
<td>S1 2½, S2 2½</td>
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<tr>
<td>10.111B</td>
<td>Pure Mathematics 3 — Multivariable Calculus*</td>
<td>S1 2½, S2 0</td>
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<tr>
<td>10.111C</td>
<td>Pure Mathematics 2 — Complex Analysis*</td>
<td>S1 0, S2 2½</td>
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<tr>
<td>10.2111</td>
<td>Applied Mathematics 2 — Vector Calculus*</td>
<td>S1 2½, S2 0</td>
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<tr>
<td>10.2112</td>
<td>Applied Mathematics 2 — Mathematical Methods for Differential Equations*</td>
<td>S1 0, S2 2½</td>
</tr>
<tr>
<td></td>
<td>General Studies elective</td>
<td>S1 4, S2 0</td>
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</tbody>
</table>

*Students who have achieved a certain standard may attempt similar material at a higher level.
Students who plan to specialize in Computer Science or Physics in a BE/BSc course should consult the School before enrolling in V%ar 2.

Compared with the full-time program above, subjects 10.0331, 10.0332, one Technical Elective and one Professional Elective are assumed to have been substituted by three Industrial Electives (see Industrial Elective subject description for more details). Other subjects, except General Studies, could be replaced in lieu of those above with approval of the Head of School.

### Year 3*

<table>
<thead>
<tr>
<th>Code</th>
<th>Subject</th>
<th>Hours per week</th>
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<tbody>
<tr>
<td>10.0331</td>
<td>E. E. Mathematics 3 — Transform Methods</td>
<td>2</td>
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<td>10.0332</td>
<td>E. E. Mathematics 3 — Numerical Methods</td>
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<td>Statistics SE</td>
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*Students who intend to major in particular disciplines should note that certain subjects are prerequisites for the Professional Electives they choose in Year 4.
†See list of Technical Electives later this section.

### Electrical Engineering III

<table>
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<th>Subject</th>
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<tr>
<td>6.0311</td>
<td>Circuit Theory II</td>
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<td>Utilization of Electric Energy</td>
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<td>6.0313</td>
<td>Electronics II</td>
<td>4</td>
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<td>6.0314</td>
<td>Systems and Control I</td>
<td>4</td>
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<td>Electronics III</td>
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<td>6.0317</td>
<td>Communications Systems I</td>
<td>4</td>
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<td>6.0318</td>
<td>Microprocessor Systems and Applications</td>
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### Year 4†

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### Electrical Engineering IV

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<td>6.903</td>
<td>Industrial Training‡</td>
<td>22</td>
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*Students are required to complete 168 hours of General Studies electives for the BE degree. If these have not been completed by the end of Year 3, then General Studies must be included in the Year 4 program.
†Three electives are taken in Session 1 and two in Session 2. See list of Professional Electives later this section.
‡6.911 Thesis is done in the last two sessions of a student's course. See subject description.
‡‡All students in the BE degree course must complete at least 60 days industrial experience.

### Stage 1

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<td>Mathematics 1</td>
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<td>5.006</td>
<td>Engineering E</td>
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<tr>
<td></td>
<td>(or equivalent)</td>
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### Stage 3*

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Students must complete 168 hours of General Studies electives for the BE degree. If these have not been completed by the end of Year 3, then General Studies must be included in the Year 4 program.

*Three electives are taken in Session 1 and two in Session 2. See list of Professional Electives later this section.
**6.911 Thesis is done in the last two sessions of a student's course. See subject description.
†‡All students in the BE degree course must complete at least 60 days industrial experience.
### Undergraduate Study: Course Outlines

#### Technical Electives

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<th>Course Code</th>
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<td><strong>S1</strong></td>
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<tr>
<td>81</td>
<td></td>
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<tr>
<td>S2</td>
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#### Stage 4*

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<th>Course Title</th>
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<tbody>
<tr>
<td>6.021 C</td>
<td>Electronics 1</td>
<td>4</td>
</tr>
<tr>
<td>6.021 E</td>
<td>Digital Logic and Systems</td>
<td>4</td>
</tr>
<tr>
<td>6.0311</td>
<td>Circuit Theory 2</td>
<td>0</td>
</tr>
<tr>
<td>6.0312</td>
<td>Utilization of Electrical Energy</td>
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</tr>
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<td>6.0313</td>
<td>Electronics 2</td>
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</tr>
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<td>Industrial Elective</td>
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#### Stage 5*

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<th>Course Title</th>
<th>Hours per week</th>
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<tbody>
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<td>6.0314</td>
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<td>6.0315</td>
<td>Electrical Energy</td>
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<td>6.0316</td>
<td>Electronics 3</td>
<td>4</td>
</tr>
<tr>
<td>6.0317</td>
<td>Communication Systems 1</td>
<td>0</td>
</tr>
<tr>
<td>6.0318</td>
<td>Microprocessor Systems and Applications</td>
<td>0</td>
</tr>
<tr>
<td>10.361</td>
<td>Statistics SE</td>
<td>2</td>
</tr>
<tr>
<td></td>
<td>Industrial Elective</td>
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#### Stage 6

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<tbody>
<tr>
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<tr>
<td></td>
<td>Four Professional Electives†</td>
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</tr>
<tr>
<td>6.903</td>
<td>Industrial Training**</td>
<td>10</td>
</tr>
<tr>
<td>6.911</td>
<td>Thesis†</td>
<td>12</td>
</tr>
</tbody>
</table>

*Students who intend to major in particular disciplines should note that certain subjects are prerequisites for the Professional Electives they choose in Stage 6.
†Two electives are taken in each session. See list of Professional Electives later in this section.
‡All students in the BE degree course must complete at least 60 days industrial experience.
††6.911 is done in the last two sessions of a student's course. See subject description.

### Electrical Engineering Professional Electives

Each elective is 5 hours per week for one session.

The list of electives is:

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Hours per week</th>
</tr>
</thead>
<tbody>
<tr>
<td>6.042</td>
<td>Digital and Analogue Signals</td>
<td>2</td>
</tr>
<tr>
<td>6.044</td>
<td>Electrical Product Design and Reliability</td>
<td>2</td>
</tr>
<tr>
<td>6.202</td>
<td>Power Engineering 1</td>
<td>2</td>
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<tr>
<td>6.203</td>
<td>Power Engineering 2</td>
<td>2</td>
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<tr>
<td>6.212</td>
<td>Power Engineering — Utilization</td>
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<tr>
<td>6.222</td>
<td>High Voltage Technology</td>
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</tr>
<tr>
<td>6.303</td>
<td>Transmission Lines for Microwave and Optical Communication</td>
<td>2</td>
</tr>
<tr>
<td>6.313</td>
<td>Signal Propagation at Microwave and Optical Frequencies</td>
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<td>6.322</td>
<td>Electronics 4</td>
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<td>6.323</td>
<td>Communication Systems 2A</td>
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<td>Communication Systems 2B</td>
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<td>Systems and Control 2</td>
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<tr>
<td>6.413</td>
<td>Digital Control</td>
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<td>Computer Control and Instrumentation</td>
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<td>6.512</td>
<td>Semiconductor Devices</td>
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<td>6.522</td>
<td>Transistor and Integrated Circuit Design</td>
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<td>Computer Organization and Architecture</td>
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<td>Computer Applications</td>
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<td>6.652</td>
<td>Data Communication and Computer Networks</td>
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<tr>
<td>6.672</td>
<td>Operating Systems and Compilers</td>
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</table>

Because of timetable clashes a free choice from all these electives is not possible.

The program selected by each student must be approved by the Head of School. Not all electives are offered each session, nor is the full range available to part-time students. Students are advised each year of the timetable of available electives. Substitution is not permitted if it unduly restricts the range of subjects studied to only one area of electrical engineering and computer science.
## Prerequisites and Co-requisites

Arranged in order of full-time Bachelor of Engineering Degree Course

<table>
<thead>
<tr>
<th>Year</th>
<th>Subject</th>
<th>Prerequisites §</th>
<th>Co-requisites</th>
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<tbody>
<tr>
<td>1</td>
<td>1.961</td>
<td>See Matriculation and Admission Requirements</td>
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<td>The Electricity &amp; Magnetism section of 1.961</td>
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<td>6.044</td>
<td>10.361</td>
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<td>6.202</td>
<td>5.0312, 6.0315</td>
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<td>6.203</td>
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<td>6.212</td>
<td>6.0312, 6.0315</td>
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<td>6.222</td>
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<td>6.0313, 6.0316</td>
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<td>6.323</td>
<td>6.0317††, 10.0331, 10.361</td>
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<td>6.333</td>
<td>6.0316, 6.0317</td>
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<td>6.412</td>
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<td>6.413</td>
<td>6.0314††, 10.0331, 10.361</td>
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<td>6.432</td>
<td>6.0314, 6.0316, 6.0318</td>
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<td>6.483</td>
<td>6.402</td>
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<td>6.512</td>
<td>6.0313</td>
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<tr>
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<td>6.522</td>
<td>6.0313, 6.0316</td>
<td></td>
</tr>
<tr>
<td></td>
<td>6.532</td>
<td>6.021E, 6.0316</td>
<td></td>
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<tr>
<td></td>
<td>6.612</td>
<td>6.0318 or 6.613</td>
<td></td>
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<tr>
<td></td>
<td>6.622</td>
<td>6.641</td>
<td></td>
</tr>
<tr>
<td></td>
<td>6.652</td>
<td>6.0318 or 6.613, 6.0317</td>
<td></td>
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<tr>
<td></td>
<td>6.672</td>
<td>6.0318 or 6.613</td>
<td></td>
</tr>
<tr>
<td></td>
<td>6.911</td>
<td>(in graduating program only)</td>
<td></td>
</tr>
</tbody>
</table>

§Pass Terminated result (PT) does not satisfy prerequisite requirements.

Two of 10.1113, 10.1114, 10.2111, or 10.2112 may be taken as co-requisites.

**Attempted at an acceptable level and to be taken as a co-requisite.

†One of 6.021B or 6.021C may be taken as a co-requisite.

††Pass Conceded (PC) awarded prior to Session 2, 1983 is not acceptable.

‡One of 6.021A or 1.982 to be passed, the other to be attempted at an acceptable level and to be repeated concurrently.
Combined Courses

Students in Electrical Engineering who maintain a creditable performance may qualify for the award of two degrees in five years of combined full-time study in which the requirements of the degrees have been merged. (The two degrees referred to here are the Bachelor of Engineering/Bachelor of Science BE BSc and the Bachelor of Engineering/Bachelor of Arts BE BA.) Students wishing to enrol in a combined course may do so only on the recommendation of the Head of School of Electrical Engineering and Computer Science and with the approval of the Faculty of Engineering and either the Faculty of Arts or the Board of Studies in Science and Mathematics, as appropriate. Students wishing to enrol, transfer into, or continue in a combined course shall have complied with all the requirements for prerequisite study, sequencing and academic attainment (a creditable performance, ie 65% average) of both the Course Authorities concerned.

Students who commence a course but subsequently do not wish to proceed with both areas of study, or who fail to maintain a creditable performance, revert to a single degree program with appropriate credit for subjects completed. Tertiary Education Assistance Scheme (TEAS) support is available for the five years of the combined degree courses.

Students may transfer into a combined course after partially completing the requirements for either degree provided suitable subjects have been studied. However, the choice of subjects and the time taken to complete the program can be seriously affected by this. Thus, students considering course 3725 or course 3720 should contact the Electrical Engineering School before completing their Year 2 enrolment. Application for transfer to a combined course must be made in writing to the Head of School by the end of the first week of January in the year following their completion of Year 2 of the BE course.

Students wishing to gain a degree at honours level in Arts or Science as part of their combined degree program shall meet all the relevant requirements of the Faculty concerned and of the appropriate Schools. Such students may enrol for the Honours year only on the recommendation of the Head of School of Electrical Engineering and Computer Science and with the approval of the Faculty of Engineering and either the Faculty of Arts or the Board of Studies in Science and Mathematics, as appropriate.

Re-enrolment of students in Courses 3720 and 3725 each year is arranged by the School of Electrical Engineering and Computer Science.

3725
BE BSc in Electrical Engineering

Having completed Years 1 and 2 of course 3640 students in their third year complete a specific course of study consisting of four Level III Science units chosen from related disciplines, the appropriate General Studies electives and no less than four other Level II or Level III units, and otherwise accord with the rules of course 3970 leading to a major in Computer Science, Mathematics or Physics.

Students may open up a wider choice of subjects in their Science Year by including additional Computer Science (viz 6,641), Physics (viz 1,992) or Mathematics in their Year 2 Electrical Engineering program. Any subject omitted may be required to be taken later in the course. The extra subject in Year 2 may be credited towards either the BE or BSc requirements, but not both.

In their fourth and fifth years the students do Year 3 and Year 4 of course 3640. Depending on the program followed in their year of Science they may have already completed parts of the normal third and fourth year programs of the Electrical Engineering course, and they will be required to omit these from their program and to include an equivalent amount of other courses chosen with the approval of the Head of School.

3720
BE BA in Electrical Engineering

The combined course should include

- the requirements of a normal BE program in Electrical Engineering less the General Studies subjects and one other subject approved by the Head of the School;

- subjects equivalent to 108 credit points in accordance with the regulations of the Faculty of Arts provided that this includes a major sequence of subjects available within the Faculty of Arts in addition to the studies in the School of Mathematics and the Department of Computer Science. These include the subjects in Table A or their equivalents.
Guidance should be sought from the School of Electrical Engineering and Computer Science, the relevant schools in the Faculty of Arts and the Arts Faculty office. After four years of study a student will normally have completed the BA requirements of study, together with subjects selected from course 3640 (in accord with an acceptable program loading) and in the fifth year will complete requirements for a BE.

It is necessary for each individual student entering the course to lodge for approval a complete program of study; changes in detail are usual from year to year. Students should choose their Arts Major early so as to start the sequence in Year 1 if possible.

Studies in Computer Science other than in BE Course 3640, BE BA 3720 and BE BSc 3725

Minor Study in BA Course 3400 or BSc course 3970

Some students will wish to include a small number of Computer Science units in courses leading to major studies in other disciplines. Level I unit 6.611 and Level II units 6.621, 6.631, 6.641 are freely available to such students.

Students majoring in other disciplines may also seek entry, on a competitive merit basis, to a limited range of Level III units.

For further details see the Combined Sciences Handbook.
Computer Science Electives offered by the School

<table>
<thead>
<tr>
<th>No.</th>
<th>Name</th>
<th>Level</th>
<th>Prerequisites</th>
<th>Excluded</th>
</tr>
</thead>
<tbody>
<tr>
<td>6.611</td>
<td>Computing 1</td>
<td>I</td>
<td>As for 10.001</td>
<td>6.600, 6.620, 6.021D</td>
</tr>
<tr>
<td>6.621</td>
<td>Computing 2A</td>
<td>II</td>
<td>6.611* and 10.001 or 10.011</td>
<td>6.620, 6.021D</td>
</tr>
<tr>
<td>6.631</td>
<td>Computing 2B</td>
<td>II</td>
<td>6.620* or 6.021D* or 6.621*</td>
<td>6.021E</td>
</tr>
<tr>
<td>6.641</td>
<td>Computing 2C</td>
<td>II</td>
<td>6.620* or 6.021D* or 6.621*</td>
<td></td>
</tr>
<tr>
<td>6.642</td>
<td>Design and Analysis of Algorithms</td>
<td>III</td>
<td>6.641*</td>
<td>6.672</td>
</tr>
<tr>
<td>6.643</td>
<td>Compiling Techniques and Programming Languages</td>
<td>III</td>
<td>6.641*</td>
<td></td>
</tr>
<tr>
<td>6.646</td>
<td>Computer Applications</td>
<td>III</td>
<td>6.620* or 6.021D* or 6.621*, 10.311A or both 10.211A and 10.311B or equivalent</td>
<td>6.622, 14.602, 14.603, 14.605</td>
</tr>
</tbody>
</table>

*Pass Conceded (PC) awarded prior to Session 2, 1983, is not acceptable.
††Can only be counted with at least 3 other Computer Science Level III subjects.

School of Mechanical and Industrial Engineering*

*Incorporating Aeronautical Engineering and Naval Architecture

Head of School
Professor R. A. A. Bryant

Executive Assistant to Head of School
Dr J. E. Baker

Senior Administrative Officer
Mr G. Dusan

The School of Mechanical and Industrial Engineering offers courses in Aeronautical Engineering, Industrial Engineering, Mechanical Engineering and Naval Architecture, either singly or in combination with Science or Arts courses.

The courses are planned to provide the appropriate academic training for the professional engineer in the fields of aeronautical, industrial and mechanical engineering, and for the naval architect. They may be taken on a full-time basis, normally over four years, or on a combined full-time/part-time basis. The equivalent of the first two full-time years may be taken by wholly part-time study. Part-time students will normally take two years for each equivalent full-time year and will be required to attend day classes for the equivalent of at least 1 ½ days per week. Students intending to enter part-time study are advised that most subjects in the later years of the course are only offered in the day-time.

The courses lead to the award of the degree of Bachelor of Engineering (BE).

The School also offers combined courses in conjunction with other faculties of the University, leading to the award of the two degrees of Bachelor of Engineering and Bachelor of
Science (BE BSc) or Bachelor of Engineering and Bachelor of Arts (BE BA). These combined courses enable students to major in the area of computer science, materials science, mathematics, physics, statistics or another relevant field, in addition to studying their chosen engineering specialty.

For the four BE courses, the study of the basic sciences — mathematics, physics and chemistry — together with an introduction to engineering, comprise Year 1. In Year 2 further mathematical studies are undertaken, together with a study of the engineering sciences — thermodynamics, fluid mechanics, engineering mechanics, mechanics of solids — and their application in the field of design.

The first halves of the courses of Mechanical, Industrial and Aeronautical Engineering and of Naval Architecture are identical, and students attend classes together. The latter halves of these four courses contain a number of common core subjects together with specific departmental requirements. In the final years, in addition to core subjects and departmental requirements, provision is made for a limited degree of specialization in one or more elective subjects. Students may take, subject to the approval of the Head of School, a limited number of graduate subjects offered by the School in lieu of an equivalent quantity of final year undergraduate electives. Each student is required to present a thesis at the end of the final year and to deliver a short paper on the subject of the thesis. General Studies form a regular part of all courses. In certain instances and with permission from the Head of School students may substitute an Arts subject in lieu of two General Studies subjects.

Industrial experience is an integral part of the courses. Full-time students must complete forty working days of approved industrial training between both Years 2 and 3 and Years 3 and 4. Students are strongly recommended to gain as much industrial training as possible between Years 1 and 2.

Students taking the course on a full-time/part-time basis must complete an equivalent amount of industrial training.

Students who have had suitable industrial experience may qualify for exemption from certain subjects. The Head of School should be contacted for details.

All BE degree course students are considered for the award of Honours which is granted for meritorious performance in the course with particular emphasis on the later years. Honours in Science or Arts in the BE BSc or BE BA combined degree course require an extra year of study.

The Institution of Engineers, Australia, recognizes the degree of BE in any of the undergraduate courses offered by the School as meeting the examination requirements for admission to graduate and corporate membership.

The award of the degree BE in Aeronautical Engineering is recognized by the Royal Aeronautical Society as giving exemption from the formal examination requirements for corporate membership. Advancement from graduate membership to associate membership grade is awarded on a case by case basis after a further period of some years of professional experience.

The award of the degree BE in Naval Architecture is recognized by the Royal Institution of Naval Architects (RINA), London, as the academic qualification for corporate membership of that body.

Course Progression Guidelines

It is the responsibility of each student to have met the course requirements by the date of application for the degree. In this context, the student's attention is directed to the Faculty's General Rules for Progression contained in the preceding chapter of this Handbook. As well, the following points should be noted:

- Progression in the School's courses is by subject, although programs and timetables are arranged by year.
- In addition to the specific subject prerequisites for a particular year of a course, a general understanding of the material in the preceding year is assumed.
- Previously failed subjects must be included in a student's current program, except that a failed elective may be replaced by another elective.
- A student who is faced with compiling a mixed year's program must give preference to subjects from the lower year of the course.
- In the event of a student dropping one or more subjects from a mixed year's program, the discarded subject(s) must be chosen from the higher year's selection.

3680
Mechanical Engineering — Full-time Course

Bachelor of Engineering
BE

Note: The program as presented is for full-time study. Alternative programs are available for a combination of full-time and part-time study. Students wishing to commence studies on a part-time basis must, in Year 1, study the subjects: 1.951, 2.951, 5.010, 10.001.

<table>
<thead>
<tr>
<th>Year 1</th>
<th>Hours per week</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>S1</td>
</tr>
<tr>
<td>1.951 Physics 1 (Mechanical Engineering)</td>
<td>4</td>
</tr>
<tr>
<td>2.951 Chemistry 1ME</td>
<td>0</td>
</tr>
<tr>
<td>5.010 Engineering A</td>
<td>6</td>
</tr>
<tr>
<td>5.030 Engineering C (Production Technology Option)</td>
<td>3</td>
</tr>
<tr>
<td>5.0303 Workshop Technology</td>
<td>3</td>
</tr>
<tr>
<td>5.061 Technical Orientation</td>
<td>1</td>
</tr>
<tr>
<td>5.0721 Computing</td>
<td>3</td>
</tr>
<tr>
<td>5.421 Mechanics of Solids</td>
<td>0</td>
</tr>
<tr>
<td>10.001 Mathematics 1 or</td>
<td>6</td>
</tr>
<tr>
<td>10.011 Higher Mathematics 1</td>
<td></td>
</tr>
</tbody>
</table>

26  23
An alternative 'Science/Arts compatible' course which can be undertaken by all students, and which must be undertaken by potential combined degree students, is as follows.

<table>
<thead>
<tr>
<th>Course</th>
<th>Hpw</th>
</tr>
</thead>
<tbody>
<tr>
<td>Physics 1</td>
<td>S1</td>
</tr>
<tr>
<td>Chemistry 1A* or 2.121</td>
<td>S2</td>
</tr>
<tr>
<td>Chemistry 1ME*</td>
<td></td>
</tr>
<tr>
<td>Engineering A</td>
<td></td>
</tr>
<tr>
<td>Engineering Dynamics 1A†</td>
<td></td>
</tr>
<tr>
<td>Mechanics of Solids</td>
<td></td>
</tr>
<tr>
<td>Engineering C (Production Technology Option)</td>
<td></td>
</tr>
<tr>
<td>Workshop Technology</td>
<td></td>
</tr>
<tr>
<td>Technical Orientation</td>
<td></td>
</tr>
<tr>
<td>Computing</td>
<td></td>
</tr>
<tr>
<td>Mathematics 1 or 10.001</td>
<td></td>
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<tr>
<td>Higher Mathematics 1</td>
<td></td>
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<tr>
<td></td>
<td>S1</td>
</tr>
<tr>
<td></td>
<td>S2</td>
</tr>
<tr>
<td></td>
<td>28</td>
</tr>
</tbody>
</table>

*Students are recommended to choose 2.951 unless they wish to pursue studies requiring 2.121. For combined degree course students, the prerequisites of 2.121 and 2.131 for 2.102A Physical Chemistry may be waived on application to the Head of the School of Chemistry Materials Science (Option 1) majors must choose 2.121.

†Students planning to take higher level Computer Science subjects should take 6.611 Computing 1 or 8.1120 Computing instead of 5.0201 which must then be taken in a subsequent year prior to taking 5.300.

**Students may substitute 10.111A, 10.1113, 10.211 and 10.212 for 10.022.

††Combined degree course students who have taken 10.1114 Complex Analysis should substitute 18.03 Optimization for the mathematics portion of this subject; if they have in addition taken 10.2113 Introduction to Linear Programming, they should substitute instead of 18.03 a Technical Elective or a half Level II or Level III unit from Table 1 of the Combined Sciences Handbook. Combined degree course students who have taken 10.211E Numerical Methods or 10.212A (or 10.222A) Numerical Analysis should substitute a Technical Elective or a half Level II or Level III unit from Table 1 of the Combined Sciences Handbook for the Numerical Analysis portion of this subject.

‡‡Combined degree course students who have taken 10.212M or 10.222M Optimal Control Theory should substitute a Technical Elective or a half Level II or III unit from Table 1 of the Combined Sciences Handbook.

#Combined degree course students who have taken 1.9222 Electronics or 1.032 Laboratory should substitute a Technical Elective or a half Level II or III unit from Table 1 of the Combined Sciences Handbook.

<table>
<thead>
<tr>
<th>Year 3</th>
<th>Hpw</th>
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</thead>
<tbody>
<tr>
<td>5.034 Engineering Experimentation</td>
<td>2</td>
<td>1½</td>
</tr>
<tr>
<td>5.043 Industrial Training 1*</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>5.073† Numerical Analysis/Mathematics</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>5.123 Mechanical Engineering</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>5.301 Mechanics of Machines 1</td>
<td>0</td>
<td>2</td>
</tr>
<tr>
<td>5.303 Mechanical Vibrations</td>
<td>0</td>
<td>2</td>
</tr>
<tr>
<td>5.343‡ Linear Systems Analysis</td>
<td>3</td>
<td>0</td>
</tr>
<tr>
<td>5.423 Mechanics of Solids 3</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>Two Fluid Mechanics/</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Thermodynamics Technical</td>
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</tr>
<tr>
<td>Electives</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>6.854 Electrical Engineering</td>
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<td>2</td>
</tr>
<tr>
<td>6.856 Electronics for Measurement and Control*</td>
<td>3</td>
<td>0</td>
</tr>
<tr>
<td>18.603 Management/Economics</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>General Studies elective(s)</td>
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<tr>
<td></td>
<td>23</td>
<td>23½</td>
</tr>
</tbody>
</table>

**Students may substitute 10.1114, 10.1113, 10.211 and 10.212 for 10.022.

Also, if they satisfy pre-requisites, they may take one or more of these at the higher level.

††Report to be submitted in Week 1 of Session 1 detailing involvement and experience gained prior to Year 3.

Year 4

<table>
<thead>
<tr>
<th>Course</th>
<th>Hpw</th>
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</thead>
<tbody>
<tr>
<td>5.044 Industrial Training 2</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>5.051 Thesis</td>
<td>6</td>
<td>6</td>
</tr>
<tr>
<td>5.062 Communications</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>5.344 Feedback Control</td>
<td>3</td>
<td>0</td>
</tr>
<tr>
<td>Technical Electives</td>
<td>9</td>
<td>12</td>
</tr>
<tr>
<td>General Studies elective(s)</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td></td>
<td>22</td>
<td>22</td>
</tr>
</tbody>
</table>

Note 1: At least six hours per week of Technical Electives must be taken from the Mechanical Engineering Technical Elective List. The remaining Technical Electives may be taken from the Industrial Engineering Technical Elective List or from Years 3 or 4 of other courses in the School or suitable subjects outside the School. Students with good academic records may include some graduate subjects. A counseling service is provided to assist students to choose electives. The selection of certain subjects or combinations of subjects may require the approval of the Head of School.

Note 2: Only a limited number of Technical Electives is offered each year. The actual Technical Electives offered each year are decided on the basis of staff availability and student demand. Students are advised in September of each year which Technical Electives will be offered in the following year.
### Mechanical Engineering Technical Electives

<table>
<thead>
<tr>
<th>Applied Dynamics</th>
<th>Hours per week</th>
<th>S1</th>
<th>S2</th>
</tr>
</thead>
<tbody>
<tr>
<td>5.334 Engineering Dynamics 2</td>
<td>3 or 3</td>
<td></td>
<td></td>
</tr>
<tr>
<td>5.345G Analogue Control Systems</td>
<td>0</td>
<td></td>
<td></td>
</tr>
<tr>
<td>5.3541 Engineering Noise 1</td>
<td>3</td>
<td></td>
<td></td>
</tr>
<tr>
<td>5.3542 Engineering Noise 2</td>
<td>0</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Mechanics of Solids</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5.414G Finite Element Applications</td>
<td>3 or 3</td>
<td></td>
<td></td>
</tr>
<tr>
<td>5.424 General Mechanics of Solids</td>
<td>3 or 3</td>
<td></td>
<td></td>
</tr>
<tr>
<td>5.434 Plates and Shells</td>
<td>3 or 3</td>
<td></td>
<td></td>
</tr>
<tr>
<td>5.444 Theory of Elasticity</td>
<td>3 or 3</td>
<td></td>
<td></td>
</tr>
<tr>
<td>5.454 Theory of Plasticity</td>
<td>3 or 3</td>
<td></td>
<td></td>
</tr>
<tr>
<td>5.464 Structural Instability</td>
<td>2</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Mechanical Design</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5.1241 Creative Design Project</td>
<td>3</td>
<td></td>
<td></td>
</tr>
<tr>
<td>5.1242 Design Technology</td>
<td>3</td>
<td></td>
<td></td>
</tr>
<tr>
<td>5.1243 Machinery Design Project</td>
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<tr>
<td>5.1244 Project Management</td>
<td>0</td>
<td></td>
<td></td>
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<tr>
<td>5.1245 Computer-Aided Engineering</td>
<td>0</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Fluid Mechanics/Thermodynamics</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5.623 Heat Transfer</td>
<td>3 or 3</td>
<td></td>
<td></td>
</tr>
<tr>
<td>5.624 Refrigeration and Air Conditioning</td>
<td>3 or 3</td>
<td></td>
<td></td>
</tr>
<tr>
<td>5.633 Turbomachines</td>
<td>3</td>
<td></td>
<td></td>
</tr>
<tr>
<td>5.634 Viscous Flow Theory</td>
<td>1½ or 1½</td>
<td></td>
<td></td>
</tr>
<tr>
<td>5.636 Lubrication</td>
<td>0</td>
<td></td>
<td></td>
</tr>
<tr>
<td>5.635 Convection Heat Transfer</td>
<td>3 or 3</td>
<td></td>
<td></td>
</tr>
<tr>
<td>5.643 Thermodynamics and Combustion</td>
<td>3 or 3</td>
<td></td>
<td></td>
</tr>
<tr>
<td>5.644 Solar Energy</td>
<td>3</td>
<td></td>
<td></td>
</tr>
<tr>
<td>5.653 Compressible Flow</td>
<td>3</td>
<td></td>
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</tr>
<tr>
<td>5.654 Hydraulic Transients</td>
<td>3</td>
<td></td>
<td></td>
</tr>
<tr>
<td>5.663 Potential Flow Theory*</td>
<td>3 or 3</td>
<td></td>
<td></td>
</tr>
<tr>
<td>5.664 Multiphase Flow</td>
<td>3</td>
<td></td>
<td></td>
</tr>
<tr>
<td>5.673 Special Fluid Mechanics Elective</td>
<td>3 or 3</td>
<td></td>
<td></td>
</tr>
<tr>
<td>5.674 Special Thermodynamics Elective</td>
<td>3</td>
<td></td>
<td></td>
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</tbody>
</table>

**Industrial Engineering**

<table>
<thead>
<tr>
<th>S1</th>
<th>S2</th>
</tr>
</thead>
<tbody>
<tr>
<td>16.004 Manufacturing Management</td>
<td>2</td>
</tr>
<tr>
<td>18.224 Numerical Control of Machine Tools</td>
<td>3 or 3</td>
</tr>
<tr>
<td>18.303 Methods Engineering</td>
<td>2</td>
</tr>
<tr>
<td>18.403 Production Design and Technology</td>
<td>4</td>
</tr>
<tr>
<td>18.404 Design for Production</td>
<td>2</td>
</tr>
<tr>
<td>18.503 Operations Research A</td>
<td>3</td>
</tr>
<tr>
<td>18.551 Operations Research</td>
<td>3</td>
</tr>
<tr>
<td>18.803 Optimization</td>
<td>0</td>
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<tr>
<td>18.874G Dynamic Programming</td>
<td>1</td>
</tr>
</tbody>
</table>

**Other Technical Electives**

<table>
<thead>
<tr>
<th>S1</th>
<th>S2</th>
</tr>
</thead>
<tbody>
<tr>
<td>4.913 Materials Science</td>
<td>3</td>
</tr>
<tr>
<td>5.074 Computing Science for</td>
<td></td>
</tr>
<tr>
<td>Mechanical Engineers</td>
<td>3</td>
</tr>
<tr>
<td>5.811 Aerodynamics 1†</td>
<td>3</td>
</tr>
<tr>
<td>5.831 Aircraft Propulsion</td>
<td>2</td>
</tr>
<tr>
<td>23.051 Nuclear Power Technology</td>
<td>3</td>
</tr>
</tbody>
</table>

†Excluded: 5.663 Potential Flow Theory.

Note: The graduate subjects listed should be of particular interest to undergraduate students; with approval, other graduate subjects from this and other Schools may be taken.

### 3681 Mechanical Engineering — Combined Course

**Bachelor of Engineering/Bachelor of Science BE BSc**

The combined degree course of five years full-time study enables a student in the School of Mechanical and Industrial Engineering to qualify for the award of the two degrees of Bachelor of Engineering and Bachelor of Science (BE BSc). The course enables such combined degree students to major in the areas of computer science, materials science, mathematics, physics or statistics. It is administered by the Faculty of Engineering.

All students who are accepted into the Year 1 'Science/Arts compatible' course in the School of Mechanical and Industrial Engineering may enrol directly into this course**. Continued enrolment in Year 2 requires a pass at first attempt in all subjects of Year 1 and students who fail to achieve this will automatically be transferred to the normal Engineering program. Alternatively, students may transfer into the Year 2 of this course, provided they have obtained a pass at first attempt in the Year 1 'Science/Arts compatible' course.

Normally, students enrolled in this BE BSc degree course are awarded their degrees at the conclusion of five years study. However, it is possible for students to take out the Science degree prior to the Engineering degree provided they have:
1. completed the requirements for Years 1, 2 and 3,
2. completed the General Studies requirements for the Science degree, and 3. obtained approval from the Board of Studies in Science and Mathematics.

Students may also undertake an additional honours year in Science and Mathematics and automatically re-enter this course without having to re-apply for admission. To undertake such an honours year in Science and Mathematics, permission is to be obtained at the end of Year 3 both from the Head of the School in which the honours year is to be undertaken and from the Head of the School of Mechanical and Industrial Engineering.

Students who commence the course and do not complete the Engineering component may take out a BSc degree on completion of one of the approved programs in the Science and Mathematics course. Similarly, students not wishing to complete the BSc degree course may revert to the normal Engineering program with appropriate credit for subjects satisfactorily completed.

Year 1 of the combined course is equivalent to the Year 1 "Science/Arts compatible" course in the School of Mechanical and Industrial Engineering, and is as detailed in course 3680 Mechanical Engineering. Having completed Years 2 and 3, as outlined below, students in Years 4 and 5 do Year 3 and Year 4 of their selected Engineering course except that significant repetition of subject material is not allowed. Instead, students are required to substitute either an appropriate Technical Elective or an appropriate Level II or III subject from Table 1* or Table 2*, or in exceptional circumstances, some other equivalent subject with the permission of the Head of the School of Mechanical and Industrial Engineering.

*Tables refer to the Combined Sciences Handbook.

**In order to limit the combined degree courses to five years, the workload in the first three years is higher than in the single degree course. Students who have barely satisfied the minimum entrance requirements are therefore advised against enrolling for the combined degree course. Those who do enrol and whose average mark at the end of Session 1 of Year 1 is less than 65% are advised to contact the School to see whether or not they should continue in the combined course in Session 2 of Year 1, as the workload in Session 2 is higher than in Session 1.

### Year 2

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Hours per week</th>
</tr>
</thead>
<tbody>
<tr>
<td>5.300</td>
<td>Engineering Dynamics 1B</td>
<td>10</td>
</tr>
<tr>
<td>5.422</td>
<td>Mechanics of Solids 2/ Materials A</td>
<td>10</td>
</tr>
<tr>
<td>10.111A</td>
<td>Pure Mathematics 2 — Linear Algebra</td>
<td>10</td>
</tr>
<tr>
<td>10.1113</td>
<td>Pure Mathematics 2 — Multivariable Calculus</td>
<td>10</td>
</tr>
<tr>
<td>10.1114</td>
<td>Pure Mathematics 2 — Complex Analysis</td>
<td>10</td>
</tr>
<tr>
<td>10.2111</td>
<td>Applied Mathematics 2 — Vector Calculus</td>
<td>10</td>
</tr>
<tr>
<td>10.2112</td>
<td>Applied Mathematics 2 — Mathematical Methods for Differential Equations</td>
<td>10</td>
</tr>
</tbody>
</table>

Subject selections which satisfy the specific requirements for the various majors are summarized below. Provided core and prerequisites are satisfied, there is scope for some subjects to be taken either in Year 2 or Year 3.

### Computer Science Majors

**Year 2**

- 5.0201, 5.300, 5.422
- 6.620, 6.631, 6.640
- 10.113A (or 10.121A), 10.1113 (or 10.1213), 10.1114 (or 10.1214), 10.2111 (or 10.2211), 10.2112 (or 10.2212), 10.331 (or 10.351)

**Year 3**

- 4 Level III units from Table 1* and Table 2* offerings of School of Electrical Engineering and Computer Science for course 3681A*
- 1 General Studies elective A*

### Materials Science Majors

**Year 2**

- 2.102A*
- 4.402, 4.522A*
- 5.300, 5.4221 and either (Option 1):
  - 2.102B, 2.131
  - 4.512 or 4.802 (recommended)
  - 10.022
- or (Option 2):
  - 10.111A (or 10.121A), 10.1113 (or 10.1213), 10.2111 (or 10.2211), 10.2112 (or 10.2212)

1 unit from 1A: 1.022, 1.982, 2.131, 4.512, 4.802, 10.1114 (or 10.1214)

**Year 3**

- 4.703
- 5.043, 5.122, 5.622
- 10.331 (or 10.351)
- 1 General Studies elective A*
- and either (Option 1):
  - 4.433
  - 48.403
- or (Option 2):
  - 3½ appropriate Level II or III units from Schools of Physics, Chemistry or Metallurgy offerings in Table 1* or Table 2* for course 3681A*.
Mathematics Majors

Year 2
Same Year 2 as for Computer Science or Materials Science (3 units of Level II mathematics option) or Physics or Statistics majors
or
1.002 or 1.012 or 1.022 or 2.102A
5.300, 5.422
10.111A (or 10.121A), 10.1113 (or 10.1213), 10.1114 (or 10.1214), 10.2111 (or 10.2211), 10.2112 (or 10.2212)
3 units from 10.1115, 10.1116, 10.2113 (or 10.2213), 10.2115 (or 10.2215), 10.411A (or 10.421A), 10.411B (or 10.421B) or from any other appropriate Level II units from Table 1* or Table 2* for course 3681.

Year 3
5.043, 5.122, 5.622
10.331 (or 10.351)^2
4 Level III units from School of Mathematics offerings in Table 1*
1 General Studies elective^.

Physics Majors

Year 2
1.002, 1.012, 1.022, 1.032
5.300, 5.422
10.111A (or 10.121A), 10.1113 (or 10.1213), 10.1114 (or 10.1214), 10.2111 (or 10.2211), 10.2112 (or 10.2212)

Year 3
1.0133*1, 1.023, 1.0333*1, 1.043*1.
1 Level III unit from School of Physics offerings in Table 1*
5.043, 5.122, 5.622
10.331 (or 10.351)1.
1 General Studies elective^.

Statistics Majors

Year 2
1.002 or 1.012 or 1.022 or 2.102A
5.300, 5.422
10.111A (or 10.121A), 10.1113 (or 10.1213), 10.1114 (or 10.1214), 10.2111 (or 10.2211), 10.2112 (or 10.2212),
10.311A (or 10.321A), 10.311B (or 10.321B), 10.3111 (or 10.3211), 10.3112 (or 10.3212)

Year 3
5.043, 5.122, 5.622
4 Level III units from Statistics offerings in Table 1*
1 Level II or III unit from School of Mathematics or School of Physics offerings in Table 1*
1 General Studies elective^.

Notes
1. Students who did not take 5.0201 Engineering Dynamics 1A in Year 1 must take it prior to taking 5.300.
2. The following considerations pertain to the choice of optional units in Years 2 and 3:
   (1) They include no more than one Level 1 unit.
   (2) They include at least four Level III units which satisfy the relevant major requirements.
   (3) They include no more than one unit from schools other than Chemistry, Electrical Engineering and Computer Science, Mathematics, Metallurgy and Physics.
   (4) They include at least one Level II unit from the Schools of Chemistry or Physics.
   (5) They include 10.331 Statistics SS, 10.351 Statistics SM or 10.311 Mathematics SM.
   (6) 4.502 Mechanical Metallurgy and 4.512 Mechanical Properties of Solids are deemed to have reduced unit values of 1 and ½ respectively.
3. The prerequisites of 2.121 Chemistry 1A and 2.131 Chemistry 1B may be waived on application to the Head of the School of Chemistry.
4. Materials Science majors may omit 10.1114 Complex Analysis or substitute 10.022 Engineering Mathematics 2 for the mathematics subjects. The balance of the units must then be made up from units from the Schools of Chemistry, Metallurgy or Physics offerings in Table 1 or Table 2 for course 3681.
5. If 4.402 Physical Metallurgy 1 or 4.422 Metallurgical Phases 2 is taken, students should take 5.422 instead of 5.422.
6. Anticipated. Actual General Studies requirements correspond to whatever is required in the second-year of the normal Mechanical and Industrial Engineering degree course.
8. 6.646 Computer Applications is excluded for students in course 3681 who should substitute a Level III unit from Table 2 offerings of the School of Electrical Engineering and Computer Science.
9. Provided 5.4221 is taken concurrently with 4.522, the prerequisite requirement of 4.512 for 4.522 and the corequisite requirement of 4.502 for 4.402 are assumed to be satisfied.
10. Materials Science majors who took 2.121 Chemistry 1A in Year 1 must take 2.131 Chemistry 1B. Those who took 2.951 Chemistry 1ME and wish to keep open the option of majoring in mathematics should include 10.331 Statistics SS, 10.361 Statistics SM or 10.311 Mathematics SM. Complex Analysis in their selection; otherwise they are advised to select 1.022 Modern Physics or 1.982 Solid State Physics.

11. Under special circumstances, with permission of the Head of the School of Physics, a student may substitute alternative Physics Level III offerings of equivalent unit value.
12. Students who followed the Year 2 for Computer Science majors should substitute 1.002 or 1.012 or 1.022 or 2.102A; those that followed the Year 2 for Statistics majors should substitute one Level II or III unit from the Schools of Physics or Mathematics offerings in Table 1.
13. Quota restrictions apply to certain Computer Science Level III units and application must be made in writing to the Head of the School of Electrical Engineering and Computer Science before the end of Session 2 in the preceding year. Prospective Computer Science majors should aim for a creditable academic attainment (65%) or "ifears 1 and 2.
14. These must include either 4.403 Physical Metallurgy 2 or 4.433 Physical Metallurgy 2C. The latter is recommended together with either 2.003A Physical Chemistry or 1.003 Statistical Mechanics (for which the prerequisite of 1.012 is waived provided students have passed 2.002A).
15. The mathematics units are also offered at higher level.

*Tables refer to the Combined Sciences Handbook.
3610
Aeronautical Engineering

Bachelor of Engineering
BE

The first and second years of this course are identical with the first two years of the course in Mechanical Engineering. Subject to the Head of the School of Mechanical and Industrial Engineering being satisfied that the present extent of equivalences is maintained, and on his recommendation, Faculty has approved an arrangement by which students who satisfy the requirements of the first two years of the Mechanical Engineering full-time degree course at any other Australian tertiary institution may be admitted to a two-year program leading to the Bachelor of Engineering degree in Aeronautical Engineering.

Year 3

<table>
<thead>
<tr>
<th>Course</th>
<th>Hours per week</th>
</tr>
</thead>
<tbody>
<tr>
<td>5.034 Engineering Experimentation</td>
<td>2 S1 1½ S2</td>
</tr>
<tr>
<td>5.043 Industrial Training 1*</td>
<td>0 S1 0 S2</td>
</tr>
<tr>
<td>5.073 Numerical Analysis/ Mathematics‡</td>
<td>3 S1 3 S2</td>
</tr>
<tr>
<td>5.303 Mechanical Vibrations</td>
<td>0 S1 2 S2</td>
</tr>
<tr>
<td>5.343 Linear Systems Analysis‡</td>
<td>3 S1 0 S2</td>
</tr>
<tr>
<td>5.423 Mechanics of Solids 3</td>
<td>2 S1 2 S2</td>
</tr>
<tr>
<td>5.800 Aircraft Design 1</td>
<td>3 S1 3 S2</td>
</tr>
<tr>
<td>5.811 Aerodynamics 1</td>
<td>3 S1 3 S2</td>
</tr>
<tr>
<td>5.822 Analysis of Aerospace</td>
<td>2 S1 2 S2</td>
</tr>
<tr>
<td>6.854 Electrical Engineering</td>
<td>0 S1 3 S2</td>
</tr>
<tr>
<td>6.856 Electronics for Measurement and Control**</td>
<td>3 S1 0 S2</td>
</tr>
<tr>
<td>18.803 Management/Economics</td>
<td>2 S1 2 S2</td>
</tr>
<tr>
<td>General Studies elective(s)</td>
<td>2 S1 2 S2</td>
</tr>
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Hpw

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<th>Year 4</th>
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<td>5.044 Industrial Training 2</td>
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<td>0</td>
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<tr>
<td>5.051 Thesis</td>
<td>6</td>
<td>6</td>
</tr>
<tr>
<td>5.062 Communications</td>
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<td>2</td>
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<tr>
<td>5.801 Aircraft Design 2</td>
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<td>3</td>
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<tr>
<td>5.812 Aerodynamics 2</td>
<td>3</td>
<td>3</td>
</tr>
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<td>5.823 Analysis of Aerospace</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>5.831 Aircraft Propulsion</td>
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<td>2</td>
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<tr>
<td>Technical Electives</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>General Studies elective(s)</td>
<td>2</td>
<td>2</td>
</tr>
</tbody>
</table>

Note 1: The Technical Electives may be taken from the Mechanical Engineering or Industrial Engineering Technical Elective List or from Years 3 or 4 of other courses in the School or suitable subjects outside the School (5.344 Feedback Control from Year 4 of the Mechanical Engineering degree course is recommended in this respect). Students with good academic records may include some graduate subjects. A counseling service is provided to assist students to choose electives. The selection of certain subjects or combinations of subjects may require the approval of the Head of School.

Note 2: Only a limited number of Technical Electives is offered each year. The actual Technical Electives offered each year are decided on the basis of staff availability and student demand. Students are advised in September of each year which Technical Electives will be offered in the following year.

3611
Aeronautical Engineering — Combined Course

Bachelor of Engineering/Bachelor of Science BE BSc

The description of this course is identical with that for course 3681 BE BSc in Mechanical Engineering.

3700
Naval Architecture

Bachelor of Engineering
BE

The first and second years of this course are identical with the first two years of the Mechanical Engineering course. The Faculty of Engineering has approved an arrangement whereby, upon the recommendation of the Head of School, students who satisfy the requirements for the first two years of the Mechanical Engineering full-time degree course at any other Australian tertiary institution may be admitted to the final two years of the BE degree course in Naval Architecture.

For Years 3 and 4, see overleaf
### Year 3

<table>
<thead>
<tr>
<th>Course</th>
<th>Hours per week</th>
<th>( \text{S1} )</th>
<th>( \text{S2} )</th>
</tr>
</thead>
<tbody>
<tr>
<td>Engineering Experimentation</td>
<td>2</td>
<td>1½</td>
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</tr>
<tr>
<td>Industrial Training 1*</td>
<td>0</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td>Numerical Analysis/ Mathematics†</td>
<td>3</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>Mechanical Vibrations</td>
<td>0</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>Mechanics of Solids 3</td>
<td>2</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>Introduction to Mathematical Modelling and Decision Making</td>
<td>3</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td>Ship Management Economics</td>
<td>0</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>Ship Hydrostatics</td>
<td>2½</td>
<td>2½</td>
<td></td>
</tr>
<tr>
<td>Ship Structures 1</td>
<td>2</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>Principles of Ship Design 1</td>
<td>3</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td>Ship Hydrodynamics</td>
<td>3</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>Electrical Engineering</td>
<td>0</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>Electronics for Measurement and Control**</td>
<td>3</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td>General Studies elective(s)</td>
<td>2</td>
<td>2</td>
<td></td>
</tr>
</tbody>
</table>

\[ \text{Total Hours per week:} 2\frac{1}{2} \times 22 \]

*Report to be submitted in Week 1 of Session 1 detailing involvement and experience gained prior to Year 3.

†Combined degree course students who have taken 10.1114 Complex Analysis should substitute 18.603 Optimization for the Mathematics portion of this subject; if they have in addition taken 10.2113 Introduction to Linear Programming, they should substitute instead of 18.603 a Technical Elective or a half Level II or Level III unit from Table 1 of the Combined Sciences Handbook. Combined degree course students who have taken 10.211E Numerical Methods, or 10.212A (or 10.222A) Numerical Analysis, should substitute a Technical Elective or a half Level II or Level III unit from Table 1 of the Combined Sciences Handbook for the Numerical Analysis portion of this subject.

**Combined degree course students who have taken 1.9222 Electronics or 1.032 Laboratory should substitute a Technical Elective or a half Level II or III unit from Table 1 of the Combined Sciences Handbook.

### Year 4

<table>
<thead>
<tr>
<th>Course</th>
<th>Hours per week</th>
<th>( \text{S1} )</th>
<th>( \text{S2} )</th>
</tr>
</thead>
<tbody>
<tr>
<td>Industrial Training 2</td>
<td>0</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td>Thesis</td>
<td>6</td>
<td>6</td>
<td></td>
</tr>
<tr>
<td>Communications</td>
<td>2</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>Ship Structures 2</td>
<td>2</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>Principles of Ship Design 2</td>
<td>4</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>Ship Design Project</td>
<td>3</td>
<td>4</td>
<td></td>
</tr>
<tr>
<td>Ship Propulsion and Systems</td>
<td>4</td>
<td>4</td>
<td></td>
</tr>
<tr>
<td>General Studies elective(s)</td>
<td>2</td>
<td>2</td>
<td></td>
</tr>
</tbody>
</table>

\[ \text{Total:} 23 \times 22 \]

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### 3701
**Naval Architecture — Combined Course**

**Bachelor of Engineering/Bachelor of Science BE BSc**

The description of this course is identical with that for course 3681 BE BSc in Mechanical Engineering.

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### Combined Courses

**Bachelor of Engineering/Bachelor of Arts**

<table>
<thead>
<tr>
<th>Code</th>
<th>Course Name</th>
</tr>
</thead>
<tbody>
<tr>
<td>3612</td>
<td>BE BA in Aeronautical Engineering</td>
</tr>
<tr>
<td>3662</td>
<td>BE BA in Industrial Engineering</td>
</tr>
<tr>
<td>3682</td>
<td>BE BA in Mechanical Engineering</td>
</tr>
<tr>
<td>3702</td>
<td>BE BA in Naval Architecture</td>
</tr>
</tbody>
</table>

---

### 3702
**BE BA in Naval Architecture**

#### Introduction

The Bachelor of Engineering and Bachelor of Arts combined degree course provides the opportunity of taking one of the normal accredited Engineering courses offered by the School of Mechanical and Industrial Engineering together with a normal Arts course. Common content between the two courses makes it possible to complete the combined degree course in 5 years, although the minimum time required could be longer depending upon the choice of Arts subjects. The course is administered by the Faculty of Engineering.

The Engineering content follows that of the standard courses offered by the School of Mechanical and Industrial Engineering. It includes the Science/Arts compatible first year program which provides a wide range of course options at the end of Year 1. The options include, in addition to the BE BA combined program, a BE BSc combined program, a normal BE program, a normal BSc program and a normal BA program. (The Science/Arts compatible first year provides up to 30 Arts credit points towards a BA program.)

The Arts content is to be chosen from the Faculty of Arts offerings in the usual way and would depend upon the interests of each individual student. Refer to the Faculty of Arts handbook for further details.

#### Requirements

The broad requirements of the BE BA course are given below. The details of a particular student's program will depend upon the student's interests and the Arts content which is chosen. Sample programs are available on request to show typical arrangements.
Engineering
The program is to contain the Science/Arts compatible first year segment followed by the full program for one of the strands offered by the School of Mechanical and Industrial Engineering. Course variations may be permitted in some cases on application to the Head of School.

Arts
The Arts component of the program is to contain at least 60 Arts credit points in addition to Arts credit points allocated to components of the Engineering strand. (A session-length Arts subject normally carries 6 credit points.) The 60 must include:
- no more than 30 First Level credit points (typically 5 one-session subjects)
- at least 24 Upper Level credit points forming a major sequence (typically 4 one-session subjects)
- at least 6 Upper Level credit points in a school other than that in which the major is taken.

Computing and mathematics majors are not permitted. The combined BE BSc program would be more appropriate in these cases.

Honours
In the Engineering component, Honours are awarded for superior performance in the standard program.

In the Arts component, the award of Honours requires at least one further year of study devoted exclusively to the Honours subject(s). Consult the Faculty of Arts for further details.

General
A BE BA proposal should be discussed with representatives of the School of Mechanical and Industrial Engineering and the Faculty of Arts as early as possible. In many cases this will be at (or preferably before) first year enrolment, but a student who has satisfactorily completed the Science/Arts compatible first year will normally be able to transfer to the second year of a combined BE BA program, and the discussions could then take place at any time before second year enrolment. Enquiries should be directed to the Executive Assistant to the Head of the School of Mechanical and Industrial Engineering and the Executive Assistant to the Dean of the Faculty of Arts.

Undergraduate Study: Course Outlines

Department of Industrial Engineering

The Department of Industrial Engineering offers a course in Industrial Engineering leading to the award of the degree of Bachelor of Engineering. This course is designed for students with engineering ability whose interests lie in the planning, developing and control of manufacturing or service operations. It may be taken either on a full-time basis, normally over four years or on a part-time basis, or on a combined full-time/part-time basis subject to the approval of the Head of the School of Mechanical and Industrial Engineering. Students intending to enter part-time study are advised that many subjects in the later years of the course are offered only in the day-time. Part-time students normally take two years for each equivalent full-time year and are required to attend day classes for the equivalent of at least one day per week.

The first two years of the degree course, taken full-time, provide the student with a sound foundation in the basic science and engineering subjects, and this knowledge is used and extended in the later years in the study of the industrial subjects in which the problems associated with the practical economics of manufacturing operations are stressed. The aim is to provide the student with the education necessary to carry out an industrial job and to examine it critically in the light of economic efficiency.

Traditional engineering courses do not embrace the problems which are characteristic of Industrial Engineering. These problems include the analysis of a product to ensure satisfactory functioning with regard to methods and sequence of manufacturing operations; the disposition of buildings and of equipment within them to permit efficient handling of materials; the avoidance of bottlenecks; the related problems of quality and cost control, testing and inspection; labour and personnel relations; and, finally, the problem of distribution and sales.

The financial and economic aspects are studied as the problem in manufacturing has not been solved until the final translation of the product into money has been accomplished successfully. While it is not intended to develop an expert in accounting practice or economics, it is intended to produce an engineer with an appreciation of the problems of cost and one who can apply considerations of ultimate economy to all industrial problems. The techniques of operations research may be applied here, where mathematical models of real life situations are constructed and manipulated to yield optimal solutions as guides to management.

The Work of the Industrial Engineer

The industrial engineer may initially be employed in any of the following major areas of industrial activity:

1. Industrial Economic Analysis

One of the principal functions of industrial engineering is to analyse a product, project or process from the economic point of view to ensure that an adequate profit can be obtained. A general working knowledge of economics and management skill has to be directed towards the making of decisions on how to operate an enterprise most efficiently. The basis for such decisions is furnished largely by the logical application of mathematics and statistics.

2. Planning and Control of Production

Manufacturing processes and operations must be planned in detail throughout an enterprise to ensure that they proceed smoothly and economically. Functions in this field include the establishment of production standards, the setting of production targets and, the control of quality.
The ultimate responsibility of those in charge of the planning and control of production is to ensure that the goods, as originally specified, perform satisfactorily and are produced when required at an optimum cost. Computer systems are increasingly being used to achieve this.

3. Product and Process Design

The design interest of the industrial engineer goes beyond normal mechanical design to develop a product that will not only function effectively but also have a pleasing appearance.

Further, the product has to be adapted to suit existing manufacturing equipment, or a manufacturing process has to be developed by means of which an existing product can be manufactured at the right price and of the right quality. The design work of the industrial engineer also incorporates problems of process selection and application for both economy and performance. Fundamental scientific studies of manufacturing processes such as metal machining, forming and casting are continually being made to improve their efficiency.

The introduction of computers has led to the automation of some aspects of product and process design. For example, developments in CAD-CAM (Computer Aided Design and Computer Aided Manufacturing) have resulted in improvements in the competitiveness of companies in the marketplace and these techniques are becoming increasingly important.

The principles for minimizing product cost can also be effectively applied to the provision of services.

4. Methods Engineering

Methods engineering is concerned with the design of systems to properly utilize and coordinate personnel, materials and machines so that an enterprise will run efficiently. A sound knowledge of engineering in general, together with an understanding of human factors and economics is necessary for this work. It includes the design of plant layouts and materials handling systems, job design and the setting of standard times for work.

5. Operations Research

This is the attack of modern science on complex problems arising in the direction and management of large systems of people, machines, materials and money in industry, business, government and defense. The distinctive approach is to develop a scientific model of the system, incorporating measurements of factors such as chance and risk, with which to predict and compare the outcomes of alternative decisions, strategies or controls. The purpose is to help management determine its policy and actions scientifically.

Employment in any of these fields may well lead to a position of responsibility in industrial management if the engineer is so inclined.

### 3660

**Industrial Engineering**

**Bachelor of Engineering BE**

The first and second years of this course are identical with the first two years of the course in Mechanical Engineering.

<table>
<thead>
<tr>
<th>Year 3</th>
<th>Hours per week</th>
</tr>
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<tbody>
<tr>
<td></td>
<td>S1</td>
</tr>
<tr>
<td>5.043</td>
<td>Industrial Training 1†</td>
</tr>
<tr>
<td>6.854</td>
<td>Electrical Engineering</td>
</tr>
<tr>
<td>6.856</td>
<td>Electronics for Measurement and Control</td>
</tr>
<tr>
<td>14.001</td>
<td>Introduction to Accounting A</td>
</tr>
<tr>
<td>14.002</td>
<td>Introduction to Accounting B</td>
</tr>
<tr>
<td>18.003</td>
<td>Numerical Methods/Industrial Experimentation</td>
</tr>
<tr>
<td>18.303</td>
<td>Methods Engineering</td>
</tr>
<tr>
<td>18.403</td>
<td>Production Design and Technology</td>
</tr>
<tr>
<td>18.413</td>
<td>Design for Industrial Engineers</td>
</tr>
<tr>
<td>18.503</td>
<td>Operations Research A</td>
</tr>
<tr>
<td>18.603</td>
<td>Management/Economics</td>
</tr>
<tr>
<td>18.803</td>
<td>Optimization</td>
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<td></td>
<td>General Studies elective(s)</td>
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†Report to be submitted in Week 1 of Session 1 detailing involvement and experience gained prior to Year 3.

<table>
<thead>
<tr>
<th>Year 4</th>
<th>Hours per week</th>
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<tr>
<td></td>
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<tr>
<td>5.044</td>
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<td>General Studies elective(s)</td>
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<td></td>
<td>Total</td>
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</table>

**Note 1:** At least 6 hours per week of Technical Electives must be taken from the Industrial Engineering Technical Elective List. The remaining Technical Electives may be taken from the Mechanical Engineering Technical Elective List or from years 3 or 4 of other courses in the School or suitable subjects outside the School. Students with good academic records may include some graduate subjects. A counseling service is provided to assist students to choose electives. The selection of certain subjects or combinations of subjects may require the approval of the Head of School.

**Note 2:** Only a limited number of Technical Electives is offered each year. The actual Technical Electives offered each year are decided on the basis of staff availability and student demand. Students are advised in September of each year which Technical Electives will be offered in the following year.
### Industrial Engineering Technical Electives

<table>
<thead>
<tr>
<th>Production Engineering</th>
<th>Hours per week</th>
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<tbody>
<tr>
<td>5.454 Theory of Plasticity</td>
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</tr>
<tr>
<td>18.224 Numerical Control of Machine Tools</td>
<td>3 or 3</td>
</tr>
<tr>
<td>18.404 Design for Production</td>
<td>2 or 2</td>
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<tr>
<td>18.360G Ergonomics</td>
<td>3 or 3</td>
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### Operations Research

<table>
<thead>
<tr>
<th>Operations Research</th>
<th>Hours per week</th>
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</thead>
<tbody>
<tr>
<td>5.074 Computing Science for Mechanical Engineers</td>
<td>3 or 0</td>
</tr>
<tr>
<td>18.574G Management Simulation</td>
<td>1 or 2</td>
</tr>
<tr>
<td>18.671G Decision Theory</td>
<td>2 or 2</td>
</tr>
<tr>
<td>18.672G Decision Theory for Industrial Management</td>
<td>3 or 3</td>
</tr>
<tr>
<td>18.673G Energy Modelling, Optimization and Energy Accounting</td>
<td>3 or 3</td>
</tr>
<tr>
<td>18.760G Discrete-Event Simulation Languages</td>
<td>3 or 3</td>
</tr>
<tr>
<td>18.764G Management of Distribution Systems</td>
<td>3 or 3</td>
</tr>
<tr>
<td>18.765G Optimization of Networks</td>
<td>2 or 2</td>
</tr>
<tr>
<td>18.777G Time Series and Forecasting</td>
<td>2 or 2</td>
</tr>
<tr>
<td>18.864G Applied Geometric Programming</td>
<td>2 or 2</td>
</tr>
<tr>
<td>18.868G Industrial Applications of Mathematical Programming</td>
<td>3 or 3</td>
</tr>
<tr>
<td>18.874G Dynamic Programming</td>
<td>2 or 2</td>
</tr>
</tbody>
</table>

*Note: The graduate subjects listed should be of particular interest to undergraduates with approval, other graduate subjects from this and other Schools may be taken.*

### School of Surveying

**Head of School**  
Associate Professor G. G. Bennett

**Administrative Assistant**  
Mr L. Daras

The School of Surveying offers a full-time course of four years’ duration leading to the award of the degree of Bachelor of Surveying. Alternatively, the course may be taken in a sandwich form in which a student may, after completing the first year of the course on a full-time basis, alternate his or her studies with periods of employment by taking leaves of absence of up to two consecutive sessions at a time thereafter. The course taken in this form requires a maximum period of seven years. The part-time course is no longer available.

The Bachelor of Surveying is a well-rounded course with a strong surveying base, aimed at preparing the graduate for a broad range of career opportunities, including land boundary surveying, engineering surveying, cartography, mining surveying, hydrographic surveying, geodesy and geodetic surveying, remote sensing and photogrammetry. The course recognizes the diversity of possible roles of a graduate who may be called on during his or her career to act as practitioner, consultant, manager, teacher or researcher.

Throughout the course theoretical studies are complemented by practical exercises in the field and the laboratory. Students make use of the most modern measuring instruments and computing equipment.

The School also offers a full-time course of four years’ duration leading to the award of the degree of Bachelor of Surveying Science. The course is designed to give an interested student the opportunity to obtain greater depth as an undergraduate in one or more of the disciplines associated with surveying: land development, cartographic science, geodesy and geophysics, environmental studies, remote sensing and photogrammetry. It is so structured that:

1. All students must take a core consisting of 104 contact hours made up from some of the subjects of the Bachelor of Surveying course. These core subjects include the formal strands in Mathematics, Physics, Physical Geography, Surveying, written and spoken communication, and 12 hours of General Studies.

2. The balance, totalling 76 hours, must comprise:
   a) at least 9 hours taken from elective subjects of the final year of the Bachelor of Surveying course;
   b) the remainder made up from any subjects required as prerequisites for a) above and any combination of subjects offered by the University and approved by the Head of School for the individual program of study. Such approval would require that the student follow a particular sequence of subjects within a given subject area. Subjects offered by the University of Sydney and Macquarie University may also be taken subject to approval by the Head of School.

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**3661 Industrial Engineering — Combined Course**  
Bachelor of Engineering/Bachelor of Science BE BSc

The description of this course is identical with that for course 3681 in Mechanical Engineering.

**3662 Industrial Engineering — Combined Course**  
Bachelor of Engineering/Bachelor of Arts BE BA

See description under Combined Courses: Bachelor of Engineering/Bachelor of Arts, immediately preceding the heading Department of Industrial Engineering.
Bachelor of Surveying students in their later years of study may elect to transfer to this course if they so desire.

The Bachelor of Surveying or the Bachelor of Surveying Science degree may be awarded as a Pass degree, Honours Class I, or Honours Class II in two divisions. Honours are awarded in recognition of superior performance throughout the course.

Students wishing to become Registered Surveyors after graduation are advised to gain practical experience under a Registered Surveyor. Some reduction in the period of practical experience required before registration may be granted because of practical experience gained during the University course, provided the New South Wales Surveyors' Board is informed in the prescribed manner. Details are obtainable from the Registrar, Surveyors' Board, Department of Lands, Bridge Street, Sydney 2000. The degree of Bachelor of Surveying confers exemption from all written examinations of the Surveyors' Board. In the case of the Bachelor of Surveying Science degree, the New South Wales Surveyors' Board may require additional subjects for registration.

Students enrolled in either course are required to equip themselves with an electronic calculator. Advice on the purchase of this equipment is given to students at the commencement of their course.

### 3740 Surveying

**Bachelor of Surveying BSurv**

<table>
<thead>
<tr>
<th>Year</th>
<th>Session 1</th>
<th>Hours per week</th>
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</thead>
<tbody>
<tr>
<td></td>
<td>1.971 Physics 1</td>
<td>6</td>
</tr>
<tr>
<td></td>
<td>6.1210 Engineering Construction 1</td>
<td>2</td>
</tr>
<tr>
<td></td>
<td>10.001 Mathematics 1</td>
<td>6</td>
</tr>
<tr>
<td></td>
<td>29.1010 Surveying 1</td>
<td>5</td>
</tr>
<tr>
<td></td>
<td>29.1110 Computations 1</td>
<td>2</td>
</tr>
<tr>
<td></td>
<td>29.1710 Professional Orientation*</td>
<td>1½</td>
</tr>
<tr>
<td></td>
<td>General Studies Elective</td>
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<tr>
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<td></td>
<td>2</td>
</tr>
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Three half-day excursions are an essential part of this subject.

<table>
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<tr>
<th>Year</th>
<th>Session 2</th>
<th>Hours per week</th>
</tr>
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<tbody>
<tr>
<td></td>
<td>1.971 Physics 1</td>
<td>6</td>
</tr>
<tr>
<td></td>
<td>5.0302 Engineering Drawing and Descriptive Geometry</td>
<td>4</td>
</tr>
<tr>
<td></td>
<td>10.001 Mathematics 1</td>
<td>6</td>
</tr>
<tr>
<td></td>
<td>29.2010 Surveying 2</td>
<td>4</td>
</tr>
<tr>
<td></td>
<td>29.2040 Survey Drafting</td>
<td>3</td>
</tr>
<tr>
<td></td>
<td>29.2050 Survey Camp†</td>
<td>3</td>
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<tr>
<td></td>
<td>General Studies Elective</td>
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</tr>
<tr>
<td></td>
<td></td>
<td>2</td>
</tr>
<tr>
<td></td>
<td></td>
<td>28</td>
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</table>

†Students are required to attend a one-week survey camp equivalent to 3 class contact hours per week.

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<tr>
<th>Year</th>
<th>Session 1</th>
<th>Hours per week</th>
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<tbody>
<tr>
<td></td>
<td>1.962 Physics of Measurement</td>
<td>3</td>
</tr>
<tr>
<td></td>
<td>10.022 Engineering Mathematics 2</td>
<td>4</td>
</tr>
<tr>
<td></td>
<td>10.341 Statistics</td>
<td>2</td>
</tr>
<tr>
<td></td>
<td>27.295 Physical Geography for Surveyors†</td>
<td>4</td>
</tr>
<tr>
<td></td>
<td>29.3010 Surveying 3</td>
<td>4½</td>
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<td></td>
<td>29.3110 Survey Computations 2</td>
<td>4½</td>
</tr>
<tr>
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<td>22</td>
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</table>

†One-day field tutorial is an essential part of this course.

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<th>Year</th>
<th>Session 2</th>
<th>Hours per week</th>
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<tbody>
<tr>
<td></td>
<td>10.022 Mathematics 2</td>
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<td>10.341 Statistics</td>
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<td>29.4010 Surveying 4</td>
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<td>29.4150 Electronics for Surveyors</td>
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<td></td>
<td>29.4220 Introduction to Geodetic Science</td>
<td>3</td>
</tr>
<tr>
<td></td>
<td>29.4520 Remote Sensing and Resource Surveys</td>
<td>3</td>
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<tr>
<td></td>
<td>29.4710 Report Writing</td>
<td>2</td>
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<tr>
<td></td>
<td>29.4810 Land Management and Development 1</td>
<td>3</td>
</tr>
<tr>
<td></td>
<td>29.4950 Survey Camp*</td>
<td>3</td>
</tr>
<tr>
<td></td>
<td></td>
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</tbody>
</table>

*Students are required to attend a one-week survey camp, which is equivalent to 3 class contact hours per week.

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<th>Year</th>
<th>Session 1</th>
<th>Hours per week</th>
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<tbody>
<tr>
<td></td>
<td>8.6140 Engineering for Surveyors 1</td>
<td>3</td>
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<tr>
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<td>29.5010 Surveying 5</td>
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<tr>
<td></td>
<td>29.5100 Survey Computations 3</td>
<td>4</td>
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<td></td>
<td>29.5220 Geodetic Positioning</td>
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<td></td>
<td>29.5230 Map Projections</td>
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<td></td>
<td>29.5610 Cadastral Surveying and Land Law 1</td>
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<td>36.411 Town Planning</td>
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Undergraduate Study: Course Outlines

<table>
<thead>
<tr>
<th>Session 2</th>
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<tbody>
<tr>
<td>8.6150 Engineering for Surveyors 2</td>
<td>3</td>
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<tr>
<td>29.6010 Surveying 6</td>
<td>4½</td>
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<tr>
<td>29.6220 Field Astronomy</td>
<td>3</td>
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<tr>
<td>29.6510 Photogrammetry 1</td>
<td>3</td>
</tr>
<tr>
<td>29.6610 Cadastral Surveying and Law</td>
<td>6</td>
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<tr>
<td>29.6810 Land Management and Development 2</td>
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<table>
<thead>
<tr>
<th>Year 4</th>
<th></th>
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</thead>
<tbody>
<tr>
<td>Session 1*</td>
<td></td>
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<tr>
<td>29.7010 Surveying</td>
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<td>29.7120 Computer Graphics</td>
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<td>29.7220 Geodetic Computations</td>
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</tr>
<tr>
<td>29.7510 Photogrammetry 2</td>
<td>4</td>
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<tr>
<td>29.7810 Land Management and Development 3**</td>
<td>2</td>
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<tr>
<td>29.7050 Survey Camp†</td>
<td>9</td>
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<tr>
<td>Technical Elective‡†</td>
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<td>General Studies Elective</td>
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<td></td>
<td>31½</td>
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<tr>
<td>Session 2*</td>
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<td>29.8010 Surveying 8</td>
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<td>29.8220 Global Geodesy</td>
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<td>29.8510 Photogrammetry 3</td>
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<td>29.8710 Seminar</td>
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<td>29.8720 Management</td>
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<td>29.8810 Land Management and Development 4</td>
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<td>Technical Elective‡†</td>
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<td>General Studies Elective</td>
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<td></td>
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</table>

*Offered from 1984.
**One day field tutorial is an essential part of this subject.
†Students are required to attend a three week survey camp equivalent to 9 contact hours per week.
‡Technical electives (each of 3 hours per week) are chosen from those listed overleaf.

Year 4 Electives
Electives include both General Studies and Technical Electives. Students re-enrolling in 1986 are required to take no more than 168 hours of General Studies electives in the entire course to fulfill requirements for the BSurv degree. A General Studies elective taken in or after 1983 is equal to 56 hours and a half elective to 28 hours. Every student is required to take two Technical Electives. Technical Electives (of three hours per week each) are chosen from:

- 29.9010 Advanced Surveying Instruments
- 29.9020 Hydrographic Surveying
- 29.9030 Precise Engineering Surveying
- 29.9210 Adjustment of Control Networks
- 29.9220 Advanced Geodetic Positioning
- 29.9520 Remote Sensing
- 29.9530 Information Systems
- 29.9610 Modern Cadastral Concepts
- 29.9830 Project
- 29.9910 Special Topic A
- 29.9920 Special Topic B

Not all electives are offered in any one year. Subjects from other Schools and Faculties may be substituted with the approval of the Head of School.

3760 Surveying Science

Bachelor of Surveying Science BSurvSc

The course consists of a mandatory program of 104 class contact hours including a General Studies program of 12 hours and an Elective Program of at least 76 hours. A student may undertake in any one session a load generally not exceeding 24 hours, comprising subjects from one or more of these programs, provided they are taken in sequence within each subject area and in accordance with their pre-requisite and/or co-requisite requirements.

Mandatory Program

The mandatory program consists of the following subjects:

<table>
<thead>
<tr>
<th>Hours per week</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.971 Physics 1</td>
</tr>
<tr>
<td>10.001 Mathematics 1</td>
</tr>
<tr>
<td>29.1010 Surveying 1</td>
</tr>
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<td>29.2010 Surveying 2</td>
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<tr>
<td>29.2050 Survey Camp</td>
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<tr>
<td>29.1710 Professional Orientation</td>
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<tr>
<td>1.962 Physics of Measurement**</td>
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<tr>
<td>10.022 Engineering Mathematics 2**</td>
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<td>10.341 Statistics SU**</td>
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<td>27.255 Physical Geography for Surveyors**</td>
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<td>29.3010 Surveying 3</td>
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<td>29.4150 Electronics for Surveyors**</td>
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<td>29.3110 Survey Computations 2</td>
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<td>29.4710 Report Writing</td>
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<td>29.4220 Introduction to Geodetic Science</td>
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<td>29.8710 Seminar</td>
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<td>6.611 Computing 1</td>
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<table>
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<tr>
<th>Hpw</th>
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<tbody>
<tr>
<td>92</td>
</tr>
</tbody>
</table>

*Offered in Year 1 of the BSurv Course (3740).
†Offered in Year 2 of the BSurv Course (3740).
‡Offered in Year 3 of the BSurv Course (3740).
§Offered in Year 4 of the BSurv Course (3740).
**May be replaced by a similar subject at least equal in coverage of the topic. Any resulting additional contact hours may be used in satisfying the Elective Program.
**General Studies Program**
This program consists normally of 3 General Studies subjects of 4 hours each per week over a single session (or their equivalent) and may be undertaken at any time during Years 2-4 of the Course, subject to the total load for a session, which, as a rule, should not exceed 24 hours.

**Elective Program**
This program consists of at least 18 hours (or 6 technical electives) selected from elective subjects of the final year of the BSurv course plus any subjects required as prerequisites for these electives and any combination of subjects offered by this University, the University of Sydney or Macquarie University provided that they are approved by the Head of School for the individual program of study. Such approval would require that a student follows a particular sequence of subjects within a selected area. This prescription means in effect that the elective component of the course can be varied to enable the student to choose the specialization that best suits his or her individual requirements so long as such specialization falls within the general disciplines associated with Surveying. Electives for such specialization may be chosen, for instance, from subject areas such as:

- Cartography and Mapping Technology
- Geography, Geographic Data Analysis, Mathematical Methods for Spatial Analysis
- Town, Urban and Neighbourhood Planning
- Geodesy, Geology, Earth Physics, Oceanography and Marine Science
- Astronomy
- Photogrammetry, Remote Sensing
- Land Law, Title Concepts, Cadastral Surveying
- Land Inventory
- Land Development and Management
- Building Economics
- Accounting and Computer Applications

Illustrative examples of programs that could be taken are available from the School.
Undergraduate Study:

Subject Descriptions

Identification of Subjects by Number

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)
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Physics

The School of Physics has introduced the specialized units 1.951, 1.961, 1.971, 1.981, 1.962, 1.972 and 1.982 for students in the Faculty of Engineering. The first-year units 1.951, 1.961, 1.971 and 1.981 are not available at night. Part-time students will be catered for by the Science Course unit 1.001.

All first year full-time students, including repeat students, should enrol in 1.951, 1.961, 1.971, 1.981 according to their schools. However, full-time Electrical Engineering students may substitute 1.011 for 1.961, subject to the approval of the School of Physics.

All first year part-time students, including repeats, should enrol in 1.001.

Physics Level I Units

1.001 Physics 1  
Prerequisites: 
- 2 unit Mathematics or 3 unit Mathematics or 4 unit Mathematics
- 2 unit Science (Physics) or 2 unit Science (Chemistry) or 4 unit Science (Multistrand)

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 Kirchhoff'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.

1.951 Physics 1 (Mechanical Engineering)  
Prerequisites: As for 1.001 Physics 1.

For students in the School of Mechanical and Industrial Engineering.


1.961 Physics 1 (Electrical Engineering)  
Prerequisite: As for 1.001 Physics 1.

For students in the School of Electrical Engineering.

Electrostatics in vacuum, electrostatics in dielectrics, steady state currents, magnetostatics in vacuum, ferromagnetism, electromagnetic induction, transient currents. Vectors, motion in one dimension, motion in a plane, particle dynamics, work and energy, the conservation of energy. Conservation of linear momentum, collisions, rotational kinematics, rotational dynamics, simple harmonic motion, gravitation. Temperature, heat and the first law of thermodynamics, kinetic theory of gases. Waves in elastic media, sound waves, geometrical optics, interference, diffraction, gratings and spectra, polarization.

1.971 Physics 1 (Surveying)  
Prerequisite: As for 1.001 Physics 1.

For students in the School of Surveying.

Aims and nature of physics, linear and rotational mechanics, hydrostatics, elasticity, gravitation, temperature, electricity and magnetism, wave motion, optical instruments, interference and diffraction, lasers and atomic clocks. The importance in surveying of precise frequency, time, speed and distance measurements.

1.981 Physics 1 (Civil Engineering)  
Prerequisite: As for 1.001 Physics 1.

For students in the School of Civil Engineering.


Physics Level II Units

1.002 Mechanics, Waves and Optics  
Prerequisites: 1.001 or 1.011, 10.001 or 10.011. Co-requisite: 10.2111. Excluded: 1.992, 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  
Prerequisites: 1.001 or 1.011, 10.001 or 10.011. Co-requisite: 10.2111. Excluded: 1.972, 1.992.

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, Heimholtz and Gibbs functions, Maxwell’s relations, phase diagrams, chemical and electrochemical potential.

1.022 Modern Physics  

Special theory of Relativity: time dilation, length contraction, simultaneity, 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.

1.032 Laboratory  
Prerequisites: 1.001 or 1.011, 10.001. Excluded: 1.9222.

Alternating current circuits, complex impedance, resonance, mutual inductance, introductory electrodynamics, radio and characteristics and circuits, power supplies, transistor characteristics, single stage and coupled amplifiers, experiments using AC circuits. Experimental investigations in a choice of areas including radioactivity, spectroscopy, properties of materials, Hall effect, nuclear magnetic resonance, photography, vacuum systems.

1.062 Computer Applications in Experimental Science  
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 modeling, analysis and elementary control of a system.

1.9222 Electronics  
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  
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.

1.962 Physics of Measurement (Surveying)  
Prerequisite: 1.971.

For students in the School of Surveying.


1.972 Electromagnetism (Electrical Engineering)  
Prerequisites: 1.961 or 1.001 or 1.011, 10.001. Co-requisites: 10.2111, 10.2112. Excluded: 1.012.

Electrostatics in vacuum, electrostatics in dielectrics, electric currents, magnetostatics in vacuum, magnetic scalar potential, magnetostatics in magnetic media, time varying fields, Maxwell’s equations.

1.982 Solid State Physics (Electrical Engineering)  
Prerequisites: 1.961 or 1.001 or 1.011, 10.001. Co-requisites: 10.2111, 10.2112. Excluded: 1.022, 1.9322.

The concepts of waves and particles, introductory quantum mechanics, atomic structure, optical spectra and atomic structure, structural properties of solids, band theory and its applications, uniform electronic semiconductors in equilibrium, excess carriers in semiconductors.

1.992 Mechanics and Thermal Physics (Electrical Engineering)  


Physics Level III Units

1.0133 Quantum Mechanics  
Prerequisites: 1.022, 10.2112. Excluded: 2.023A, 10.222F, 1.013.

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.

1.023 Statistical Mechanics and Solid State Physics S1 L3T1

Prerequisites: 1.012, 1.023.

1.033 Electromagnetism S1 L1\frac{1}{2}T\frac{1}{2}

Prerequisites: 1.012, 10.2112, 10.2112. Excluded: 10.222C, 1.033.

Electromagnetic fields; Maxwell's equations, Poynting theorem, electromagnetic potentials, electromagnetic waves. Reflection and transmission, Fresnel equations, waveguides, radiation fields, dipoles and antenna theory.

1.043 Experimental Physics A FT4

Prerequisite: 1.032.

Basic experimental techniques and analysis of results in the following areas: electricity, magnetism, diffraction optics (including X-ray and electron diffraction, solid state physics, nuclear physics, atomic physics and spectroscopy, vacuum systems).

Chemistry

Level I Units

2.111 Introductory Chemistry S1 L2T4

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.

Classification of matter and the language of chemistry. The gas laws and the Ideal Gas Equation, gas mixtures and partial pressure. The structure of atoms, cations and anions, chemical bonding, properties of ionic and covalent compounds. The periodic classification of elements, oxides, hydrides, halides and selected elements. Acids, bases, salts, neutralization. Stoichiometry, the mole concept. Electron transfer reactions. Qualitative treatment of reversibility and chemical equilibrium, the pH scale. Introduction to the diversity of carbon compounds.

2.121 Chemistry 1A S1 or S2 L2T4

Prerequisites:
HSC Exam
Percentile Range
Required
2 unit Mathematics* or
21-100
31-100
4 unit Mathematics and
2 unit Science (Physics) or
4 unit Mathematics or
2 unit Science (Chemistry) or
31-100
2 unit Science (Geology) or
31-100
2 unit Science (Biology) or
31-100
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: 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.

2.131 Chemistry 1B S1 or S2 L2T4

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, stereochemistry; alkanes, alkenes, alkynes, aromatic compounds; alcohols, ethers, aldehydes, ketones, carboxylic acids and derivatives, amines.

Note: Students who have passed 2.111 may be permitted to enrol in 2.131 on application to the Head of the School of Chemistry.

2.951 Chemistry 1ME S2 L3T3

Prerequisite: As for 1.001.

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.
2.991 Chemistry 1CE
Prerequisites: As for 2.121.

Level II Units

2.102A 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.

2.102B Organic Chemistry
Prerequisite: 2.131 or 2.141. Excluded: 2.002B.
Discussion of the major types of organic reaction mechanisms (eg addition, substitution, elimination, free-radical, molecular rearrangement) within context of important functional groups (eg aliphatic hydrocarbons, monocyclic aromatic hydrocarbons, halides, organo-metallic compounds, alcohols, phenols, aldehydes, ketones, ethers, carboxylic acids and their derivatives, nitro compounds, amines and sulfonic acids). Introduction to application of spectroscopic methods to structure determination.

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 S1 or S2 L3T3
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.

Level III Units

2.003A Physical Chemistry S2 L3T3
Prerequisite: 2.002A.
Thermodynamics, including non-ideal systems; advanced electrochemistry; statistical thermodynamics; applications to gases, liquids and chemical equilibria; states of matter.

2.003C Inorganic Chemistry S1 or S2 L2T4
Prerequisite: 2.042C.
Coordination chemistry: valence bond and crystal field theory and their application to magnetic and spectral properties of complexes. Factors affecting the stability of complexes; unusual oxidation states of transition metals. Chemistry of the groups 3A (the lanthanides and actinides), IA, VA, VIA and VIIA. More advanced chemistry of groups 3B, IVB, VB, VIB and VIIIB and the noble gases.

2.013C Advanced Inorganic Chemistry S1 or S2 L2T4
Prerequisite: 2.042C. Co-requisite: 2.003C.

2.043A Environmental Chemistry S2 L3T3
Prerequisites: 2.002A, 2.002D.
Physico-chemical aspects of atmospheric 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 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.

Metallurgy

4.402 Physical Metallurgy 1 S1 L3T3 S2 L2T4
The crystal structure of metallic phases. Crystal defects. Physical properties of solids. X-ray diffraction. Phase equilibrium in alloy systems. The genesis of microstructure. Mechanisms of phase transfor-
4.403 Physical Metallurgy 2  
Prerequisite: 4.402. Excluded: 1.3033.

4.433 Physical Metallurgy 2C  
Prerequisite: 4.402.

4.512 Mechanical Properties of Solids  
Co-requisite: 4.512.

4.522 Mechanical Metallurgy  
Prerequisite: 4.512.

4.703 Materials Science  
Co-requisite: 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.

4.913 Materials Science  
Prerequisite: 1.962 Solid State Physics.

4.964 Materials Science and Engineering for Electrical Engineers  
Prerequisite: 5.010. Excluded: 5.010, 5.0201.
Mechanics, 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.

Mechanical and Industrial Engineering

5.006 Engineering E  
Prerequisite: as for 5.010. Excluded: 5.010, 5.0201, 5.030.

5.010 Engineering A  
Prerequisite: HSC Exam
Percentile Range Required
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
5.0201 Engineering Dynamics 1A  S1 or S2 L/T3
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  S1 or S2 L/T4 or L/T6 or F L/T3
Prerequisites: as for 5.010.


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

1. Production Technology  S2 L/T3
(Mechanical, 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, Machining. 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  S2 L/T3
(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  S2 L/T3
(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  S2 L/T3
(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, beneficiation 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  S2 L/T3
(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, pot forming and other forming procedures.

5.0302 Engineering Drawing and Descriptive Geometry  S1 or S2 L/T3


5.0303 Workshop Technology  SS L/T2

The implementation of design and its interaction with manufacturing equipment and processes. Manufacturing capabilities and tolerancing. Approximately 30 hours of practical training including casting, welding, fitting and machining. Students who have done Industrial Arts for the HSC, have an appropriate trade or certificate course qualification, or are suitably employed, may qualify for exemption from this subject.

5.034 Engineering Experimentation  S1 L/T1 S2 L/T1
Prerequisites: 5.300, 5.422, 5.622, 10.351. Co-requisites: 5.343, 6.856.

Analog and digital instrumentation. Transducers, computer communication interfaces, computer control of experiments. Scientific method, engineering method, report writing, errors in experiments. Nineteen experiments and demonstrations.

5.043 Industrial Training 1  SS

Practical work in industry at the process or shop floor level to gain experience of people, industrial problems and relations, and process equipment. (Report submitted in Week 1 of session detailing involvement and experience gained prior to Year 3.)

For details contact Mr. G. Crawford, Industrial Training Officer.

5.044 Industrial Training 2  SS

Practical work in industry at the professional level to gain experience in design, development, investigation or management control systems areas in collaboration with professional engineers. (Report submitted in Week 1 of session detailing responsibilities and experience gained in vacation period between Years 3 and 4.)

For details contact Mr. G. Crawford, Industrial Training Officer.
5.051 Thesis
Co-requisite: 5.062.
To be taken in year of completion of course.
For students in the BE degree courses in the School of Mechanical and Industrial Engineering.

5.056 Mechanical Engineering
Prerequisites: 1961 or equivalent, 10.2111, 10.2112.

5.061 Technical Orientation
A series of lectures on technical topics arranged to provide an introductory background to engineering and its profession. Students are encouraged to develop their skill in observing and reporting on technical matters.

5.062 Communications
Co-requisite: 5.051.

5.0721 Computing
Co-requisite: 10.001 or 10.011.

5.073 Numerical Analysis/Mathematics
Prerequisites: 5.0721, 10.022.

5.074 Computing Science for Mechanical Engineers
Prerequisite: 5.0721.

5.122 Mechanical Engineering Design 2
Prerequisites: 5.010, 5.030. Co-requisites: 5.0201, 5.061, 5.422, 5.622.
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.

5.123 Mechanical Engineering Design 3
Prerequisite: 5.122. Co-requisites: 5.301, 5.423.
Mathematical modelling and decision making in design with applications. More advanced design analyses, component design and drawing with individual and group projects of an interdisciplinary nature.

5.1241 Creative Design Project
Prerequisite: 5.123.
This subject is concerned with the development of a feasible solution to a specified problem. The execution of the project requires attention to problem identification, creative thinking, feasibility analysis and decision making.

5.1242 Design Technology
Prerequisite: 5.122.

5.1243 Machinery Design Project
Prerequisite: 5.123 or equivalent.
Development of a final design to satisfy specified objectives involving design analysis, component selection and preparation of working drawings.

5.1244 Project Management
Prerequisite: 5.122.
Studies of aspects of implementation of design work to ensure that design objectives are achieved. Project scheduling and control, preparation of contracts and specifications, use of standards and codes, quality assurance, product liability, patent law, marketing.

5.1245 Computer-Aided Engineering Design
Prerequisite: 5.123 or 5.901. Excluded: 18.803, 18.870G.
Mathematical modelling and analysis of component and system designs using the computer as a tool to optimize and investigate design solutions. Use of available algorithms and computer packages.
5.300 Engineering Dynamics 1B  S2 L1T1
Prerequisites: 1.001 or 1.951, 5.0201, 10.001 or 10.011.

Kinematics and kinetics of rigid bodies in planar motion: absolute motion and motion relative to translating and rotating frames of reference; constraint and degrees of freedom; friction; extensions to Newton's second law; D'Alembert's principle; differential equations of motion; gyroscopic couple; work and energy, variational principles; impulse and momentum, impact.

5.301 Mechanics of Machines 1  S2 L1½T½
Prerequisites: 5.300, 10.022.

Kinematics and dynamics of planar mechanisms: methods for the analysis of velocities, accelerations and forces in planar mechanisms. Kinematics of gear tooth profiles; standard and non-standard gear tooth profiles. Static and dynamic rotor balancing; field balancing of large rotors.

5.303 Mechanical Vibrations  S2 L1½T½
Prerequisites: 5.300, 10.022.


5.304 Engineering Dynamics 2  SS L2T1
Prerequisite: 5.333.

Inertia effects in machinery: analysis of torsional and translational disturbances set up in machines containing one or more reciprocating masses; means of reducing or eliminating undesirable effects. Mechanical vibrations: two degrees of freedom systems; free and forced vibrations; applications; the undamped vibration absorber. Multiple rotor systems; free and forced torsional vibrations. geared branched systems. Introduction to beam vibrations. Matrix methods.

5.343 Linear Systems Analysis  S1 L2T1
Prerequisites: 5.0201, 10.022.

Models of physical systems: differential equations for physical systems including mechanical, electrical, hydraulic, thermal and pneumatic systems; linearization. System analysis techniques: solution by Laplace transform method. Transfer functions and block diagrams. System response: response of first and second order systems to impulse step, ramp, sinusoidal and periodic inputs; higher order system response; system stability, applications.

5.344 Feedback Control  S1 L2T1
Prerequisite: 5.343.


5.3541 Engineering Noise 1  SS L2T1
Prerequisite: 5.073 (Mathematics Strand). Excluded: 5.653G.


5.3542 Engineering Noise 2  SS L2T1
Prerequisite: 5.3541. Excluded: 5.654G.


5.421 Mechanics of Solids 1  S1 or S2 L2T1
Prerequisite: 5.010.


5.422 Mechanics of Solids 2/Materials  F L2T2½
Prerequisites: 5.421 or 5.171, 10.001 or 10.011.


5.4221 Mechanics of Solids 2  F L1½T2
Intended for Materials Science Majors in combined BE BSc degree course.

Prerequisites: 5.421 or 5.171, 10.001 or 10.011.

5.424 General Mechanics of Solids  SS L2T1
Prerequisite: 5.423. Excluded: 5.417G.
Inelastic behaviour of bars, beams, shafts and columns. Thick cylinders and composite cylinders loaded by internal and external pressures; rotating discs; contact stresses. Elementary concepts of fracture mechanics; stress intensity factor; fracture toughness; cracks.

5.434 Plates and Shells  SS L2T1
Prerequisite: 5.423.
Bending of rectangular and circular plates under normal loading; thermal stresses. Shells; membrane stresses, bending stresses, discontinuities at junction of ends; design of pressure vessels.

5.444 Theory of Elasticity  SS L2T1
Prerequisites: 5.423, 5.300, 5.622.
Mathematical foundations; analysis of stress; deformation and strain; equilibrium, motion and flow; fundamental laws of continuum mechanics; linear elasticity; viscoelasticity; applications.

5.454 Theory of Plasticity  SS L2T1
Prerequisite: 5.423 or 18.413.
Analysis of stress, strain, strain rate; plastic stress/strain relations with description of experimental verification. Application of plasticity theory to a selection of problems including metal working processes such as extrusion and rolling and metallic friction and wear.

5.464 Structural Instability  S1 L1½T½
Prerequisite: 5.423.
Buckling of perfect and imperfect columns; bending and buckling of thin flat plates; local instabilities and crippling of thin-walled columns. Buckling of monocoque cylinders and curved panels. stiffened panels. Tension field beams.

5.622 Fluid Mechanics/Thermodynamics  F L2T2
Prerequisites: 10.001 or 10.011, 1.951 or 1.001, 5.010. Co-requisite: 3.000.

5.623 Heat Transfer  SS L2T1
Prerequisites: 5.622, 10.022.
Conduction: steady one and two dimensional; unsteady one dimensional. Radiation: properties; shape factor; compound surfaces. Convection: laminar and turbulent boundary layers and heat transfer; flow in ducts and pipes; natural convection. Design of heat exchangers.

5.624 Refrigeration and Air Conditioning  SS L2T1
Prerequisite: 5.622. Co-requisite: 5.623, 10.022.
Psychrometry and air conditioning calculations, heat load, estimates, vapour compression, absorption and air cycle refrigeration, refrigeration and air conditioning systems and components, cryogenic cycles.

5.633 Turbomachines  SS L2T1
Prerequisites: 5.622, 10.022. Co-requisites: 5.073, 5.633.
Dimensional analysis and experience charts, cavitation, thermodynamics of a stage, blade element theory of axial machines, thin wing theory, cascade data and design procedures, aerodynamic design of an axial machine, theory of centrifugal machines, design of centrifugal machines.

5.6341 Viscous Flow Theory  F L/T1½
Prerequisites: 5.622, 10.022.

5.6342 Lubrication  SS L/T3
Prerequisites: 5.622, 10.022. Excluded: 5.631G.
History of lubrication, types of bearings and bearing operation, nature of surfaces and their contact, modes of lubrication, properties of lubricants, viscous flow in pipes and channels, measurement of viscosity, infinitely long and short bearing approximations, one-dimensional analysis of short bearing, other slider bearing geometries, the effect of end leakage, hydrostatic or externally pressurized bearings, squeeze films.

5.635 Convection Heat Transfer  SS L2T1
Prerequisite: 5.623. Excluded: 5.717G.
Conservation of energy, momentum and mass. Friction and heat transfer on surfaces with laminar boundary layers: similarity and integral methods, influence of fluid Prandtl Number, relations for Nusselt and Stanton numbers. Natural convection boundary layers. Turbulent boundary layers: laminar and turbulent sub-layers, law of the wall, analogies between friction and heat transfer. Friction and heat transfer inside tubes: laminar and turbulent flow, relation between friction and heat transfer.
5.643 Thermodynamics and Combustion  SS L2T1
Prerequisites: 5.622, 10.022. Co-requisite: 5.633.

General thermodynamic relations, ideal and non-ideal gases, statistical thermodynamic derivations of internal energy and entropy, ideal gas mixtures. Combustible fuels, combustion equations, internal energy and enthalpy of reaction. First law analysis of combustion, adiabatic flame temperatures. Second law analysis of combustion, chemical equilibrium, chemical kinetics and rate controlled reactions. Application of chemical equilibrium and reaction rate methods to combustion and emission problems. Detonation, detonation and diffusion flames, mixing controlled reactions.

5.644 Solar Energy  SS L2T1
Prerequisites: 5.622, 10.022. Co-requisite: 5.623. Excluded 5.722G.


5.653 Compressible Flow  S1 L2T1
Prerequisites: 5.622, 10.022. Excluded: 5.621G, 5.811.

One dimensional steady flow: isentropic channel flow, normal shock waves, supersonic wind tunnels and diffusers. Two dimensional steady flow: oblique shock waves, Prandtl-Meyer expansions, nozzles, airfoils. One dimensional unsteady flow: moving waves, reflections, explosions in ducts, shock tubes; method of characteristics, internal flows, piston and valve effects.

5.654 Hydraulic Transients  SS L2T1
Prerequisites: 5.622, 10.022.

Mass oscillations in surge systems with various types of surge tanks. Stability of surge systems, comparison with experiment. Allievi's theory of water hammer, fast and slow closures, water hammer in pumping systems, circle diagrams.

5.663 Potential Flow Theory  S1 L2T1
Prerequisites: 5.622, 10.022. Co-requisite: 5.073. Excluded: 5.811.


5.664 Multiphase Flow  SS L2T1
Prerequisites: 5.622, 10.022.

5.831 Aerospace Propulsion

Prerequisites: 5.622, 5.653 or 5.811.


5.901 Introduction to Mathematical Modelling and Decision Making

Prerequisite: 5.122.

This subject is identical with Session 1 of 5.123. Models and modelling: types, criteria, parameters, constraints; mathematical formulation and validation of models; fundamentals of solution algorithms; post-solution analysis. Decision making: scales and ratings; subjective decision making; mixed rating comparisons; sensitivity; pitfalls. Introduction to project control. Applications from the marine field.

5.902 Ship Management Economics

Prerequisite: 10.022. Co-requisite: 5.073.


5.911 Ship Hydrostatics

Prerequisites: 5.010, 10.001 or 10.011.

Basic concepts and integration methods. Hydrostatic particulars and approximate formulae. Intact stability, cross curves and righting arm, stability at small angles and free surface effects, the wall-sided formula, flooding and water tight subdivision. Damaged stability. Launching calculations and docking.

5.921 Ship Structures 1

Prerequisites: 5.422, 10.022.


5.922 Ship Structures 2

Prerequisites: 5.423, 5.921.


5.9311 Principles of Ship Design 1


5.9321 Principles of Ship Design 2

Prerequisite: 5.931.


5.937 Ship Design Project

Prerequisites: 5.901, 5.911, 5.953. Co-requisites: 5.902, 5.931, 5.932.

Each student is required to perform the following design tasks and submit the results: 1. Rationale, specifications, weights, inboard profile. 2. Power, capacities, freeboard, trim, stability, stern gear. 3. Sectional area curve, lines drawing, Prelim midship section. 4. Hydrostatics, floatability and stability curves. 5. Powering, propeller, systems — schematic drawing, detailed capacity. 6. Section modulus calculation, bulkhead, midship section, module concept. 7. Final weights, capacity drawing, operational data, and evaluation.

5.941 Ship Propulsion and Systems

Prerequisites: 5.911, 5.953.


5.953 Ship Hydrodynamics

Prerequisites: 5.300, 5.622, 10.022. Co-requisite: 5.073.

1. 5.663 (Potential Flow Theory) in Session 1. 2. 5.952 (Hydrodynamics) in Session 2. Introduction and elementary methods applied to ship hydrodynamics. Dimensional analysis and experimentation. Motion of a spar buoy and derivation of coefficients in equation of motion. Linearized uncoupled motion of a ship. Non-linear aspects. Coupled heave and pitch motion of a ship. Ocean waves and their properties.
Electrical Engineering and Computer Science

6.010 Electrical Engineering 1 S2 L2T4
Prerequisite: Electricity and magnetism section of 1.061.
Prepares students for the various areas and disciplines of Electrical Engineering. Includes field and circuit theory; electronics; logic circuits; communications; energy conversion; automatic control. Laboratory exercises and project work are major components.

6.021A Circuit Theory 1 S1 or S2 L2T2
Prerequisites: 1.061 or equivalent, 6.010, 10.001.

6.021B Power S1 or S2 L2T2
Prerequisite: 6.021A attempted at an acceptable level.
Topics in electric power engineering including analysis of AC power circuits (single phase, three phase, steady state and transient), magnetic circuits, transformers, fundamentals of electro-mechanical energy conversion and electrical safety.

6.021C Electronics 1 S1 or S2 L2T2
Prerequisite: 1.062, 6.021A (one of these to be passed, the other to be attempted at an acceptable level and to be repeated concurrently).
Principles of operation and low-frequency characteristics of PN diodes, bipolar and field effect transistors, thyristors and various optoelectronic devices. Transistor low-frequency small-signal equivalent circuits. Design and analysis of low frequency Class A transistor amplifiers, temperature effects. Device ratings and use of data sheets.

6.021D Computing S1 or S2 L2T2
Assembler programming and simple machine architecture. The Unix operating system: file system, processes, pipes, programming in the Shell command language. Data structures: lists, trees, recursion. Sorting: some basic algorithms for sorting arrays. Engineering applications of computers.

6.021E Digital Logic and Systems S1 or S2 L2T2
Prerequisite: 10.001.

6.0311 Circuit Theory 2 S1 or S2 L2T2
Prerequisites: 6.021A, 10.111A (10.111A if attempted at an acceptable level may be taken as a co-requisite). 10.113, 10.114, 10.211, 10.2112 (two of these may be taken as co-requisites). 6.021B, 6.021C (one of 6.021B or 6.021C may be taken as a co-requisite).
Basic circuit concepts followed by basic system ideas such as order, state, linearity and typical system waveforms. Typical linear time invariant systems modelled and described by differential equations leading to use of Laplace transforms. Partial fractions, poles, zero and stability. Transfer functions and circuit responses both in time and frequency domain. Basic signal analysis. Fourier series. Fourier Transform. Modern filter design, Butterworth and Chebychev filters. Transformation of low-pass filter to high pass, bandpass and band stop filters.

6.0312 Utilization of Electric Energy S1 or S2 L2T2
A continuation of study in the utilization of electrical energy commenced in 6.021B. Power. Topics include: dc machines, synchronous machines, single- and three-phase induction motors, fractional horsepower motors, motor speed control, performance characteristics and applications, the thermal behaviour and rating of machines, harmonics in three-phase transformers.

6.0313 Electronics 2 S1 or S2 L2T2

6.0314 Systems and Control 1 S1 or S2 L2T2
Prerequisite: 6.0311.

6.0315 Electrical Energy S2 L2T2
Prerequisite: 1.072; 6.0312 attempted at an acceptable level.
Aspects of the supply, control and utilization of electrical energy. Choice of voltage and supply configuration. Transmission line characteristics and calculations. Dielectric and thermal considerations of power equipment. Protection considerations for medium voltage (up to 600V) systems — circuit breakers, fuses, relays, earthing, surge suppression. Electrical methods of industrial heating: direct, induction, dielectric, etc. Light sources, their operation and efficacy. AC-DC conversion, power switching devices, their characteristics and uses.
6.0316 Electronics 3 S1 or S2 L2T2
Prerequisite: 6.0313. Co-requisites: 6.0311, 6.021E.

Extension of 6.0313 Electronics 2 to include oscillators, large-signal electronics of bipolar and field-effect transistors, power amplifiers, waveform generators and shapers, monostables, astables, with an increasing emphasis on integrated circuit realizations.

6.0317 Communication Systems 1 S2 L2T2

Overview of information acquisition, transmission and processing. Aims to enable students not specializing in this field to understand the communication problems they are likely to meet in their career, and to provide a background if they intend to specialize in communications. Topics: analogue to digital conversion (sampling, quantizing, aliasing, pulse code modulation, delta modulation, time and frequency division multiplexing); modulation and demodulation (amplitude, frequency and phase modulation, signal to noise ratio, noise figure, error probability, bandwidth, spectrum, intersymbol interference). Communication systems (transmission lines, radio wave propagation, antennas and arrays, modems, repeaters, equalizers, line and error coding).

6.0318 Microprocessor Systems and Applications S1 or S2 L2T2

Basic computer architecture: fetching and executing instructions; Motorola 6809 registers and instructions; assemblers, addressing modes; bus waveforms; interfacing to a bus, parallel interfacing — the PIA; handshake; interrupts; critical regions; buffered I/O; stack data frames; translating from Pascal to assembler; recursion; serial interfacing — the ACIA; direct memory access (DMA); dynamic memory; memory management; VLSI aspects of microprocessor chip design.

6.042 Digital and Analogue Signals S1 L2T3
Prerequisites: 6.0311, 10.0331, 10.0332, 10.361.

Analysis and processing of continuous-time and discrete-time (digital) signals: Generalized Fourier analysis; convolution, correlation, energy and power density spectra. Signal distortion (linear and nonlinear) H/ber transforms; analytic signals, signals in systems. Sampling and digital processing of analogue signals; the discrete Fourier transform (DFT), the fast Fourier transform (FFT), algorithm. Design of finite and infinite impulse response (FIR and IIR) digital filters. Analysis of random signals and noise; transmission through linear systems and nonlinear devices, signal-to-noise ratios, matched filters. Estimation and measurement of power density spectra.

6.044 Electrical Product Design and Reliability S2 L2T3
Prerequisite: 10.361.

The design and development of reliable, high-quality hardware, from components to systems: product and procurement specifications; factors in choice of system configuration, materials, components, processes, prediction of reliability, availability, system effectiveness; cost-of-ownership optimization; maintainability; thermal design; mechanical design; redundancy; design reviews; fault-free analysis; failure mechanisms; failure mode analysis; Monte Carlo simulation; worst case and statistical design; sensitivity analysis and marginal testing; component screening; product development; life testing; environmental testing; non-destructive testing; quality control; attribute sampling.

6.202 Power Engineering — Systems 1 S1 L2T3
Prerequisites: 6.0312, 6.0315.

An elective emphasizing parameters and performance of power system components; transmission lines and cables, transformers, synchronous machines; power system overvoltages; fault calculations; circuit interruption; protection; distribution systems; power system economics.

6.203 Power Engineering — Systems 2 S2 L2T3


6.212 Power Engineering — Utilization S2 L2T3
Prerequisites: 6.0312, 6.0315.

Topics include: Power electronics: scope of power electronics, commutation, filtering and harmonics, thyristor protection, AC phase control, integral cycle control, rectification, inversion, bridge converters, converter control, dual converter, cyclo-converter, DC switching and regulation. Electrical machines; application and control; unified machine theory; application of symmetrical component theory to the operation of induction motors. Electrical equipment for hazardous atmospheres. A program of experimental projects and design applications accompanies the lectures.

6.222 High Voltage Technology S1 L2T3
Prerequisite: 6.0315.

An elective concerned with the high voltage design and testing of electrical equipment used in the power industry. The practical applications of relevant materials, with emphasis on properties of insulation systems (gases, liquids and solids) and the interaction of the materials in non-uniform fields. Methods of testing under steady state — AC and DC — and surge conditions are incorporated in the laboratory work. Design examples are taken from insulator, bushing, cable, power capacitor, transformer, rotating machine and switchgear technologies.

6.303 Transmission Lines for Microwave and Optical Communication S1 L2T3
Prerequisite: 6.0317.

Ray theory of multimode Optical Fibre. Two-conductor transmission lines and microstrips. Smith Chart and stub matching transients on transmission line.

6.313 Signal Propagation at Microwave and Optical Frequencies S2 L2T3
Prerequisite (or co-requisite): 6.303.

Maxwell’s equations, waveguides, single mode optical fibres, free space propagation, antennas. Microwave sources. Light emitting diodes, lasers and optical detectors.
6.322 Electronics 4
Prerequisites: 6.0313, 6.0316.
Theory and applications of electronic devices, circuits and systems employing microelectronics technology. Active filters, voltage-controlled oscillators, phase-locked loops, switching regulators. Additional topics chosen from: digital ICs using MOS logic, charge-coupled devices, voltage references and optical links. Laboratory: a series of projects to design, construct and study circuits based on the above topics.

6.323 Communication Systems 2A
Prerequisites: 6.0317 (Pass Conceded (PC) awarded prior to Session 2, 1983, is not acceptable for this subject), 10.0331, 10.361.
Theory and practice of modern analogue and digital communication techniques. Topics selected from: digital communications; band-limited signaling, Nyquist and partial response shaping, non-binary transmission, receiver optimization and matched filters, line coding, spectrum with line coding, adaptive equalization, error control coding, information theory (entropy, discrete and continuous channel capacity); linear and nonlinear analogue modulation (AM, SSB, FM, etc, signal to noise ratios, characterization and effect of nonlinearities on transmitters and receivers, comparison); aspects of transmission media relevant to telecommunication systems.

6.333 Communication Systems 2B
Prerequisites: 6.0316, 6.0317.
Modern digital and analogue communications systems from a systems point of view. Topics include: television, teletext and viewdata; acoustic systems; broadcast systems covering AM, FM, stereo; radar, sonar, electronic navigation aids; satellite communication systems; point-to-point terrestrial communication systems.

6.402 Introductory Physiology for Engineers
Prerequisites: 6.0313, 6.0316.
An introduction to biophysics and physiology for engineers. Cells, tissues and organ systems with emphasis on their functional and regulatory characteristics and their interaction. An introduction to computer models of physiological control systems demonstrating their value in understanding the dynamics of complex neural, hormonal and circulatory responses to changes in homeostasis.

6.412 Systems and Control 2
Prerequisites: 6.0311, 6.0314.
The design of feedback controllers for single and multivariable systems typically encountered in electrical engineering. Emphasis on satisfying steady-state, transient and sensitivity specifications by both frequency domain and time domain techniques. Treatment of identification methods and nonlinearities via the describing function. Extensive use of interactive computer-aided design programs.

6.413 Digital Control
Prerequisites: 6.0314 (Pass Conceded (PC) awarded prior to Session 2, 1983, is not acceptable for this subject), 10.033, 10.361.
The design and analysis of digital control systems. Consideration of problems in analog-digital and digital-analog conversion such as quantization, aliasing and finite word length and their relation to the design of numerical control algorithms. On-line digital identification and adaptive control techniques as illustrated by the self-tuning regulator, minimum variance and dead beat control structures.

6.432 Computer Control and Instrumentation
Prerequisites: 6.0314, 6.0316, 6.0318.
Current practice in hardware and introduction to software techniques as applied to the implementation of control and instrumentation systems. Analog computers and associated circuit techniques, Transducers, actuators, controllers and special electro-mechanical devices as used in industrial instrumentation. Digital instrumentation. Hybrid devices and analog conversion. Sampling. Computer control organization and interfacing concepts. Microprocessor peripherals, including display systems, and magnetic data storage devices. Bus communication system for instrumentation. Programmable logic controllers. Standard process control configurations. Introduction to software systems for digital control applications. Computer control of processes via on-line languages. Includes a significant laboratory program aimed both at illustrating the lecture material and introducing new concepts.

6.483 Biomedical Engineering
Prerequisites: 6.0314, 6.0316, 6.402.
Electromedical instrumentation and electronic aspects of life design. Electrodes, transducers, amplifiers, common mode and noise problems. Specific instrumentation: blood pressure and flow measurements, medical imaging systems, etc.

6.512 Semiconductor Devices
Prerequisite: 6.0313.
Principles of operation and circuit characteristics of a range of semiconductor devices including bipolar diodes and transistors, MOS devices and circuits, charge-coupled devices, solar cells, light-emitting diodes, and semiconductor lasers. The lectures are supplemented by experimental work with a selection of these devices.

6.522 Transistor and Integrated Circuit Design
Prerequisites: 6.0313, 6.0316.
Review of IC Technology. Development of circuit models for bipolar and MOS devices. Relationship of model parameters to processing, design and physics. The use of CAD programs (eg SPICE) in circuit simulation. Design studies of selected IC functions chosen from: bipolar and MOS operational amplifiers, analog multipliers, D/A and A/D converters, SITL and MOS logic. Laboratory: studies of the internal design and performance of selected ICs, plus the use of the School's CAD facilities to carry out a design project.

6.532 Integrated Digital Systems
Prerequisites: 6.021E, 6.0316.
Integrated circuit logic families with emphasis on MOS technologies, structured chip design, custom and semi-custom approaches, system architecture, computer aided design, layout considerations, timing estimates, circuit failures, testing, design for testability.
6.606 Computing Science Honours

6.611 Computing 1  S1 or S2 L3T3

Prerequisite: As for 10.001. Co-requisite: 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.

6.612 Computer Organization and Architecture S1 L3T2

Prerequisite: 6.0318 or 6.613.

The structural organization and hardware design of digital computer systems, basic computer organization, control and microprogramming, arithmetic algorithms and processor design, memory management and organization, input-output systems, parallel processing and multiprocessor systems. Use of algorithmic state machines for digital system description, specification and design.

6.613 Computer Organization and Design S1 L3T3

Prerequisites: 6.631 or 6.021E, 6.021D or 6.620 or 6.621 (Pass Conceded (PC) awarded prior to Session 2, 1983, is not acceptable for these subjects). Excluded: 6.0318.

Bussing structures (asynchronous and synchronous); input/output organization; polling, interrupt and DMA control; parallel and serial device and processor communication and interfacing. Memory organization: CPU and control unit design. Processes: synchronization and communication. Microprocessor case studies.

6.621 Computing 2A  S1 or S2 L3T2

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.

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.

6.622 Computer Applications SS L3T2


6.631 Computing 2B  S1 or S2 L3T2

Prerequisites: 6.620 or 6.621 or 6.021D (Pass Conceded (PC) awarded prior to Session 2, 1983, is not acceptable for these subjects), 6.600 (CR). Excluded: 6.021E.

Assembler programming: programming in a low level machine-oriented language in order to illustrate the mapping of higher level language constructs onto a typical machine and the interaction between operating systems and devices. Digital Logic Design: Boolean algebra and logic gates, simplification of Boolean functions, combinational logic, medium scale integration building blocks, clocked sequential circuits, registers and memory, computer arithmetic.

6.632 Operating Systems  S1 L2T3

Prerequisites: 6.631 or 6.021E, 6.641 (Pass Conceded (PC) awarded prior to Session 2, 1983, is not acceptable for these subjects). Excluded: 6.672.

Introduction to operating systems via an intensive case study of a particular system, namely the UNIX Time-sharing system which runs on the PDP11 computer. Includes system initialization, memory management, process management, handling of interrupts, basic input/output and file systems. A comparison of UNIX with other operating systems. General principles for operating system design.

6.633 Data Bases and Networks  S2 L3T2


Data Base Management Systems: data models; relational and network structures; data description languages; data manipulation languages; multi-schema structures. Data integrity and security; recovery; privacy. Computer Networks: economic and technological considerations; digital data transmission; error detection and recovery; network configurations; circuit switching, packet switching; communication protocols, current international standards; data compression; encryption and decryption.

6.641 Computing 2C  S1 or S2 L3T2

Prerequisites: 6.620 or 6.021D or 6.621 (Pass Conceded (PC) awarded prior to Session 2, 1983, is not acceptable for these subjects), 6.600 (CR).

6.642 Design and Analysis of Algorithms

Prerequisite: 6.641 (Pass Conceded (PC) awarded prior to Session 2, 1983, is not acceptable for this subject).

Techniques for the design and performance analysis of algorithms for a number of classes of problems. Analysis of algorithms: ordination, recursion, recurrence equations, worst case and expected order statistics. Design of efficient algorithms: recursion, divide and conquer, balancing, backtracking algorithms, branch and bound, dynamic programming; set manipulation problems; fast search algorithms, balanced optimal and multilway trees; graph representations and algorithms; pattern matching algorithms. NP — complete problems. Design and specification of programs: modularization, interface design, introduction to formal specification techniques.

6.643 Compiling Techniques and Programming Languages

Prerequisite: 6.641 (Pass Conceded (PC) awarded prior to Session 2, 1983, is not acceptable for this subject). Excluded: 6.672.


6.646 Computer Applications

Prerequisites: 6.620 or 6.021D or 6.621 (Pass Conceded (PC) awarded prior to Session 2, 1983, is not acceptable for these subjects), or 6.600 (CR), one of 10.311A, 10.321A, 10.301, 10.331, 45.101 or equivalent. Excluded: 6.662.

The use of computers for solving problems with a substantial mathematical and operational research content; includes use of some standard software packages. Topics selected from: discrete event simulation; a simulation language; pseudo random number generation; simple queuing theory, applications of mathematical programming; dynamic programming; statistical calculations; critical path methods; computer graphics, artificial intelligence.

6.647 Business Information Systems


Introduction to accounting systems — general ledger, debits and credits; models of business information systems; integrated business systems. System specification, system analysis, system design and implementation; testing and debugging. Managing a project team; project control. The COBOL programming language. File organization and design; sequential, indexed sequential, random, inverted, B-tree file organizations; data dictionaries, program generators, automatic system generators. A major project, written in COBOL, is undertaken as a team exercise.

6.649 Computing Practice

Prerequisite: 6.641 (Pass Conceded (PC) awarded prior to Session 2, 1983, is not acceptable for this subject). Co-requisites: 6.633 or 6.643.

Not offered in 1966.

Can only be counted with at least 3 other Level III Computer Science units.

For students majoring in Computer Science who seek a programming career in government or commercial industry. Topics, related to current computing practice, include: Comparative study of computer hardware in current popular use; Comparative study of the 'popular' programming languages, eg COBOL, RPG, BASIC, FORTRAN, PL/1, APL. Job control languages. Data Preparation procedures. Keyboard entry; Verification; Word processing; report preparation; documentation; Social implications of computing. Professional responsibilities and ethics. Project management; software engineering; psychology of computer programming.

6.652 Data Communication and Computer Networks


6.672 Operating Systems and Compilers


Operating Systems: properties of a real time virtual machine; implementation of a real time virtual machine; scheduling; reliability; processes for the virtual machine; system programming, performance measurement. Compilers: language description; phrase structure grammars, context-free grammars, finite state grammars; Backus-Naur form; lexical analysis-LEX; compiler generators-YACC; recursive descent parsing techniques.

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.
6.856 Electronics for Measurement and Control  S1 L2T1

The use of electronics in mechanical systems and the processing of signals by analog and digital techniques. Revision of basic circuit theory, operational amplifier circuits, feedback and filtering. Digital logic using integrated circuits. Noise. Techniques for A/D and D/A conversion, measurement system interfacing to microprocessors.

6.902 Industrial Experience

A minimum of three years of appropriate industrial experience must be obtained concurrently with attendance in Course 3650. Students are required to submit to the School evidence from their employers confirming completion of the prescribed period of industrial training.

6.903 Industrial Training

Students enrolled in courses 3640, 3725 and 3720 must complete a minimum of 60 days' industrial training. At least some of this must be obtained in Australia. Overseas employment must have prior approval. Students are required to submit to the School evidence from their employers confirming completion of the prescribed training. Experience claimed as an industrial elective covers requirements for this subject.

6.911 Thesis

This is done in the last two sessions of the BE degree course. For full-time students, three hours per week in the first session, and twenty one hours per week in the second session are devoted to directed laboratory and research work on an approved subject under guidance of members of the lecturing staff. Part-time students may need to attend the University full-time in their final session or attend for one further part-time session, if facilities are not available for the thesis to be done at work. Generally, the thesis involves the design and construction of experimental apparatus together with laboratory tests. Each student is required to present a seminar, and a written thesis must be submitted on each project by the penultimate Monday in November or June.

6.921 Project

The project is done in the final stages of the BSc(Eng) course. It involves the design and construction of experimental apparatus together with laboratory tests. Each student is required to present a seminar and submit a written report. The project should represent the equivalent of a minimum 100 hours of directed laboratory work. If facilities are not available for this to be done largely at work, students may need to attend the University full-time in final session, or attend for one further part-time session.

6.931 Industrial Elective

6.932 Industrial Elective

6.933 Industrial Elective

Prerequisites for 6.931, 6.932, 6.933: Students must be in at least the third stage of part-time BE degree course and be in full-time approved employment.

Each Industrial Elective represents one year of appropriate quality concurrent industrial experience for students in approved full-time employment. Students must submit evidence and a written report to the satisfaction of the Head of School. Some attendance at the University for verbal reporting may also be required.

A maximum of three such electives can be taken and they may be substituted for certain subjects in course 3640 requirements. An Industrial Elective cannot be claimed for work submitted for credit as 6911 Thesis. Details of the procedure for registering and the requirements to be met can be obtained from the School of Electrical Engineering and Computer Science.
8.1210 Engineering Construction 1  
Identification of the basic processes that comprise construction activity. Detailed technological analysis of plant, processes and techniques involved in engineering construction activities including earth-moving, rock excavation and placement, concreting etc. Introduction to construction site organization and control. Preparation of a major report based on field observations.

8.1410 Dynamics and Vibration  
Prerequisite: 8.1140.
Dynamics of particles. Laws governing conservation of energy and momentum. Derivation and solution of equations of motion for simple spring-mass systems responding to forces of simple form. Applications to civil engineering problems.

8.1610 Fluid Mechanics  
Co-requisites: 8.1410, 10.001.

8.2110 Systems Engineering 1  
Prerequisite: 10.001.

8.2120 Systems Engineering 2  
Prerequisites: 8.1120, 8.2110, 10.381.

8.2210 Engineering Construction 2  
Prerequisite: 8.1210.

8.2220 Engineering Construction 3  
Prerequisite: 8.2210.

8.2310 Materials Technology  
Prerequisite: 2.991. Co-requisites: 8.2220, 8.2420.

8.2320 Concrete Technology 1  

8.2410 Mechanics of Solids 1  
Prerequisite: 8.1410.

8.2420 Mechanics of Solids 2  
Prerequisite: 8.2410.

8.2430 Structural Design 1  
Prerequisite: 8.2410. Co-requisite: 8.2420.

8.2610 Hydraulics 1  
Prerequisites: 8.1410, 8.1610, 10.001.
8.3110 Engineering Computations
Prerequisites: 8.1120, 10.022.

8.3210 Engineering Management 1
Prerequisite: 8.2220.

8.3220 Engineering Management 2
Prerequisite: 8.3210.

8.3310 Soil Mechanics
Prerequisite: 8.2610.

8.3320 Geotechnical Engineering
Prerequisite: 8.3310.

8.3330 Concrete Technology 2
Prerequisite: 8.2320. Co-requisite: 8.3430.

8.3340 Structural Design 3
Prerequisite: 8.3430.
Behaviour, analysis and design of reinforced concrete beams from first cracking up to ultimate moment capacity; ultimate strength theory, design for shear, bond and anchorage, modular ratio theory, reinforced concrete columns, continuous beams and frames, composite beams, detailing, concrete codes.

8.3350 Traffic Flow Theory
Prerequisite: 10.381.

8.3610 Hydraulics 2
Prerequisite: 8.2610.
8.3600 Hydraulics S1 L1T½
Prerequisite: 8.3610.


8.3610 Water Supply and Wastewater Disposal S1 L2T1
Prerequisite: 8.2610.


8.3620 Engineering Hydrology S2 L2T1
Prerequisite: 10.361.


8.3630 Industrial Training S2 L2T1
Prerequisite: 8.3630.

Requirement for the Bachelor of Engineering Degree.

Students are required to complete a minimum of 60 working days of approved industrial training and submit a report on this training before the fourth week of Session 1.

8.4200 Construction Major S2 L1T1
Prerequisite: 8.3230, 8.4220.

Construction camp: a one week field camp involving several construction procedures and associated performance measurements. Construction planning and design; organisation, management, and control to support the conduct of the construction camp. Either construction technology or construction management. Construction and/or management project.

8.4210 Engineering Management S1 L1T½
Prerequisite: 8.3220.

Human resources: conflict management, industrial relations, work groups in construction practice. Legal systems: contracts and their administration, professional liabilities and duties. Financial management: corporate entities and legal forms of enterprises, financial accounting, accounting systems, project finance, cash flow, taxation, depreciation of fixed assets.

8.4220 Materials Major S2 L1T1
Prerequisite: 8.3320, 8.3330, 8.4320, 8.4330.

Four topics selected from the following list (only four topics will be offered in each year): Soil engineering. Rock engineering. Foundation engineering. Dam engineering. Advanced pavement design. Offshore engineering. Fracture mechanics. Plastics. Concrete design. Special topic. A project consisting of either the design of a major geotechnical structure, or analytical or experimental work in geotechnical engineering or concrete technology.

8.4230 Metals Engineering S1 L2
Prerequisite: 8.2310. Corequisite: 8.3440.

Metals used in structures: types, applications and developments in steels, aluminium alloys etc. Corrosion: causes, prevention and control in structural, reinforcing and plating steels. Fatigue and brittle fracture: factors leading to increased risk, significance of welding; empirical and fracture mechanics approaches to design against failures in service.

8.4310 Pavement Engineering S1 L1T½
Prerequisite: 8.3310.

Pavement materials: subgrades, gravels, crushed rock, mechanical and chemical stabilisation, concrete, interlocking blocks, bituminous concrete, sprayed seals. Pavement design: traffic and environmental effects, loading spectra, design of flexible, rigid and block pavements. Pavement construction: construction processes and control.

8.4320 Structures Major S2 L/T1
Prerequisites: 8.4420, 8.4430, 8.4440.

Either: a design project and six of the following topics (only six topics will be offered in each year): Concrete structures. Steel structures. Bridges. Vibration. Applied analysis. Micro-computer applications. Special topics. Or: a research project and three of the above topics, specified by the supervisor.

8.4330 Structural Analysis 3 S1 L1T1
Prerequisite: 8.3420.

Approximate analysis and structural form. Brief discussions of cable structures, arches, plates and shells.

8.4410 Structural Design 4 S1 L1T1
Prerequisite: 8.3440.

Slab design: two-way edge supported slabs, simplified equivalent frame and direct design methods, punching shear, moment transfer at column connections, serviceability approach, detailing. Design of reinforced concrete footings and retaining walls. Plastic design of steel frames.

8.4420 Timber Engineering S1 L2
Prerequisite: 8.2420.

8.4510 Transport Major

Prerequisites: 8.3510, 8.4520.

Geometric design of transport elements: road location and form design, subdividing and simple intersections, application of computer aided design methods. Design for traffic management and control: efficiency, safety, environmental factors, information systems, lighting. Environmental and social impact of transport design. Transport operations: industry regulation, design for efficiency, timetabling of facilities. Project involving transport analysis or design.

8.4520 Transport Systems Analysis

Prerequisite: 8.2120.

Description and analysis of transport system interactions: feedback, steady state performance, sensitivity analyses. Travel demand: traffic generation and distribution. Transport supply: capacity and operational measures of different transport modes. Land use and transport interactions. Project involving transport analysis or design.

8.4610 Water Major

Prerequisites: 8.3630, 8.4620.

Either: a design project and four of the following topics (only six topics will be offered in each year): Water resources. Hydrology. Advanced hydraulics. Coastal engineering. Public health engineering. Environmental and social issues. Special topic. Or: a research project and four of the above topics, specified by the supervisor.

8.4620 Water Resources Engineering

Prerequisites: 8.3640.


8.6110 Structures


8.6120 Civil Engineering for Electrical Engineers

Includes an introduction to the various branches of civil engineering, the nature and organization of the profession. Relationship between clients and design consultants. The historical development of civil engineering. Theory of beams and trusses, resultant forces, structural action, stress and strain. Relation between load, shear force and bending moments, geometric properties of sections, deflection of beams. Properties of materials used in structures; various steels, concrete (plain, reinforced and prestressed), aluminium and timber. Brittle fracture. Introduction to buckling. Engineering failures. Introduction to design of transmission lines and towers.

8.6130 Properties of Materials


Mathematics

10.001 Mathematics 1

Prerequisite:

HSC Exam
Percentile Range
Required
2 unit Mathematics* or
71-100
2 unit Mathematics or
21-100
4 unit Mathematics or
1-100
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:
- 3 unit Mathematics
- or
- 4 unit Mathematics
Excluded: 10.001, 10.021B, 10.021C.

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

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 and/or Applied Mathematics and/or Theoretical Mechanics except that 10.412A may be taken with 10.031 and 10.032.

Note B: Mathematics 10.031 is included for students desiring to attempt only one Level II Mathematics unit. If other Level II units in Pure Mathematics or Applied Mathematics are taken, 10.031 Mathematics will not be counted.

Differential equations, use of Laplace transforms, solutions by series; partial differential equations and their solution for selected physical problems, use of Fourier series; multiple integrals, matrices and their application to theory of linear equations, eigenvalues; introduction to numerical methods.

10.111 Pure Mathematics 3 — Group Theory

Prerequisite: 10.001. Co-requisites: 10.111A, 10.1113, 10.1114, 10.2111, 10.2112. Excluded: 10.121A.

Mathematical systems, groups, determination of small groups, homomorphisms and normal subgroups.

10.112 Pure Mathematics 3 — Geometry


Elementary concepts of Euclidean, affine and projective geometries.

10.113 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.

10.114 Pure Mathematics 2 — Complex Analysis

Prerequisite: 10.001 or 10.011. Excluded: 10.1214.

Analytic functions, Taylor and Laurent series, integrals. Cauchy's Theorem, residues, evaluation of certain real integrals.

10.115 Pure Mathematics 2 — Finite Mathematics A

Prerequisite: 10.001.

Positional number systems, floating-point arithmetic, rational arithmetic, congruences, Euclid's algorithm, continued fractions, Chinese remainder theorem, Fermat's theorem, applications to computer arithmetic. Polynomial arithmetic, division algorithm, factorization, interpolation, finite field. Codes, error-correcting codes, public-key cryptography.

10.116 Pure Mathematics 2 — Finite Mathematics B

Prerequisite: 10.1115 (or any other Year 2 Mathematics half-unit).

Introduction to combinatorial computing, recurrence relations, examples of divide and conquer strategies, backtrack and branch and bound algorithms. Finite Fourier transforms, roots of unity, convolutions, applications to fast multiplication and the analysis of pseudorandom numbers. Boolean algebra, switching circuits.

10.121A Higher Pure Mathematics 2 — Algebra

Prerequisite: 10.001 or 10.001 (DN). Excluded: 10.111A, 10.1111.

10.1214 Higher Pure Mathematics 2 — Complex Analysis
Prerequisite: 10.1213. Excluded: 10.1114.
As for 10.1114 Pure Mathematics 2 — Complex Analysis, but in greater depth.

Prerequisite: 10.2211. Excluded: 10.2112.
As for 10.2112 but in greater depth.

10.2213 Higher Applied Mathematics 2 — Introduction to Linear Programming
Prerequisite: 10.011 or 10.001 (DN). Excluded: 10.2113.
As for 10.2113 but in greater depth.

10.2215 Higher Applied Mathematics 2 — Discrete-Time Systems
Prerequisite: 10.011 or 10.001 (DN). Excluded: 10.2115.
As for 10.2115, but in greater depth and with additional material on positive linear systems and Markov chains.

10.3111 Theory of Statistics 2 — Statistical Computing and Simulation
Prerequisite: 10.001 or 10.011 or 10.021C (CR). Co-requisite: 10.311A.
Introduction to APL, random variables, univariate transformation, simulation of random variables, APL programming, integer value random variables, random walks — theory and simulation, introduction to Markov chains.

10.3112 Theory of Statistics 2 — Nonparametric Statistical Inference
Prerequisite: 10.311A. Co-requisite: 10.311B.
Order statistics, exact and approximate distributions, multinomial distributions, goodness of fit, contingency tables, one-sample and two-sample estimation and inference problems.
10.321A Higher Theory of Statistics 2 — Probability and Random Variables S1 L3T1
Prerequisite: 10.001 or 10.011. Excluded: 10.311A, 10.301, 10.331, 45.101.
As for 10.311A but in greater depth.

10.321B Higher Theory of Statistics 2 — Basic Inference S2 L3T1
Prerequisite: 10.321A. Excluded: 10.311B, 10.301, 10.331, 45.101.
As for 10.311B but in greater depth.

10.3211 Higher Theory of Statistics 2 — Statistical Computing and Simulation S1 L1½T½
Prerequisite: 10.001 or 10.011. Co-requisite: 10.321A.
As for 10.3111 but in greater depth.

10.3212 Higher Theory of Statistics 2 — Nonparametric Statistical Inference S2 L1½T½
Prerequisite: 10.321A. Co-requisite: 10.321B.
As for 10.3112 but in greater depth.

10.331 Statistics SS F L1½T½
An introduction to the theory of probability, with finite, discrete and continuous sample spaces. The standard elementary univariate distributions: binomial, Poisson and normal, an introduction to multivariate distributions. Standard sampling distributions, including those of $\chi^2$, $t$ and $F$. Estimation by moments and maximum likelihood (including sampling variance formulae, and regression); confidence interval estimation. The standard tests of significance based on the above distributions, with a discussion of power where appropriate. An introduction to experimental design; fixed, random and mixed models, involving multiple comparisons and estimation of variance components.

10.341 Statistics SU F L1½T½
Prerequisite: 10.001 or 10.011.
Introduction to probability theory, random variables and distribution functions, sampling distributions, including those of $t$, $\chi^2$ and $F$. Estimation procedures; including confidence interval estimation with an emphasis on least squares and surveying problems, and computer based exercises.

10.351 Statistics SM F L1T½
Prerequisite: 10.001 or 10.011.
For students in Aeronautical, Industrial and Mechanical Engineering and Naval Architecture as part of 5.071 Engineering Analysis or 5.072 Statistics/Computing.

Introduction to probability theory, with finite, discrete and continuous sample spaces. Random variables: the standard elementary distributions including the binomial, Poisson and normal distributions. Sampling distributions: with emphasis on those derived from the normal distribution: $t$, $\chi^2$ and $F$. Estimation of parameters: the methods of moments and maximum likelihood and confidence interval estimation. The standard test of statistical hypotheses, and, where appropriate, the powers of such tests. An introduction to regression and the bivariate normal distribution.

10.361 Statistics SE FL1½T½
Prerequisite: 10.001 or 10.011.
For students in the School of Electrical Engineering.

Introduction to probability theory, random variables and distribution functions; the binomial, Poisson and normal distributions in particular. Standard sampling distributions, including those of $\chi^2$ and $t$. Estimation by moments and maximum likelihood; confidence interval estimation. The standard tests of significance based on the above distribution with a discussion of power where appropriate.


10.381 Statistics SC S1 or S2 L1T1

10.4111 Theoretical Mechanics 2 — Introduction to Theoretical Mechanics S1 L1½T½

10.4112 Theoretical Mechanics 2 — Introduction to Hydrodynamics S2 L1½T½
Equations of continuity and motion. Bernoulli's equation for an incompressible liquid. Kelvin's theorem. Some irrotational flow problems in one, two and three dimensions.
10.412A Theoretical Mechanics 3 — Dynamical and Physical Oceanography

Prerequisites: 10.2111 and 10.2112 or 10.031, 1.001. It is recommended that one of the following be taken concurrently: 10.4112 or 1.3533.


10.412B Theoretical Mechanics 3 — Continuum Mechanics

Prerequisites: 10.2111, 10.2112, 10.111A, 10.1113, 10.1114. Co-requisites: 10.411A or 1.012 or 1313. Excluded: 10.422B.


14.001 Introduction to Accounting A

Architecture: 2 credit points; compulsory for BBuild degree course students.

Prerequisite: Nil.


14.002 Introduction to Accounting B

Architecture: 2 credit points; compulsory for BBuild degree course students.

Prerequisite: 14.001.

An introduction for non-commerce students to managerial accounting. Long-range planning, budgeting and responsibility accounting; cost determination, cost control and relevant cost analyses.

Economics

Industrial Relations

15.501 Introduction to Industrial Relations

For students enrolled in Faculties other than Commerce and Arts. Designed to provide a practical introduction to important industrial relations concepts, issues and procedures. Includes: the origins, evolution and operation of the Australian system of industrial relations; the structure and role of trade unions and employer bodies; the function of industrial tribunals such as the Australian Conciliation and Arbitration Commission and the NSW Industrial Commission; wages structure and determination; employment, unemployment and retraining; the nature and causes of strikes and other forms of industrial conflict; the processes and procedures for conflict resolution.

Where appropriate to class composition, particular attention is paid to individual industries.

Health Administration

16.711 Quantitative Methods 1

Prerequisite: 16.540.

Industrial Engineering

Industrial Engineering is a Department within the School of Mechanical and Industrial Engineering.

18.003 Numerical Methods/Industrial Experimentation  
Prerequisites: 5.0721, 10.022, 10.351.


18.004 Manufacturing Management  
Prerequisites: 18.503, 18.603, 14.001, 14.002.

Production control: modes of manufacture, information flow in multi-stage production systems; classical production and inventory models and control techniques; Material Requirements Planning; Just-in-Time Production; Flexible Manufacturing Systems and their control. Quality control: sampling inspection, economic aspects, control charts, management of QC. Project control: critical path scheduling, PERT. Computers in manufacturing management: systems design.

18.091 Industrial Management  
Prerequisites: 10.2112, 10.361.

Engineering Economy: economic objectives of the firm. Economic measures 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. Introduction to Operational Research: The formation and optimization of mathematical models of industrial processes. The development of decision rules. Some techniques of operational research and applications, eg mathematical programming, queuing theory, inventory models, simulation, critical path networks. 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.

18.224 Numerical Control of Machine Tools  
Prerequisite: 5.0721.

Overview of numerical control systems; machine specification and selection; manual part programming; production and operator aspects including selection of operating conditions, work holding devices and tooling; introduction to computer assisted programming dealing with specific and generalized part programming.

18.303 Methods Engineering  
Prerequisite: 10.351.


18.403 Production Design and Technology  
Prerequisites: 5.072, 5.422 or 5.411 and 8.259.

Basic metrology and tolerancing, introduction to plasticity theory and its application to theories for machining and forming, economics of production processes; interaction of machines and tools; principles of process selection; review of major processes, interaction of design, production quantity, materials and processes; value analysis.

18.404 Design for Production  
Prerequisite: 5.123 or 18.413.

Product design, development and manufacture important in the manufacturing industry. Includes industrial design, patents law, product liability, product reliability, safety standards and regulations, process and operation planning, advanced production aids and jig and fixture design, advanced measuring inspection and gauging methods, quality control methods and systems.

18.413 Design for Industrial Engineers  
Prerequisites: 5.122, 5.422.

Tooling design. Production aids. Fluid power systems. Introduction to fatigue in design. Design analysis for manufacture; component design and drawing with individual and group projects of an interdisciplinary nature. (Some material taken with 5.123 Mechanical Engineering Design 3.)

18.503 Operations Research A  
Prerequisites: 5.072, 10.022. Co-requisite: 18.803.

History and overview of operations research. Decision theory. Methodology: identification and formulation of the problem; construction of a model, obtaining solutions; testing the model and implementing the solution. Case study.

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, queuing 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.
18.503 Management/Economics  
Prerequisites: 5.072, 18.020.


18.803 Optimization  
Prerequisite: 10.022.


Servicing Subjects
These are subjects taught within courses offered by other faculties.

For further information regarding the following subjects see the Faculty of Applied Science Handbook.

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. Introduction to Operational Research: The formation and optimization of mathematical models of industrial processes. The development of decision rules. Some techniques of operational research and applications, e.g., mathematical programming, queuing theory, inventory models, simulation.

18.1211 Production Management A  
Prerequisites: 10.031, 10.331.

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.

18.1212 Production Management B  
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. Introduction to Operational Research: Formation and optimization of mathematical models of industrial processes. Development of decision rules. Some techniques of operational research and applications, e.g., mathematical programming, queuing theory, inventory models, simulation.

18.131 Operations Research  
Introduction to Operational Research: The formation and optimization of mathematical models of industrial processes. The development of decision rules. Some techniques of operational research and applications, e.g., mathematical programming, queuing theory, inventory models, simulation.

Nuclear Engineering

23.051 Nuclear Power Technology  
The status of fusion research and development. The technology, safety, economics and environmental impact of nuclear fuel cycles, from mining, through enrichment, fabrication and burnup to waste disposal. Comparative assessment of nuclear, fossil and alternative energy systems in local and global contexts.

Applied Geology

25.110 Earth Materials and Processes  
Constitution of the Earth: The Earth and the Solar System. The interior of the Earth: The crust and its chemical composition, gravity and isostasy. Minerals and rocks, economic mineral deposits. Earth Pro-
esses. The origin of igneous rocks; plutonism and volcanism. The geological cycle. Weathering processes, soil formation and landforms. The origin of sedimentary rocks; transportation, deposition, lithification. And, glacial and periglacial processes. Geological time: Metamorphism and metamorphic rocks. Structural geology, classification and origin of faults and folds. Quaternary stratigraphic sequences, neotectonics. Field Work of up to two days is a compulsory part of the subject.

25.120 Earth Environments and Dynamics S2 L2T4

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)
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 subject 2 Unit Mathematics (Mathematics in Society).


25.211 Earth Materials 1 S1 L2T4

Prerequisite: 25.120.


25.212 Earth Environments 1 S1 L3T3

Prerequisite: 25.120.


25.221 Earth Materials 2 S2 L3T3

Prerequisite: 25.211.


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. Orthomorphic, hydrothermal, porphyry, volcanic-sedimentary, Mississippian Valley type, chromium, 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 textural studies. *Field Work* of up to four days is a compulsory part of the subject.

**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, eg Cooma Complex, Broken Hill. *Field Work* of up to three days is a compulsory part of the subject.

**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.

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**Geography**

**27.111 Applied Physical Geography 1**  
F L2T3  
Prerequisites:

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<td>4 unit Science (multistrand)</td>
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A systematic introduction to physical geography as a basis for applied studies. Principles of meteorology and climatology with particular emphasis on climatic controls at local and regional scales. Weather systems and forecasting methods. Climatic classification and the regional pattern of climates in Australia. Geologic and climatic factors in landforms and soils, and in the physiographic build and major
27.133 Pedology
Prerequisites: 27.111 or any two units from 2.111, 2.121, 2.131, 2.141, and 27.811 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
Prerequisites: 27.311/811 or 27.828 or 17.031 and 17.041 or 27.111 or 27.172.


27.153 Climatology
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.


27.172 Environmental Measurements
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 geomorphologic 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.

27.175 Introduction to Remote Sensing
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 airborne interpretation techniques relevant to environmental assessment. Introduction to principles of the electromagnetic spectrum, photometry and radiometry. Sensor types, image formation and end products associated with selected satellite programs including Landsat. Land-cover and land-use interpretation procedures in visual image analysis. Basic procedures in machine-assisted image enhancement.

27.176 Remote Sensing Applications
Prerequisite: 27.175 or 27.171.

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 road location and hazard monitoring.

27.183 Geomorphology
Prerequisites: 25.110 and 25.120 or 27.311/811 or 27.828 or 27.111 or 27.172. Excluded: 27.860.

27.295 Physical Geography for Surveyors  S1 L2T2
Fundamentals of physical geography. Landscapes of 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.

27.862 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.

Surveying

Note: Electronic Calculators.

Students enrolled in the surveying courses are required to equip themselves with an electronic calculator. Advice on the purchase of this equipment is given to students at the commencement of their course.

29.1010 Surveying 1  S1 L2½T2½

29.1110 Computations 1  S1 L1T1
Principles of calculation, rounding off, significant figures, estimation of orders of magnitude. Fundamentals of programming, introduction to Fortran, constant types, data elements, Fortran arithmetic, selection control, loop control, input and output. Program modules, documentation and presentation.

29.1710 Professional Orientation  S1 L1½T½
The scope of surveying activities and their relationship to associated disciplines. Introduction to geodesy and positioning from stars and satellites; map projections and coordinates; aerial photographs, maps and remote sensing, applications in resource surveys; cadastral, engineering and land development surveys, role of the consulting surveyor; mining and hydrographic surveys. Includes visits to surveying organizations.

29.2010 Surveying 2  S2 L1½T2½
Principles of levelling, methods, recording, levelling instruments; testing and adjustment. Theodolites; principles and construction. Horizontal and vertical angle measurement.

29.2040 Survey Draughting  S2 L½T2½

29.2050 Survey Camp  S2
Detail surveys using minor instruments, setting out using steel band and theodolite, levelling, compass and tape traversing between control.

29.3010 Surveying 3  S1 L2½T2
Theodolite errors; testing and adjustment. Control surveys. Traversing; methods, calculation and errors. Trigonometric and Barometric heighting. Hydrostatic levelling. Error propagation, precision, accuracy and testing.

29.3110 Computations 2  S1 L3T1½
Prerequisite: 29.1110.
Programming Strand: Operating systems, library programs, file structures, data base management, programming examples. Computations Strand: Algorithm development for traverse adjustment by Bowditch's method. Intersection and resection (unique solution and solution with redundant data), trilateration, semigraphic solution of mixed observations, missing data problems, road intersections, subdivision calculations, transformations. Spherical trigonometry.

29.4010 Surveying 4  S2 L2½T2½
Co-requisites: 29.3010, 29.3110.
29.4050 Survey Camp  

Theodolite and steel band traverse; surveys by stadia. Road survey. Setting out of horizontal and vertical circular curves. Long section and cross sections.

29.4150 Electronics for Surveyors  
Prerequisite: 1.971.

Introduction to digital circuits and systems. Data transmission, recording and display.

29.4220 Introduction to Geodetic Science  
Prerequisites: 1.971, 10.001. Co-requisite: 10.022.

Historical development of geodesy. Scope and goals of contemporary geodesy. The earth's gravity field. The earth's motions in space. Foundation of celestial observations for position and azimuth determination. Time and time keeping. Coordinate systems and transformations. Earth satellite motion.

29.441 Surveying for Engineers  
S1 or S2 L2T4


29.4520 Remote Sensing and Resource Surveys  
S2 L1¼T1½


29.4710 Report Writing  
S2 L1T1

Requirements and purposes of technical reports. Introduction to the literature of surveying, literature searches. Characteristics of effective writing: structure, style, vocabulary. Citations and references. Exercises in technical writing, criticism and editing.

29.4810 Land Management and Development 1  
S2 L2T1

Surveyor's role in land development. Variation of land use and land value: effect on land development. Urbanization and land use. Location theory. Public measures for directing land use; social, economic and locational determinants of land use; land on urban fringe. Introduction to valuation; factors affecting value of land; valuation principles for land use and subdivision.

29.491 Survey Camp

A one-week field camp for students studying 29.441 Surveying for Engineers.

29.5010 Surveying 5  
S1 L2T2½

Prerequisite: 29.3010.

Precision theodolites; construction, errors and testing. Precise horizontal angle measurement. Electronic theodolites. Precise levelling; instruments, staves, errors. Field methods, marking and accuracy.

29.5110 Computations 3  
S1 L2T2

Prerequisite: 29.3110.


29.5220 Geodetic Positioning  
S1 L2T½

Prerequisites: 29.4220, 10.022, 10.341.


29.5230 Map Projections  
S1 L2T½

Prerequisites: 10.022, 29.4220.


29.5610 Cadastral Surveying and Land Law 1  
S1 L2½T1

The legal system in Australia and NSW; the nature of land law including land tenure, estates in land, interests in land; title systems in land; land administration in Australia and NSW. Boundary surveying — controlling principles; cadastral mapping in NSW.

29.6010 Surveying 6  
S2 L2T2½

Prerequisite: 29.3010. Co-requisite: 29.5010.


29.6220 Field Astronomy  
S2 L2T1

Prerequisite: 29.4220.

Introduction to the determination of latitude and longitude from meridian and prime vertical observations. Determination of azimuth from the sun and close circum-polar and circum-elongation stars. Simultaneous determination of latitude and longitude by position lines.
29.6510 Photogrammetry 1  
Prerequisite: 29.3110.

29.6610 Cadastral Surveying and Land Law 2  
Prerequisite: 29.5610.
Survey investigation for both artificial and natural boundaries; survey and title searching; field note preparation for cadastral surveying; survey marking; preparation of plans of survey; study of appropriate statutes and regulations; cadastral survey techniques for urban and rural properties; the role of coordinates in cadastral surveying.
The status of roads in NSW; Identification surveys; consents for MHWM, railways, rivers, kerbs in Sydney, strata plan surveys including plan preparation; the surveyor as a professional; contract, partnership and corporations, liability; surveyors and the law, limitation periods, insurance, loss prevention; software packages for cadastral surveying.

29.6810 Land Management and Development 2  
Co-requisite: 29.5610.
Subdivision control in NSW; broad-acre subdivisions under Local Government and Planning and Environment Legislation, procedures and legal controls; review of subdivision design; engineering aspects.

29.7010 Surveying 7  
Co-requisite: 29.6010.

29.7050 Survey Camp  
Prerequisites: 29.5010, 29.6010, 29.5110, 29.6220, 29.6610, 29.5610, 29.6610.
Cadastral Surveying including astronomic observations for azimuth, land use survey including air photo and Landsat imagery interpretations. Photo control survey by traverse and resection, precise traverse and heighting with EDM. Preparation of reports based on field tasks completed.

29.7120 Computer Graphics  
Prerequisite: 29.3110.
Computer graphics, especially in relation to computer assisted mapping and draughting. Acquisition, processing and presentation of data; graphics programming using a high level language and a graphics language; use of interactive graphics display terminals and plotters.

29.7220 Geodetic Computations  
Prerequisites: 29.5220, 29.5110.
Elements of geodetic methodology; classes of mathematical models. Least squares solution of overdetermined models; assessment of results. Adjustment of control surveys. Solution of direct and inverse geodetic problems.

29.7510 Photogrammetry 2  
Prerequisite: 29.6510.

29.7810 Land Management and Development 3  
Prerequisite: 36.411.
Design and studio project for a residential neighbourhood development. Constraint and site analysis; preparation of maps of land use, vegetation, surface and soils, drainage and terrain, slopes, climates and aspect; composite overlay maps. Structure plan design: residential precincts, schools, commercial areas, industrial areas, active and passive recreation, pedestrian ways and road hierarchy.

29.8010 Surveying 8  
Prerequisite: 29.5010.

29.8220 Global Geodesy  
Prerequisite: 29.5220. Co-requisite: 29.7220.

29.8510 Photogrammetry 3  
Co-requisite: 29.7510.

29.8710 Seminar  
Prerequisite: 29.4710.
Introduction to characteristics of effective speaking. Oral presentation by individual students on topics in selected areas of surveying. Participation in colloquia by invited speakers on current topics in surveying. Student assessment of degree course.
29.8720 Management S2 L2

29.8810 Land Management and Development 4 S2 L1T1
Prerequisites: 8.6140, 8.6150. Co-requisite: 29.7810.
Continuation of design and studio project for a residential neighbourhood development. Plan of detailed lot layout: consideration of access, grades, drainage reserves, parks and pedestrian ways. Engineering design and plans: catchment details, road longitudinal and cross-sections, drainage layout, flow schedule, hydraulic grade line calculations, longitudinal sections of kerb profiles.

29.9010 Advanced Surveying Instruments S1 or S2 L2T1
Prerequisites: 29.5010, 29.6010.

29.9020 Hydrographic Surveying S1 or S2 L1T2
Prerequisite: 29.7010.
Practical training: a hydrographic survey requiring establishment of horizontal and vertical shore control, preparation of plotting sheets, control marking, bathymetry, equipment calibration, tidal observations and reduction, inking in. Other navigational equipment. Nature of seabed, wind waves, the survey report. Discussions on practical surveying tasks or topics of current interest. Harmonic analysis of tidal data.

29.9030 Precise Engineering Surveying S1 or S2 L2T1
Prerequisites: 29.5010, 29.6010.
Review of survey problems in industry and engineering. Surveys for large structures — location, setting out and control during construction, monitoring of deformation and settlement: high precision mechanical, optical and electronic equipment for distance measurement, levelling, horizontal and vertical alignment, local deformation. Network design, station marking, observation techniques, data presentation, deformation and settlement analysis including free network solutions. Close-range surveys: optical tiling, laser interferometry. Positioning and alignment of machine components, optical positional constraints, scale and azimuth control.

29.9080 Project S1 or S2 T3
Prerequisites: High standard in the chosen topic area normally required; permission of project supervisor.
Theoretical or practical investigation of a selected topic under the guidance of a supervisor, with a report of a high academic standard required. Topic may be one suggested by the School or by the individual student based on his or her experiences.

29.9210 Adjustment of Control Networks S1 or S2 L1½T1½
Prerequisite: 29.7220.

29.9220 Advanced Geodetic Positioning S1 or S2 L2T1
Prerequisite: 29.5220.
Precise aspects of terrestrial and extraterrestrial reference frames; units, constants, coordinate systems and transformations used in satellite positioning; modeling of measurements. Orbit determination. Positioning with GPS; field procedures. Inertial surveying systems: inertial frame; sensors; mathematical and error models; filtering and smoothing processes; post-mission adjustment techniques; inertial positioning methods and applications.

29.9520 Remote Sensing Principles S1 or S2 L1½T1½
Prerequisite: 29.4520.
Definition and physics of basic electromagnetic quantities, atmospheric effects, photographic film images and sensors. Thermal infrared sensing, radar, radar sensing, electro-optical sensors. Choice of sensor and data processing. Remote sensing project.

29.9530 Land Information Systems S1 or S2 L2T1
Land information systems and computer-assisted mapping; land information as maps and records; computerization of land information; data acquisition from ground surveys, aircraft and satellite mounted sensors; data acquisition from maps and air photographs; data storage methods; data structures; data processing, transformations, searching, sorting; data base management systems; interactive graphical editing; data output including computer plotters and software packages; cartographic presentation; an examination of existing systems in Australia and overseas.

29.9610 Modern Cadastral Concepts S1 or S2 L2T1
Prerequisite: 29.6610.
An analysis of the operation and components of a modern cadastral survey system, especially the relationship between title, conveyancing, surveying and mapping. Components of land tenure and cadastral systems; statewide parcel based land information systems; cadastral models. Horizontal and vertical subdivision, trends in group housing in Australia and overseas, ownership alternatives including strata titles, management of strata schemes, the development process related to strata subdivision.
29.9910 Special Topic in Surveying A S1 or S2 L2T1
A special subject to be lectured on by visiting professors or other visiting staff. Details of syllabus and lecturer to be communicated to Faculty on each occasion when the subject runs.

29.9920 Special Topic in Surveying B S1 or S2 T3
A special subject taken by a group of students by private study in conjunction with tutorial sessions with the member(s) of staff in charge of the subject.

Chemical Engineering and Industrial Chemistry

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.

48.403 Polymer Science S1 or S2 L2T1
Prerequisites: 2.102A, 2.102B, 10.031, 10.301. Co- or prerequisites: 48.001, 48.113.

Anatomy

70.011C Introductory Anatomy S1 L2T4
Prerequisites: 17.031, 17.041.
Introduction to gross anatomy, based on a study of prospected specimens. Musculoskeletal, cardiovascular, respiratory, gastrointestinal, genitourinary and nervous systems. General topographical and surface anatomy. Normal variations including those related to sex and age.

70.306 Functional Anatomy 1 S1 L2T4
Prerequisite: 70.011C.
Introduction to fundamental issues in the morphology and dynamics of human movement systems. Includes: physical properties of bone, muscle and connective tissue; biomechanics, movement analysis and neuromuscular control. These basic principles are applied to a detailed study of musculoskeletal components of head and neck and upper limb. Emphasis on modern analytical techniques and findings. Tutorials include detailed limb and joint dissections plus intensive study of surface and radiological anatomy.
Physiology and Pharmacology

73.111 Physiology 1A F L2T4
Prerequisites: 17.031 & 17.041; 2.121 & 2.131, or 2.141; 10.001 or 10.011 or 10.021 B & C. Excluded: 73.121, 73.011A. Co-requisite: 41.101.

Introduction to fundamental physiological principles, dealing first with basic cellular function in terms of chemical and physical principles, and, second, with the operation of the various specialized systems in the body, for example, the cardiovascular system, whose function it is to transport materials to and from the tissues of the body; the respiratory system which must maintain the exchange of oxygen and carbon dioxide between the atmosphere and the blood; the gastrointestinal system which enables food materials to be modified by digestion and absorbed into the circulation; the kidney which is involved in the regulation of body fluid and electrolyte balance and with the excretion of the waste products of metabolism; the endocrine system which releases chemical messengers, called hormones, that are carried in the blood stream to regulate a great variety of body functions, eg metabolism and reproductive activity; the nervous system which by means of very rapidly propagated electrical impulses is responsible for all our movements, sensations, memories, emotions and consciousness itself. A substantial series of practical class experiments on these different areas of physiology is included in the course. This subject is taken by students enrolled in any of the Physiology programs.

Law

90.502 Industrial Safety and Health Law S1 S2Hpw4 C3
The law relating to compensation for work-related injuries and disabilities and to the regulation of safety standards in industry and of the processes and substances employed therein. Topics include: the employer's common law duty of care; the development and application of workers' compensation schemes; comprehensive no-fault compensation schemes and inquiries relating thereto in their application to industrial injuries and disabilities; existing protective legislation in Australia; a comparative survey of protective legislation in other countries and its effectiveness; proposals for amendment of protective legislation; individual rights under protective legislation; regulation of industrial safety and health under compulsory arbitration schemes; management and union initiatives in the fields of industrial safety and health; new problems in industrial safety and health.
Faculty of Engineering
Enrolment Procedures

All students re-enrolling in 1986 or 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 School of Engineering

In November 1964 the Council of the University approved the establishment of the Graduate School of Engineering to co-ordinate and develop the graduate activities of the Faculty.

Through its Schools and Centres for Biomedical Engineering and Remote Sensing, the Faculty provides excellent facilities for well-qualified graduates to engage in advanced studies and research. The Faculty awards seven higher degrees as follows: Research — Doctor of Philosophy, Master of Engineering and Master of Surveying; Course Work Masters — Master of Engineering Science (available in a number of areas of specialization), Master of Surveying Science, Master of Safety Science and Master of Biomedical Engineering. In addition, the degrees of Doctor of Science and Master of Science may be awarded for research conducted in, or in association with, the Faculty of Engineering.

Research Degrees

Doctor of Philosophy
PhD

This degree is awarded for a thesis considered to be a substantially original contribution to the subject concerned. The degree is becoming a prerequisite for research appointments in government and industrial research and development laboratories.

Admission Guidelines

A candidate for registration for the degree of Doctor of Philosophy should hold an honours degree from the University of New South Wales or an honours degree of equivalent standing from another approved university. Applications for admission should be made to the...
Master of Engineering/Master of Science/ 
Master of Surveying 
ME/MSc/MSurv

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

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

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

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

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<td>Computer Science</td>
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<td>Mechanical and Industrial Engineering</td>
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<tr>
<td></td>
<td>Surveying</td>
<td>1680</td>
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<tr>
<td></td>
<td>Biomedical Engineering</td>
<td>1710</td>
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<tr>
<td>ME</td>
<td>Civil Engineering</td>
<td>2650</td>
</tr>
<tr>
<td></td>
<td>Electrical Engineering</td>
<td>2650</td>
</tr>
<tr>
<td></td>
<td>Computer Science</td>
<td>2661</td>
</tr>
<tr>
<td></td>
<td>Mechanical and Industrial Engineering</td>
<td>2690</td>
</tr>
<tr>
<td></td>
<td>Nuclear Engineering</td>
<td>2700</td>
</tr>
<tr>
<td>MSurv</td>
<td>Surveying</td>
<td>2720</td>
</tr>
</tbody>
</table>

MSc Civil Engineering 2750
Electrical Engineering and Computer Science 2761
Mechanical and Industrial Engineering 2780
Nuclear Engineering 2785
Biomedical Engineering 2795

Course Work Masters Degrees

Master of Engineering Science/Master of Surveying Science 
MEngSc/MSurvSc

These are Faculty-wide degrees allowing for flexibility of choice between formal course work and research. The schools in the Faculty have developed recommended programs of study leading to specialization in certain areas.

Candidates are required to complete a program totalling 36 credits* for formal course work. Alternatively a degree may be awarded for the completion of formal course work and a report on a project or completion of a thesis. The number of credits for a project report are 9 or 18, and 36 for a thesis.

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

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

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

Applicants for admission to a course of study leading to the award of a course work Masters degree should apply to the

*See definition of 'credit' under Graduate Subjects later in this section.
Registrar on the prescribed form at least two calendar months before the commencement of the session in which registration is to begin. It may be necessary to limit entry to some formal courses because of available resources. In such cases, an application may be provisionally accepted 'subject to acceptance within one month. Period of Candidature The normal period is two academic sessions (full-time) or four academic sessions (part-time) from the date of enrolment. The maximum period of candidature is four academic sessions (full-time) and eight academic sessions (part-time). In special cases an extension of time may be granted. A candidate is not permitted to continue in a course if the credit value of the subjects failed totals more than six.

Master of Biomedical Engineering MBiomedE

This degree is primarily obtained through course work but includes a project report conducted in either a hospital or other institution. The course of study offers scope for original research into the application of engineering principles and technology to medical problems. Candidates must complete a program totalling 60 credits, 40 of which must be for the study of subjects at graduate level.

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

Applicants for admission to a course of study leading to the award of a course work Masters degree should apply to the Registrar on the prescribed form at least two calendar months before the commencement of the session in which registration is to begin.

Period of Candidature The normal period is three academic sessions (full-time) and six academic sessions (part-time) from the date of enrolment. The maximum period of candidature is six academic sessions (full-time) and ten academic sessions (part-time). In special cases an extension of time may be granted. A candidate is not permitted to continue in a course if the credit value of the subjects failed totals more than six.

Courses of Study

Courses of study leading to the award of course work Masters degrees may be undertaken in the Faculty as follows:

<table>
<thead>
<tr>
<th>Degree</th>
<th>School/Course</th>
<th>Course Code</th>
</tr>
</thead>
<tbody>
<tr>
<td>MEngSc</td>
<td>Electrical Engineering and</td>
<td>8500</td>
</tr>
<tr>
<td></td>
<td>Computer Science</td>
<td></td>
</tr>
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<td></td>
<td>Industrial Engineering</td>
<td>8530</td>
</tr>
<tr>
<td></td>
<td>Mechanical Engineering</td>
<td>8540</td>
</tr>
<tr>
<td></td>
<td>Nuclear Engineering</td>
<td>8550</td>
</tr>
<tr>
<td></td>
<td>Remote Sensing</td>
<td>8640</td>
</tr>
<tr>
<td></td>
<td>Civil Engineering</td>
<td>8610</td>
</tr>
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<td></td>
<td>Surveying</td>
<td>8640</td>
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<tr>
<td>MSurvSc</td>
<td>Surveying</td>
<td>8650</td>
</tr>
<tr>
<td>MBiomedE</td>
<td>Biomedical Engineering</td>
<td>8660</td>
</tr>
<tr>
<td>MSafetySc</td>
<td>Safety Science</td>
<td>8670</td>
</tr>
</tbody>
</table>

The program in Remote Sensing is offered in both the Faculty of Engineering and the Faculty of Applied Science. Entry into either Faculty depends upon the background of the applicant and the orientation of the proposed program.

The program in Arid Lands Management, to which the Faculty of Engineering contributes, is available in the Faculty of Applied Science (course code 8025). Details are available from the Faculty of Applied Science Handbook.

Subjects available in the Faculty of Engineering are listed toward the end of this section. However, not all electives are offered in any particular year. Subject descriptions appear in the following chapter of the handbook.
Course Work Programs

Detailed information is available from the schools offering the courses.

8500 Electrical Engineering and Computer Science

Master of Engineering Science
MEngSc

- All candidates must commence in Session 1 and possess an appropriate level of knowledge for the subjects chosen.
- All candidates elect to study in one of the specific programs offered by the School of Electrical Engineering and Computer Science; each Program Co-ordinator will advise if applicants are adequately qualified to undertake the proposed subjects and must approve the chosen program.

All candidates must register in one of the following programs:

- Dr C. J. E. Phillips
- Dr T. R. Blackburn
- Dr H. S. Blanks
- A/Prof. A. Dunworth
- Dr R. F. Brown

In an all course work program of 36 credits (ie 12 subjects) at least 9 subjects from the program area must be chosen and up to 3 from other areas. Where an 18 credit project is approved, a lesser number of subjects is taken.

After a transition period, the programs will require more specific core subjects to be studied.

8501 Communications
8502 Electric Power
8503 Electronics
8504 Computer Science
8505 Systems and Control

Formal lecture subjects are not restricted to the School of Mechanical and Industrial Engineering, Faculty or University, but two-thirds of all credits must be taken at the University of New South Wales.

In consultation with their School Adviser, candidates at enrolment put together a program which is based on these requirements, but which may be modified from time to time in the light of changes in availability of subjects. These requirements also apply to a number of specialist courses which are offered by the School of Mechanical and Industrial Engineering and which are described below.

Specialist Programs

1. Refrigeration and Air Conditioning

16 credits of core subjects:

- 5.151-2G Refrigeration and Air Conditioning Design 1, 2 3 3
- 5.716-7G Advanced Heat Transfer 1, 2 3 3
- 5.751-2G Refrigeration, Air Conditioning and Cryogenics 1, 2 2 2

2 credits of approved options from subjects offered by this School or elsewhere

and

18 credit Project Report

or

9 credit Project plus 9 credits from:

- 5.074 Computer Science for Mechanical Engineers 2
- 5.075-6G Computational Methods in Mechanical Engineering 1, 2 2 2
- 5.086G Digital Logic Fundamentals for Mechanical Engineers 3
- 5.087G Microprocessor Fundamentals for Mechanical Engineers 3
- 5.328-9G Control and Modelling of Mechanical Systems 1, 2 3 3
- 5.345-6G Analogue, Non-Linear Control Systems 1, 2 3 3
- 5.653-4G Acoustic Noise 1, 2 2 2
- 5.655G Energy Conservation and System Design 3
- 5.722G Solar Thermal Energy Design 3
- 5.758-9G Refrigeration and Air Conditioning Applications 4
- 35.426G Building Services 3

or such other subjects as may be approved by the Head of School.

8530 Industrial Engineering

8540 Mechanical Engineering

Master of Engineering Science
MEngSc

A major field of study is required to be nominated and two-thirds of the 36 credits required for the degree must be taken in that major field. (Examples of major fields are heat engines, fluid mechanics, solar energy, etc. Consult School Advisers for further details.)

All candidates take either a 9 credit or 18 credit project on a topic in their major field.
2. Industrial Automation

18 credits of core subjects taken from:

- 5.086G Digital Logic Fundamentals for Mechanical Engineers (3)
- 5.087G Microprocessor Fundamentals for Mechanical Engineers (3)
- 5.089G Elements of Industrial Automation (3)
- 5.090G The Analysis and Use of Integrated CAD/CAM Systems (3)
- 5.328G Control and Modelling of Mechanical Systems (3)
- 6.460G Real Time Computing and Simulation (3)

or

18 credit Project Report

or

9 credit Project and a further 9 credits from subjects selected from:

- 5.075G Computational Methods in Mechanical Engineering 1 (2)
- 5.088G Industrial Applications of Microprocessors (3)
- 5.317G Industrial Robotics (3)
- 6.458G Decision and Syntactic Systems for Digital Pattern Recognition (3)
- 6.467G Digital Image Processing, Scene Analysis and Machine Vision (3)
- 18.772G Information Processing Systems in Organizations (2)
- 18.878G Industrial Applications of Mathematical Programming (2)

or such other subjects as may be approved by the Head of School

3. Industrial Management

3 credits of core subjects:

- 18.074G Industrial Management (3)
- 18.965G Industrial Management Seminar (0)

at least 11 credits selected from:

- 14.062G Accounting for Engineers (3)
- 18.380G Methods Engineering (4)
- 18.571G Operations Research 1 (6)
- 18.675G Economic Decisions in Industrial Management (3)
- 18.776G Production and Inventory Control (2)
- 18.909G Project (9)

or

18.918G Project Report (18)

The remaining credits may be selected from:

- 15.565G Industrial Relations (3)
- 18.061G Industrial Experimentation 1 (3)
- 18.075G Decision Support Systems (2)
- 18.171G Inspection and Quality Control (3)
- 18.360G Ergonomics (3)
- 18.371G Factory Design and Layout (3)

4. Operations Research

Prerequisites:

(i) 2 years of University level Mathematics
(ii) minimum 40 hours University level course in Probability and Statistics (or enrolment in 5.0721 Computing or equivalent as a co-requisite)
(iii) minimum 40 hours University level course in Engineering Economic Analysis (or enrolment in 18.675G Economic Decisions in Industrial Management as a co-requisite)
(iv) competence in computer programming (or enrolment in 5.0721 Computing as a co-requisite).

12 credits of core subjects:

- 14.062G Accounting for Engineers (3)
- 18.571G Operations Research 1 (6)
- 18.574G Management Simulation (3)
- 18.970G Operations Research Seminar (0)
- 18.909G Project (9)

or

18.918G Project Report (18)

The remaining credits may be selected from:

- 18.074G Industrial Management (3)
- 18.075G Decision Support Systems (2)
- 18.360G Ergonomics (3)
- 18.371G Factory Design and Layout (3)
- 18.380G Methods Engineering (4)
- 18.464G Value Analysis/Engineering (3)
- 18.671G Decision Theory (2)
- 18.672G Decision Theory for Industrial Management (3)
- 18.673G Energy Modelling, Optimization and Energy Accounting (3)
- 18.675G Economic Decisions in Industrial Management (3)
- 18.761G Simulation in Operations Research (3)
- 18.764G Management of Distribution Systems (2)
- 18.765G Optimization of Networks (2)
or such other subjects as may be approved by the Head of School

5. Advanced Analysis for Design

Prerequisites:
(i) 5.123 Mechanical Engineering Design 3 or equivalent
(ii) 5.423 Mechanics of Solids 3 or equivalent

21 credits of core subjects:
5.414G Finite Element Applications 3
5.415G Stress Analysis for Mechanical Engineering Design 1 3
5.417G Mechanics of Fracture and Fatigue 3
5.909G Project (Design and Build) 9
18.360G Ergonomics 3

plus at least 5 credits selected from:
5.1242 Design Technology 2
5.1244 Design Management 2
5.1245 Computer Based Engineering Design (or 18.870G) 2
5.403G Experimental Stress Analysis 3
6.044 Electrical Product Design and Reliability (or 6.576G) 3
6.576G Reliability Engineering (or 6.044) 3
8.731G Project Management (or 8.732G) 3
8.732G Advanced Project Management Theory (or 8.731G) 3
18.464G Value Analysis/Engineering 3
18.575G Economic Decisions in Industrial Management 3
18.870G Large Scale Optimization in Industry (or 5.1245) 3

The remaining credits, resulting overall in at least 36 credits, must be chosen from an approved list of subjects, details of which may be obtained from the School of Mechanical and Industrial Engineering.

8640 Remote Sensing

Master of Engineering Science MEngSc

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
6.587G Computing Techniques in Remote Sensing Image Analysis 3
27.043G Remote Sensing Applications 3
29.601G Remote Sensing Principles and Procedures* 6
29.605G Ground Investigations for Remote Sensing 3

*Includes Group Practical Exercise in Remote Sensing, 3 credits.

Project

Credits
Project in Remote Sensing† or 9
Research Project in Remote Sensing† 18

†The subject number for these subjects varies according to the school in which the candidate is enrolled.
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.

<table>
<thead>
<tr>
<th>Subject</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>6.458G Decision and Syntactic Systems for Digital Pattern Recognition</td>
<td>3</td>
</tr>
<tr>
<td>6.468G Computer Display Systems and Interactive Instrumentation</td>
<td>3</td>
</tr>
<tr>
<td>6.611 Computing 1</td>
<td>4</td>
</tr>
<tr>
<td>6.621 Computing 2A</td>
<td>3</td>
</tr>
<tr>
<td>25.816G Remote Sensing</td>
<td>2</td>
</tr>
<tr>
<td>27.642 Mathematical Methods for Spatial Analysis</td>
<td>2</td>
</tr>
<tr>
<td>27.643G Geographic Data Analysis</td>
<td>2</td>
</tr>
<tr>
<td>27.672G Geographic Information Systems</td>
<td>2</td>
</tr>
<tr>
<td>27.911G Soil Erosion and Conservation</td>
<td>6</td>
</tr>
<tr>
<td>29.520G Photogrammetric Production Processes*</td>
<td>3</td>
</tr>
<tr>
<td>29.604G Land Information Systems</td>
<td>3</td>
</tr>
</tbody>
</table>

*Not offered 1986.

8660
Biomedical Engineering
Master of Biomedical Engineering
MBiomedE

The program of study must total 60 credits and include at least 40 credits at graduate level.

Strand A subjects are directed to candidates with an engineering/physical sciences background and Strand B to those with a medical/biological sciences background. Selection of subjects is not limited to those listed below: relevant approved subjects from other areas may be undertaken. A research project is compulsory and may be undertaken concurrently with other subjects. An 18 credit Project Report is the normal requirement.

Session 1 (March-June)

<table>
<thead>
<tr>
<th>Subject</th>
<th>Credits</th>
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</thead>
<tbody>
<tr>
<td>73.111 Physiology 1A (full year)</td>
<td>C 6</td>
</tr>
<tr>
<td>70.011C Introductory Anatomy</td>
<td>HR 6</td>
</tr>
<tr>
<td>42.211G Principles of Biology</td>
<td>3</td>
</tr>
<tr>
<td>42.212G Principles of Biochemistry</td>
<td>3</td>
</tr>
<tr>
<td>32.012G Biomedical Statistics</td>
<td>4</td>
</tr>
<tr>
<td>32.020G Radiation Physics</td>
<td>4</td>
</tr>
<tr>
<td>32.510G Introductory Biomechanics§</td>
<td>3</td>
</tr>
<tr>
<td>32.561G Mechanical Properties of Biomaterials*</td>
<td>3</td>
</tr>
<tr>
<td>6.481G Introductory Physiology for Engineers#</td>
<td>3</td>
</tr>
</tbody>
</table>

Strand B

<table>
<thead>
<tr>
<th>Subject</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>32.510G Introductory Biomechanics§</td>
<td>3</td>
</tr>
<tr>
<td>32.501G Computing for Biomedical Engineers HR</td>
<td>4</td>
</tr>
<tr>
<td>32.101G Mathematical Modelling for Biomedical Engineers C</td>
<td>4</td>
</tr>
<tr>
<td>32.040G Analogue Electronics for Biomedical Engineers</td>
<td>4</td>
</tr>
<tr>
<td>32.020G Radiation Physics</td>
<td>4</td>
</tr>
<tr>
<td>32.012G Biomedical Statistics</td>
<td>4</td>
</tr>
<tr>
<td>6.021E Digital Logic and Systems</td>
<td>4</td>
</tr>
</tbody>
</table>

Session 2 (July-November)

<table>
<thead>
<tr>
<th>Subject</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>73.111 Physiology 1A</td>
<td>StrA 6</td>
</tr>
<tr>
<td>32.611G Medical Instrumentation†</td>
<td>3</td>
</tr>
<tr>
<td>32.541G Mechanics of the Human Body*</td>
<td>3</td>
</tr>
<tr>
<td>32.332G Biocompatibility</td>
<td>3</td>
</tr>
<tr>
<td>32.321G Physiological Fluid Mechanics</td>
<td>4</td>
</tr>
<tr>
<td>32.311G Mass Transfer in Medicine</td>
<td>4</td>
</tr>
<tr>
<td>32.050G Microprocessors and Circuit Design for Biomedical Engineers‡</td>
<td>4</td>
</tr>
<tr>
<td>32.010G Biomedical Engineering Practice HR</td>
<td>2</td>
</tr>
<tr>
<td>18.360G Ergonomics</td>
<td>3</td>
</tr>
<tr>
<td>6.471G Systems and Control Elective — Medical Systems Analysis</td>
<td>3</td>
</tr>
</tbody>
</table>

*For Session 3 and footnotes, see overall
Engineering Cradits
3
30
18
3
Session 3 (March-June)
72.402G Principles of Disease Processes** 3
32.030G Project Report†† or 30
32.018G Project Report†† C 18
32.621G Biological Signal Analysis 3
32.701G Dynamics of the Cardiovascular System 3
32.551G Biomechanics of Physical Rehabilitation* 3

C Compulsory
HR Highly Recommended
Str A Strand A only
*For students with no mechanics background.
**These three electives vary according to session offered. Only one is offered each year. Prerequisite 32.501G or equivalent.
††Prerequisite 32.040G or equivalent.
‡‡Prerequisite 32.501G and 32.040G or equivalents
*For non-medical graduates only. Prerequisite 73.111 or equivalent; pre- or co-require 70.011C.
††Research project may be done concurrently with course work during the other sessions. An 18 credit Project Report is the normal requirement.
#Part-time students only who are unable to do 73.111.

8670
Faculty of Engineering

Master of Safety Science
MSafetySc

Candidates are required to complete a program totalling 54 credits made up of 12 credits of preliminary subjects (selected according to previous qualifications), 22 credits of compulsory subjects, 11 credits Safety Engineering electives, and a 9 credit Project. The preliminary subjects enable graduates from a wide range of disciplines (such as engineering, science, medicine, economics, law) to reach an adequate standard of comprehension for studying the compulsory and elective subjects.

Preliminary Subjects

Statistics and Computing

<table>
<thead>
<tr>
<th>Statistics and Computing</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>16.901G Health Services Statistics 1</td>
<td>2</td>
</tr>
<tr>
<td>32.012G Biomedical Statistics</td>
<td>4</td>
</tr>
<tr>
<td>32.501G Computing for Biomedical Engineers</td>
<td>2</td>
</tr>
<tr>
<td>47.015G Programming in BASIC</td>
<td>2</td>
</tr>
</tbody>
</table>

Management

Either:
18.074G Industrial Management 3
or
30.935G Organizational Behaviour A 3

Plus the following subjects:
47.051G Principles of Solid Mechanics 3
70.201G Introductory Functional Anatomy 3
80.701G Occupational Disease 3
47.900G Introductory Law 2

Compulsory Subjects
47.120G Human Behaviour and Safety Science 3
18.360G Ergonomics 3
47.180G Management for Safety 3
80.702G Occupational Health Control 3
90.502 Industrial Safety and Health Law 4
47.330G The Accident Phenomenon 3
47.052G Introduction to Safety Engineering 3

Safety Engineering Electives
39.908G Community Noise Control 2
47.054G Machines and Structures Safety 3
47.070G Ventilation 3
47.480G Fire and Explosion 3
47.060G Electrical Safety 3
47.230G Radiation Protection 3
18.380G Methods Engineering 4
47.481G Management of Dangerous Materials 3
2.251G Toxicology, Occupational and Public Health 6

Project
47.909G Project 9
or
47.918G Project Report 18

Graduate Diplomas

Courses of study leading to the award of a Graduate Diploma in Engineering provide graduates with opportunities to extend their professional knowledge. In most cases, candidates may choose from a range of subjects in the special area of their choice. There are also opportunities to select subjects from other professional areas in which candidates may be interested. In addition, the graduate diploma courses in Engineering Developments are intended for those who wish to take a more general program in several areas of interest.

Before enrolment, an applicant should submit an intended program for approval by the school or centre offering the majority of the credits. Candidates must complete a program...
totalling 30 credits. Forty per cent of these may consist of approved undergraduate subjects and the program may contain subjects from other schools of the Faculty, other faculties of the University and other universities or institutions subject to meeting any prerequisite requirements. If an applicant nominates a course of study from the list below, at least half of the credits should come from the subjects taken in that area.

**Admission Guidelines** An applicant for admission to a graduate diploma course should be a graduate of the University of New South Wales or other approved university or have other qualifications as may be approved by the Faculty of Engineering. Applicants should apply to the Registrar on the prescribed form at least two calendar months before the commencement of the session in which registration is to begin. It may be necessary to limit entry because of available resources. In such cases, an application may be provisionally accepted subject to acceptance within one month.

**Period of Candidature** The normal period is two academic sessions (full-time) or four academic sessions (part-time) from the date of enrollment. The maximum period of candidature is four academic sessions (full-time) and eight academic sessions (part-time). A candidate is not permitted to continue in a course if the credit value of the subjects failed totals more than six.

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

<table>
<thead>
<tr>
<th>School/Course</th>
<th>Course Code</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Graduate Diploma in Engineering:</strong></td>
<td></td>
</tr>
<tr>
<td>Biomedical Engineering</td>
<td>5462</td>
</tr>
<tr>
<td>Civil Engineering</td>
<td>5461</td>
</tr>
<tr>
<td>Electrical Engineering and Computer Science</td>
<td>5463</td>
</tr>
<tr>
<td>Industrial Engineering</td>
<td>5465</td>
</tr>
<tr>
<td>Mechanical Engineering</td>
<td>5466</td>
</tr>
<tr>
<td>Nuclear Engineering</td>
<td>5467</td>
</tr>
<tr>
<td><strong>Graduate Diploma in Engineering</strong></td>
<td></td>
</tr>
<tr>
<td>Developments</td>
<td></td>
</tr>
<tr>
<td>Graduate Diploma in Remote Sensing*</td>
<td>5495</td>
</tr>
<tr>
<td>Graduate Diploma in Safety Science**</td>
<td>5480</td>
</tr>
<tr>
<td>Graduate Diploma in Surveying</td>
<td>5490</td>
</tr>
</tbody>
</table>

Graduate Subjects

The subjects which may be available for a candidate proceeding to the award of the degree of Master of Engineering Science, Master of Safety Science, Master of Surveying Science, Master of Biomedical Engineering and Graduate Diploma are listed below. Not all electives are necessarily offered in any particular year.

Under the credit system in operation in the Faculty, one credit is normally equal to one hour's attendance per week for one session. The qualification 'normally' is required because of the varying ways in which credits are distributed for coursework, design, critical review or research in the different schools.

<table>
<thead>
<tr>
<th>Subject</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>47.015G Programming in BASIC</td>
<td>2</td>
</tr>
<tr>
<td>47.051G Principles of Solid Mechanics</td>
<td>3</td>
</tr>
<tr>
<td>47.052G Introduction to Safety Engineering</td>
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Subjects offered by Tape Correspondence

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<td>6.379G Solar Cells — Operating Principles, Technology and System Applications</td>
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Civil Engineering

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<td>8.832G Pipe Networks and Transients</td>
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<td>8.833G Free Surface Flow</td>
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<td>8.836G Coastal Engineering 2</td>
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<td>8.838G Flood Design</td>
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<td>8.839G Advanced Flood Estimation</td>
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<td>8.840G Reservoir Design and Yield Determination</td>
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<td>8.850G Drainage of Agricultural Lands</td>
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Graduate Study: Graduate School of Engineering

8.851G Unit Operations in Public Health Engineering

8.852G Water Distribution and Sewage Collection

8.854G Solid and Liquid Waste Management

8.855G Water and Wastewater Analysis and Quality Requirements

8.856G Water Treatment**

8.857G Sewage Treatment and Disposal**

8.858G Water Quality Management**

8.860G Investigation of Groundwater Resources 1

8.861G Investigation of Groundwater Resources 2

8.862G Fluvial Hydraulics

8.863G Estuarine Hydraulics

8.864G Arid Zone Hydrology

8.865G Arid Zone Waters Resources Management

Other Subjects

8.901G Civil Engineering Elective 1

8.902G Civil Engineering Elective 2

8.909G Project

8.918G Project Report

8.936G Thesis*

* A 36 credit Thesis is not normally approved in the School of Civil Engineering. The normal program includes a 9 credit Project.

** Students specializing in Public Health Engineering normally study 42.211G Principles of Biology and 42.214G Biotechnology in the School of Biotechnology.

Electrical Engineering and Computer Science

Department of Communications

6.050G Occasional Elective — Digital Signal Processing

6.150G Communication Elective — Applied Optoelectronics

6.164G Microwave Antenna Theory and Applications

6.169G Microwave Circuits: Theory and Techniques

6.170G Microwave Electronics

6.336G Digital Communication Networks

6.337G Sound Broadcast Systems

6.338G Television Systems

6.339G Electroacoustics

6.344G Communication Theory

6.345G Analogue and Digital Filters

6.347G Digital Communications

6.348G Optical Communications

6.349G Radar and Navigation Aids

Department of Electric Power Engineering

6.221G High Voltage Technology

6.224G Partial Discharges in Electrical Insulation

6.227G Insulation Performance in Electrical Plant

6.228G Power System Equipment

6.229G Fields and Materials

6.234G Power System Protection

6.242G Power System Analysis

6.250G Power Elective 1

6.251G Power Elective 2

6.256G Underground Systems

6.257G Electric Power Distribution Systems

Department of Electronics

6.550G Solid State Electronics Elective

6.573G Advanced Semiconductor Devices

6.575G Integrated Circuit Technology

6.576G Reliability Engineering

6.577G Integrated Circuit Design

6.578G Solar Energy Conversion

6.579G Solar Cells — Operating Principles, Technology and System Applications

6.580G Image Analysis in Remote Sensing

6.587G Computing Techniques in Remote Sensing

Department of Systems and Control

6.433G Applied Microprocessor Design

6.453G Computer Methods of Optimization

6.455G System Identification and Modelling

6.456G General Concepts in Formal System Theories

6.458G Decision and Syntactic Systems for Digital Pattern Recognition

6.459G Control Computing

6.460G Real Time Computing and Simulation

6.464G Digital Estimation, Prediction and Control

6.466G Computer-Aided Design of Multivariable Control Systems


6.468G Computer Display Systems and Interactive Instrumentation

6.470G Advanced Topics in Control — Robotics, Automation and Productivity Technology

6.471G Systems and Control Elective — Medical Systems Analysis

6.484G Biological Signal Analysis

Department of Computer Science

6.650G Computer Science Elective — VLSI System Design

6.651G Digital Electronics

6.654G Digital Systems

6.655G Computer Organization and Architecture

6.656G Software Systems A

6.657G Software Systems B
### Mechanical and Industrial Engineering

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<td>5.073G</td>
<td>Ordinary Differential Equations in Mechanical Engineering</td>
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<td>5.075-6G</td>
<td>Computational Methods in Mechanical Engineering 1, 2</td>
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<td>5.087G</td>
<td>Microprocessor Fundamentals for Mechanical Engineers</td>
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<td>Elements of Industrial Automation‡</td>
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<td>The Analysis and Use of Integrated CAD/CAM Systems</td>
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<td>Refrigeration and Air Conditioning Design 1, 2</td>
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### Department of Industrial Engineering

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# Graduate Study: Graduate School of Engineering

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<td>18.936G</td>
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Note 1: Candidates taking their Projects in Industrial Management are generally required to take 18.874G and 18.875G plus at least 11 credits from 18.870G, 18.871G, 18.874G, 18.875G and 14.062G Accounting for Engineers. Before enrolling in the Projects they must have had one year's relevant industrial experience and have access to industry for their Project topics.


Note 3: All Master of Engineering Science candidates in the Department of Industrial Engineering must include 18.909G or 18.918G in their programs.

A 36 credit Thesis is not normally approved in the School of Mechanical and Industrial Engineering.

## Surveying

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<td>29.102G</td>
<td>Characteristics of Optical Surveying Instrumentation</td>
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<td>29.103G</td>
<td>Precise Engineering Surveys</td>
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<td>29.106G</td>
<td>Special Topic in Surveying A</td>
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<td>29.107G</td>
<td>Special Topic in Surveying B</td>
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<tr>
<td>29.151G</td>
<td>Adjustment of Control Surveys</td>
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<td>29.210G</td>
<td>Satellite Surveying</td>
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<td>29.212G</td>
<td>Doppler Positioning</td>
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<td>Gravimetric Geoid Evaluations</td>
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<td>Analytical Photogrammetry</td>
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<td>Photogrammetric Block Adjustment</td>
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<td>Computer Assisted Mapping</td>
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<td>Statutory Control of Land Development</td>
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<td>Land Information Systems</td>
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<tr>
<td>29.609G</td>
<td>Project</td>
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<tr>
<td>29.918G</td>
<td>Project Report</td>
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<tr>
<td>29.936G</td>
<td>Thesis</td>
<td>36</td>
</tr>
</tbody>
</table>

## Centre for Biomedical Engineering

**Director**
Associate Professor P. C. Farrell

<table>
<thead>
<tr>
<th>Course Code</th>
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<tr>
<td>32.009G</td>
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<td>32.010G</td>
<td>Biomedical Engineering Practice</td>
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<td>32.012G</td>
<td>Biomedical Statistics</td>
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<tr>
<td>32.016G</td>
<td>Project Report</td>
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<td>Radiation Physics</td>
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<td>Project Report</td>
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<td>Analogue Electronics for Biomedical Engineers</td>
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<td>Mass Transfer in Medicine</td>
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<td>Biocompatibility</td>
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<tr>
<td>32.510G</td>
<td>Introductory Biomechanics</td>
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**Nuclear Engineering**

**Head of School**
Professor J. J. Thompson

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Credits</th>
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<tbody>
<tr>
<td>23.013G</td>
<td>Neutron Transport and Diffusion</td>
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<tr>
<td>23.015G</td>
<td>Multigroup Reactor Theories</td>
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<tr>
<td>23.023G</td>
<td>Reactor Thermal Performance</td>
<td>3</td>
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<tr>
<td>23.028G</td>
<td>Reactor Accident and Safety Analysis</td>
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<tr>
<td>23.032G</td>
<td>Mathematics Analysis and Computation</td>
<td>3</td>
</tr>
<tr>
<td>23.033G</td>
<td>Matrix Theory and Computation</td>
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</tr>
<tr>
<td>23.042G</td>
<td>Nuclear Fuel and Energy Cycles</td>
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<tr>
<td>23.043G</td>
<td>Nuclear Power Costing and Economics</td>
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<tr>
<td>23.045G</td>
<td>Uranium Enrichment Technology</td>
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<td>23.909G</td>
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**Surveying**

<table>
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<tr>
<th>Course Code</th>
<th>Course Title</th>
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<tbody>
<tr>
<td>29.101G</td>
<td>Aspects of Electromagnetic Distance Measurement</td>
<td>3</td>
</tr>
<tr>
<td>29.102G</td>
<td>Characteristics of Optical Surveying Instrumentation</td>
<td>3</td>
</tr>
<tr>
<td>29.103G</td>
<td>Precise Engineering Surveys</td>
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<tr>
<td>29.106G</td>
<td>Special Topic in Surveying A</td>
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<td>29.107G</td>
<td>Special Topic in Surveying B</td>
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</tr>
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<td>29.151G</td>
<td>Adjustment of Control Surveys</td>
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<tr>
<td>29.210G</td>
<td>Satellite Surveying</td>
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<td>29.212G</td>
<td>Doppler Positioning</td>
<td>3</td>
</tr>
<tr>
<td>29.217G</td>
<td>Gravimetric Geoid Evaluations</td>
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<tr>
<td>29.530G</td>
<td>Analytical Photogrammetry</td>
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<td>29.531G</td>
<td>Photogrammetric Block Adjustment</td>
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<td>Computer Assisted Mapping</td>
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<tr>
<td>29.601G</td>
<td>Remote Sensing Principles and Procedures</td>
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<td>29.603G</td>
<td>Statutory Control of Land Development</td>
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<td>29.604G</td>
<td>Land Information Systems</td>
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<td>Ground Investigations for Remote Sensing</td>
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<td>Cadastral Surveying</td>
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**Centre for Biomedical Engineering**

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Associate Professor P. C. Farrell

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</table>
### Graduate Diploma Subjects

Graduate Diploma programs in all schools of the Faculty may include subjects from the above list, subject to the approval of the Head of School responsible for the subject.

In addition the following subjects are offered specifically for Graduate Diploma candidates. Not all electives are necessarily offered in any particular year.

#### School of Electrical Engineering and Computer Science

<table>
<thead>
<tr>
<th>Subject</th>
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<tbody>
<tr>
<td>6.060G Microprocessor Systems</td>
<td>3</td>
</tr>
<tr>
<td>6.167G Propagation and Transmission of Electromagnetic Waves</td>
<td>3</td>
</tr>
<tr>
<td>6.340G Communication Electronics</td>
<td>3</td>
</tr>
<tr>
<td>6.341G Signal Analysis</td>
<td>3</td>
</tr>
<tr>
<td>6.343G Digital and Analogue Communications</td>
<td>3</td>
</tr>
<tr>
<td>6.452G Feedback Control 1</td>
<td>3</td>
</tr>
<tr>
<td>6.457G Cybernetic Engineering</td>
<td>3</td>
</tr>
<tr>
<td>6.472G Feedback Control 2</td>
<td>3</td>
</tr>
<tr>
<td>6.481G Introductory Physiology for Engineers</td>
<td>3</td>
</tr>
<tr>
<td>6.659G Date Bases and Networks</td>
<td>3</td>
</tr>
<tr>
<td>6.660G Design and Analysis of Algorithms</td>
<td>3</td>
</tr>
<tr>
<td>6.661G Business Information Systems</td>
<td>3</td>
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<tr>
<td>6.662G Computing Practice</td>
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#### School of Mechanical and Industrial Engineering

<table>
<thead>
<tr>
<th>Subject</th>
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<tbody>
<tr>
<td>5.086G Digital Logic Fundamentals for Mechanical Engineers</td>
<td>3</td>
</tr>
<tr>
<td>18.380G Methods Engineering</td>
<td>4</td>
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<tr>
<td>18.580G Operations Research</td>
<td>6</td>
</tr>
<tr>
<td>18.681G Engineering Economic Analysis</td>
<td>3</td>
</tr>
<tr>
<td>18.780G Production Control</td>
<td>2</td>
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<tr>
<td>14.001 Introduction to Accounting A</td>
<td>3</td>
</tr>
<tr>
<td>14.002 Introduction to Accounting B</td>
<td>3</td>
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<tr>
<td>14.042G Industrial Law</td>
<td>2</td>
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<td>14.062G Accounting for Engineers</td>
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</table>

### Project Reports and Theses

Supervision of project reports and theses will generally be available in the following areas of research interest in the Schools of the Faculty. Alternatively, design and other topics may be chosen by arrangement.

#### Civil Engineering

**Engineering Construction and Management**

Construction techniques. Equipment selection.
Field studies of spatial layout, material flow, and construction operations.
Micro, macro, and system structure of construction operations.
Civil engineering management.
Critical path methods, and operations research methods in engineering construction.
Information flow requirements and decision processes of office and field agents.

**Engineering Materials**

Application of finite element techniques to analysis of raft foundations, pile foundations, layered soils, and rigid retaining structures, marine structures, reinforced earth.
Structure — foundation interaction analysis for space frames supported on a raft foundation — static and dynamic states.
Stabilization of soils by thermal treatment.
Influence of defects on strength and deformation of rocks.
Theoretical and experimental studies of blasting hard rocks.
Corrosion, fatigue and fracture of metals.
Pavement analysis and management.
Skid resistance of pavements.
Rehabilitation of pavements.
Resource investigations by acoustic holograph.
Effect of stress history on concrete.
Specification of concrete.
Indigenous material studies.

**Groundwater**

Water movement in unsaturated soils.
Pollutant movement in soils.
Salinity studies.
Groundwater studies.

**Hydrology**

Flood estimation.
Yield and reservoir studies.
Hydrological instrumentation, data collection, and processing.
Mathematical rainfall-runoff models.
Stochastic hydrology.
Hydrological processes.
Hydrometeorology.
Urban drainage.
Arid Lands Hydrology.
Hydraulics
Two-fluid systems with small density differences.
Sediment motion.
Air entrainment in water in open channels and closed conduits.
Wave action and coastal engineering.
Flow through porous media.
Hydraulic transportation of solids.
Coastal engineering and breakwater stability.
Closed conduit flow.

Prestressed Concrete Structures
Partially prestressed concrete beams.
Analysis and design of end blocks for post-tensioned beams.

Public Health Engineering
Sewage sludge conditioning and filtration.
Clarifiers and sedimentation in water and waste water treatment.
Filtration.
Fluidized bed aerobic and anaerobic treatment.
Aerobic digestion.
Nutrient control.
Treatment of high strength waste waters.
Chemical fixation of hazardous wastes.

Reinforced Concrete Structures
Torsion, bending and shear in reinforced concrete and prestressed concrete beams.
Creep and shrinkage effects in reinforced concrete structures.
Shear and torsion in reinforced concrete flat slab floors.

Structural Analysis
Development of computer methods for the analysis of multi-storey flat plate structures.
Development and application of finite element techniques.
Investigation of elastic stability.
Analysis of dynamic response of highway bridges and buildings.

Transport Engineering
Problems of land use and transport interaction.
Theories of traffic structure and flow.
Measurements, planning and control of traffic.
Transport systems analysis.
Transport and the environment — accidents, energy, intrusion, noise and pollution.
Investigation of human factors.
Economic evaluation of transport investments.
Transport planning — local, urban and regional systems.
Investigations into transport economics, policy and decision-making.
Investigations of the geometric shape of the road alignment on the driver’s view of the road.
Study of road alignment design in three dimensions.

Water Resources Engineering
Multi-objective water resources planning.
Hydro-economic studies.
Optimization problems in water resource systems design.
Drought studies.
Flood plain management.
Arid Lands Management.

Electrical Engineering and Computer Science

Communications
Optical communications.
Optical fibres and integrated optics.
Digital communications.
Digital radio and modulation methods.
Computer communications and local area networks.
Switching and stored program control systems.
UHF and microwave circuits and devices.
Microwave measurements.
Antennas and phased arrays.
Radar and navigational aids.
Signal processing and analysis.
Active and adaptive filtering.
Digital filters.
Acoustic and seismic signal processing.
Digital image processing.
Microprocessor and other digital signal processing chip applications.
Electronic music.

Systems and Control
Boiler-turbine modelling, control and simulation.
Digital systems and digital signal processing.
Design of non-linear filters for improved noise performance.
Computer aided design.
Analysis and design of d/c-dc converters.
Microprocessor technology in control systems and information displays.
Optimal control computation.
Biomedical engineering: gait analysis, compartmental modelling, physiological systems modelling.
Medical applications of microprocessors.
Cybernetic engineering and advanced robotics: pattern, image and scene analysis, learning machines, vision and assembly.
Electric vehicle control and optimisation.
Records storage system development.
High speed facsimile links for document transfer.

Electric Power
The stability, dynamics and control of electric power systems.
Instrumentation and protection in power systems.
Electrical contacts.
Electrical measurements and data acquisition.
Superconductivity.
Electrical machines and thyristor control schemes.
Electromagnetic compatibility.
High voltage and heavy current phenomena.
Insulation research: partial discharge, detection and location.
Transients on transmission lines.
Wind power generation and integration.
Electrical equipment for hazardous atmospheres.
Arcing fault characteristics.
Gaseous insulation.
Load management and control.
Computer Science
Computer organization.
Computer graphics.
Artificial intelligence.
Operating systems.
Languages.
Scheduling.
Network projects.
Data base machine projects.
Computer aided design.
Computer aided instruction projects (CAI)
Fault tolerant computer systems.
Office automation and electronic publishing.
Computer aids for dyslexic children.
Digital systems description languages.
Integrated circuit and logic testing.
VLSI systems.

Electronics
Semiconductor device physics.
Integrated circuit design.
Integrated circuit technology.
Surface elastic wave devices.
Reliability engineering.
Photovoltaic solar energy conversion.
Computer-aided IC design.
Dry etching.
Remote sensing.

Mechanical and Industrial Engineering

Agricultural Engineering
Mechanical harvesting of fruit and vegetables.
Mechanical handling, grading and processing of agricultural produce.
Development of shearing equipment.
Metering and placement of seed and fertilizer.

Applied Mechanics
Biomechanics.
Mechanics of solids, stress analysis.
Impact mechanics.
Adaptive control systems.
Process stimulation and control.
Spatial and planar mechanisms.
Dynamics of machines.
Rotor bearing dynamics.
Multi-mode vibrations.
Lubrication and wear.
Hydrodynamic dampers.
Computer aided design.
Industrial automation.

Fluid Mechanics/Thermodynamics — including Aeronautical Engineering and Naval Architecture
Two-phase flow with and without heat transfer. Slurries.
Conveying of solid dusts by gases.
Hydraulic transients.

Hydrodynamics, water hammer. Fluidics.
Conduction, convection and radiation. Natural convection.
Computational fluid dynamics and heat transfer.
Refrigeration and air conditioning.
Energy conversion and conservation.
Solar energy and systems.
Engine performance and emissions.
Gas dynamics. Transonic flow. Shock waves.
Large scale structures.
Light aircraft design and performance.
Development of a ship structure optimization system.
Analysis and design of plated grillages.
Vortex shedding in aeronautical and maritime engineering.
Economic studies relative to ship industry.
Hydrodynamics of planing surfaces.
Problems in wave resistance.
Finite element methods.

Industrial Engineering — comprising Operations Research and Production Engineering

Engineering economic analysis.
Efficiency of production lines.
Optimum shearing policies for rolled bars.
Application of probability theory in the allocation of engineering tolerance.
Computer generation of timetables.
Job shop scheduling.
Least-cost tolerance.
Optimum reject allowance.
Operational simulation.
Variety reduction.
Probabilistic networks.
Optimization techniques relevant to information processing systems.
Statistical decision theory.
Production scheduling for variable demand.
Inventory and production control.
Optimum control.
Mathematical programming.
Dynamic programming.
Geometric programming.
Integer programming.
Large scale optimization.
Applications of operations research to real-world problems.
Stochastic processes.
Applications of optimization techniques.
Experimental and theoretical investigations of the following processes: machining, extrusion, indentation, compression, rolling, drawing.
Performance of single and multipoint cutting tools including tool life and economics of machining.
Properties of materials at high rates of strain.
Materials handling studies.
Factory design and location studies.
Plant layout by computer.
Ergonomics.
Occupational safety and health.
Production design studies.
Engineering design analysis and tolerance technology.
Metrology studies.
Group technology studies.
Nuclear Engineering

Neutron transport and diffusion theory.
Thermal and thermo-mechanical analysis of reactor components.
Nuclear reactor noise theory and analysis.
Nuclear fuel cycles.
Reactor channel hydrodynamics.
Numerical methods for reactor analysis and simulation.
Nuclear power planning and reactor strategy.
Risk assessment.
Radiation processing.

Surveying

Geodesy
Physical geodesy, geoid and gravimetric studies.
Satellite geodesy and precise orbit determinations.
Geodynamics: crustal motion studies using satellite laser ranging and very long baseline interferometry data, effects of mass movements on polar motion.
Satellite altimetry analysis, sea surface topography, unification of vertical datums.
Geometric geodesy and geodetic surveying. Doppler positioning determination methods, geodetic astronomy.
Positioning with GPS.
Effects of atmosphere on distance, angular and levelling measurements.
Adjustments and error theory: applications in geodesy and photogrammetry.
Solution of large systems of equations.
Adjustment of continental control networks.

Photogrammetry and Cartography
Production and evaluation of orthophotos and other map products.
Applications of digital techniques in cartography.
Monocular and stereoscopic pointing to photographic images, applications to ground targets, instrument cursors, cartographic symbolization.
Geometry of image sensors, remote-sensing imaging devices.
Non-topographic applications.
Restoration of digital image data.
Design of analytical plotter software.
Aerotriangulation, computer applications, block adjustment, independent model triangulation.
Digital terrain models.
Land and spatial information systems.
Remote sensing techniques particularly in urban areas.
Computer assisted mapping.

Biomedical Engineering

Modelling of respiratory function, cardiovascular function, nervous system, artificial kidney therapy, extracorporeal heart-lung support, endocrine system and other body systems.
Development of biomaterials.
Investigation of physiological fluid mechanics.
Microprocessor control of medical equipment.
Limb and joint dynamics studies.
Development of implantable electrodes.
Development of rehabilitation devices.
Development and evaluation of new hospital equipment and treatment procedures.
Signal analysis of waveform from medical diagnostic equipment.
Implants for fracture support and joint replacement.
Improved drug administration.

Remote Sensing

Director
Dr. J. A. Richards

Development of committee and related classifier algorithms for use with multitemporal data.
Context classification.
Incorporation of auxiliary data into classification procedures.
Application of satellite data to Urban Area studies.
Monitoring land use change using remotely sensed data.
Determining the characteristics of surface reflectance.
Analysis of image quality.
Application of satellite imagery to small scale mapping.
Multispectral linear transformations.
Application of spaceborne synthetic aperture radar data.
Subject Descriptions

Identification of Subjects by Number

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>
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</thead>
<tbody>
<tr>
<td>1 School of Physics</td>
<td>Science</td>
<td></td>
</tr>
<tr>
<td>2 School of Chemistry*</td>
<td>Science</td>
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</tr>
<tr>
<td>4 School of Metallurgy</td>
<td>Applied Science</td>
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<td>5 School of Mechanical and Industrial Engineering</td>
<td>Engineering</td>
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<tr>
<td>6 School of Electrical Engineering and Computer Science</td>
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<td>7 School of Mining Engineering</td>
<td>Applied Science</td>
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<td>8 School of Civil Engineering</td>
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<td>9 School of Wool and Pastoral Sciences</td>
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<td>10 School of Mathematics*</td>
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<td>14 School of Accountancy*</td>
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<td>15 School of Economics*</td>
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<td>23 School of Nuclear Engineering</td>
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<td>25 School of Applied Geology</td>
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<td>26 Department of General Studies</td>
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<td>27 School of Geography*</td>
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<td>28 School of Marketing*</td>
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<td>30 Organizational Behaviour*</td>
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<td>32 Centre for Biomedical Engineering</td>
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<td>38 School of Food Science and Technology</td>
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<td>42 School of Biotechnology*</td>
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<td>43 School of Botany</td>
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*Graduate subjects also offered for courses in this handbook.
2.251G Toxicology, Occupational and Public Health

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.

5.075G Computational Methods in Mechanical Engineering 1

Prerequisites: 5.072 (Computing strand) or 5.0721 and 5.073 (Numerical analysis strand) or equivalent.


5.076G Computational Methods in Mechanical Engineering 2

Prerequisites: 5.072 (Computing strand) or 5.0721 and 5.073 (Numerical analysis strand) or equivalent.

Partial differential equations; finite differences and finite elements. Mathematical formulation of physical problems in mechanical engineering and their solution.

5.086G Digital Logic Fundamentals for Mechanical Engineers

Excluded: 6.021E, 6.631 and equivalent.

Discrete logic elements; assembly design; misoriented design; support devices; microprocessor units.

5.087G Microprocessor Fundamentals for Mechanical Engineers

Prerequisite: 5.086G or equivalent. Excluded: 6.432, 6.433G, 6.613, 6.651G and equivalent.

Microprocessor chips; system design; memory; past design; programming; applications.

5.088G Industrial Applications of Microprocessors

Prerequisite: 5.087G or equivalent. Excluded: 6.432, 6.433G, 6.651G and equivalent.


5.089G Elements of Industrial Automation

Co-requisite: 5.086G or equivalent.

An introductory overview of the elements of Industrial Automation systems and the factors governing their use in industry.

5.090G The Analysis and Use of Integrated CAD/CAM Systems

Prerequisite: 5.089G.

5.151G Refrigeration and Air Conditioning
Design 1

Prerequisite: 5.624 or equivalent.

5.152G Refrigeration and Air Conditioning
Design 2

Prerequisite: 5.151G or equivalent.


5.307G Dynamics 1

Excluded: 5.304G and equivalent.

5.308G Dynamics 2

Prerequisite: 5.307G or equivalent. Excluded: 5.305G and equivalent.


5.317G Industrial Robotics

Prerequisite: 5.066G or equivalent.


5.318G Advanced Mechanism Analysis and Synthesis 1

Excluded: 5.315G and equivalent.

A selection of topics from Planar mechanisms: Kinematic analysis of complex mechanisms; Kinetic analysis; Kinematic geometry; Precision position synthesis. Cam: basic and common curves; Equations of motion; Development of profile; Determination of system geometry and mechanical properties; Noise, wear, backlash and manufacture. Spatial linkages: structural analysis; Equations of motion; Screw system algebra; special configurations.

5.319G Advanced Mechanism Analysis and Synthesis 2

Excluded: 5.316G and equivalent.

5.328G Control and Modelling of Mechanical Systems 1

C3

5.329G Control and Modelling of Mechanical Systems 2

Prerequisite: 5.328G or equivalent.

Development of modelling techniques using both digital and analogue computation, with special emphasis on the representation of non-linearities. Typical examples of mechanical systems.

5.335G Vibrations

C2


5.336G Random Vibrations

Prerequisite: 5.331 or 5.333 or equivalent.

Probability, vibration theory review, linear mechanical system response to random vibrations. Statistical characteristics: autocorrelation, spectral density, convolution, narrow band processing, consistency, applications.

5.345G Analogue Control Systems

Prerequisite: 5.324 or 5.344 or equivalent. Excluded: 5.321G and equivalent.


5.346G Non-Linear Control Systems

Prerequisite: 5.324 or 5.344 or equivalent. Excluded: 5.322G and equivalent.


5.403G Experimental Stress Analysis

Excluded: 5.401G.


5.617G Internal Combustion Engines 2
Prerequisite: 5.615G or 5.616G or equivalent.


5.621G Gasdynamics 1
Excluded: 5.635, 5.811.

One dimensional steady flow: isentropic channel flow, normal shock waves, supersonic wind tunnels and diffusers. Two dimensional steady flow: oblique shock waves, Prandtl-Meyer expansions, nozzles. One dimensional unsteady flow: moving waves, reflections, explosions in ducts, shock tubes; method of characteristics, internal flows, piston and valve effects.

5.622G Gasdynamics 2
Prerequisite: 5.621G or equivalent.


5.631G Lubrication Theory and Design 1
Excluded: 5.634.

History of lubrication, types of bearings and bearing operation, nature of surfaces and their contact, modes of lubrication, properties of lubricants, viscous flow in pipes and channels, measurement of viscosity. Infinitely long and short bearing approximations, one dimensional analysis of short bearing, other slider bearing geometries, the effect of end leakage, hydrostatic or externally pressurized bearings, squeeze films.

5.632G Lubrication Theory and Design 2
Prerequisite: 5.631G or equivalent.


5.653G Acoustic Noise 1
Excluded: 5.351.


5.654G Acoustic Noise 2
Prerequisite: 5.653G or equivalent. Excluded: 5.354.

5.655G Energy Conservation and System Design

Examination of some existing systems, assessment of their energy losses and their improvement by tuning. Alternative energy sources and their availability, energy utilization and efficiency in various systems. Environmental aspects, assessment of emissions, means of improvement. Economically viable energy technology under present conditions. Expected trends in energy technology in the short and long term. A number of case studies.

5.716G Advanced Heat Transfer 1

Prerequisite: 5.623 or equivalent. Excluded: 5.718G, 5.719G, 5.721G and equivalent.


5.717G Advanced Heat Transfer 2

Prerequisite: 5.623 or equivalent. Excluded: 5.635, 5.712G, 5.713G and equivalent.


5.722G Solar Thermal Energy Design

Prerequisite: 5.721G or equivalent. Excluded: 5.644, 5.720G and equivalent.


5.751G Refrigeration, Air Conditioning and Cryogenics 1

Prerequisite: 5.624 or equivalent.

5.752G Refrigeration, Air Conditioning and Cryogenics 2

Prerequisite: 5.751G or equivalent.

Thermodynamic principles, diagrams; properties of real fluids, refrigerants. Thermodynamics of change of phase; liquids and dilute solutions; mixtures of liquids; steady flow processes with binary mixtures; rectification of a binary mixture; absorption refrigeration; selective refrigeration. The vapour compression cycle; multi-pressure systems; analysis of compressor performance; condensers, evaporators and expansion devices; properties of the ideal refrigerant; reversed cycles; analysis and performance characteristics of the complete cycle. Air-cycle, steam-jet refrigeration; application to air conditioning design; cooling towers, mixtures of gases and vapours; psychrometry, evaporative cooling of air; dehumidification of air. Thermoelectric cooling; Seebeck, Joulean, conduction, Peltier, Thomson effects; thermodynamic analysis; thermoelectric materials. Production of low temperatures; liquefaction and rectification of gases; magnetic cooling; application to research.

5.753G Ambient Energy Air Conditioning

Prerequisite: 5.624 or equivalent.


5.759G Refrigeration and Air Conditioning Applications


5.909G Project

5.912G Naval Hydrodynamics 1

Prerequisite: 5.663 or 10.411A or equivalent.

5.913G Naval Hydrodynamics 2

Prerequisite: 5.912G or equivalent.

Advanced treatment of topics selected from: ship waves and ship resistance; ship maneuvrability; ship motion and seakeeping; hydrofoil and propeller theory; aero and hydrodynamics of surface effect machines.

5.918G Project Report

5.936G Thesis

Electrical Engineering and Computer Science

6.050G Occasional Elective — Digital Signal Processing


Advanced subject on the techniques and applications of digital signal processing which assumes students have had basic courses on discrete-time systems and signals (such as digital filters, z-transforms and discrete Fourier transforms) and elementary random processes. Application areas stressed are telecommunications, speech processing and seismic signal processing, radar, sonar. Image processing and control (eg TDM/FDM transmultiplexers, equalization of PCM
Engineering

6.167G Propagation and Transmission of Electromagnetic Waves


6.169G Microwave Circuits: Theory and Techniques

Properties of microstrip transmission lines. Theory and design of microstrip circuit components and their integration with active devices into microwave subsystems.

6.170G Microwave Electronics


Principles and applications of microwave amplifying and control devices. Includes microwave transistors, Gunn and IMPATT diodes, recent developments in ultra high-speed transistors and a selection from PIN diodes, mixers and detectors, travelling wave tubes, klystrons, magnetrons.

6.221G High Voltage Technology

Prerequisite: 6.202 or equivalent. Excluded: 6.222.

Introduction to the technology involved in the design and testing of high voltage power system equipment. Study of the practical applications of relevant materials, with emphasis on properties of insulation systems (gases, liquids and solids) and the interaction of the materials in non-uniform fields. Methods of testing under steady state, AC and DC, and surge conditions are incorporated in the laboratory work. Design examples are taken from insulator, bushing, cable, power capacitor, transformer, rotating machine and switchgear technologies.

6.224G Partial Discharges in Electrical Insulation

Prerequisite: 6.202 or 6.222 or equivalent.

Many aspects of partial discharge phenomena and their effect on electrical insulation. The physical processes involved in partial discharges plus the interpretation of results from measurements on simple and complex apparatus, such as power cables, power capacitors, rotating machines and transformers. Techniques studied include digital based systems with particular emphasis being given to practical applications, in order to relate theoretical concepts to measurements which are subject to laboratory or on-site limitations.
6.227G Insulation Performance in Electrical Plant

Prerequisite: 6.202 or 6.222 or equivalent.

Selection from: design test requirements. Forms of high voltage works test: alternating, impulse, switching surge and direct. Non-destructive tests: dielectric loss angle, dispersion, partial discharge and insulation resistance. Methods of determining material condition: moisture content, gas in oil, impurities, electron microscopy including determination of aging and long life. Commissioning and site tests.

Demonstrations and projects to support the lecture material.

6.228G Power System Equipment

Prerequisite: 6.202 or equivalent.

Includes study of the operating characteristics and major design features of the items comprising a power system, including alternators, power transformers, voltage and current instrumentation equipment, oil and gas insulated circuit breakers, isolators, overhead lines and components. Lighting arrestors and protection for lines and substations. Power and the line coupling capacitors, bus bars, connectors, cables and bushings. Line carrier systems.

6.229G Fields and Materials

General description of the inter-relationship between the different types of fields (electric, magnetic and thermal) and materials when used in various areas of electric power engineering. Topics include: a general coverage of dielectric, conducting, magnetic and thermal materials; solution of Poisson's, Laplace's and Fourier's equations for simple geometries and calculation of electric, magnetic and thermal fields, including boundary effects; a selection of typical applications from thermal rating, electric heating, contact effects, laser action, surface electron emission, etc; a brief outline of some measurement techniques applicable to the above.

6.234G Power System Protection

Prerequisite: 6.202 or equivalent: credit level or higher.

The theory and application of protective devices and systems, related to the protection of transmission lines, transformers, bus bars and generators.

6.242G Power System Analysis


6.250G Power Elective 1

As for 6.550G Solid State Electronics Elective.

6.251G Power Elective 2

As for 6.550G Solid State Electronics Elective.

6.256G Underground Systems

Prerequisite: 6.202 or equivalent.

A specialized course relating to developments and contemporary practices in underground systems for the transmission of electrical energy. The thermal and electrical properties, rating and economics of cable systems and their accessories for a range of voltages from the reticulation level through to transmission voltage levels.

6.257G Electric Power Distribution Systems

Prerequisite: 6.203 or equivalent.

The engineering problems or distribution systems including industrial power systems, stressing the electrical distribution system as an entity. Distribution system planning. Overall design criteria. Co-ordination of thermal ratings. Protection of distribution network: cables and overhead lines. Design and performance of individual plant items. Particular problems of urban and rural distribution systems. Demonstrations and project work.

6.336G Digital Communication Networks

Prerequisites: 6.343G or similar. Some familiarity with probability, random processes, queueing theory and Markov processes is an advantage.

Provides an up-to-date coverage of key techniques and their underlying principles in two important areas of digital communications, namely: Computer Communication Networks including capacity assignment, time delay versus cost trade-offs, information flow control, queueing theory, concentration and buffering in store-and-forward networks, message and packet switching algorithms, protocols, routing and network topology. Random Access Techniques including satellite networking, local area networks, carrier-sense system, ETHERNET, reservation systems, capacity, stability, control; spread spectrum systems, direct sequence systems, interference rejection, jamming margin, error correction techniques.

6.337G Sound Broadcast Systems

Prerequisites: 6.167G, 6.341G or similar. Some familiarity with probability, random processes, queueing theory and Markov processes is an advantage.

Topics: Specifications: coverage, bandwidth, power. AM radio: studio equipment, sound equipment, medium and shortwave systems, transmitters, antennas. FM radio: stereotransmission, studio equipment, transmitters, antennas. Recording equipment: links, etc. Distortion: distortion in recorders, distortion and noise in various parts of the transmission path.

6.338G Television Systems

Prerequisites: 6.167G, 6.341G or similar.


6.339G Electroacoustics

Aspects of acoustics which are relevant to sound engineering, includes: scalar wave equation, plane and spherical waves, plane piston as a sound source, analysis of mechanical and acoustical lumped systems; loudspeaker and microphone types, practical aspects; room acoustics; sound recording, the ear, loudness and annoyance; underwater sound; introduction to sound in solids.
6.340G Communication Electronics

Prerequisite or co-requisite for 6.170G Microwave Electronics and 6.345G Analogue and Digital Filters.

Modern electronics as used in communication systems. Topics selected from: active, digital and switched-capacitor filters; CCDs and SAW devices, and their use in signal processing; phase-locked loops; analogue and digital integrated circuits (including ADCs, DACs, PLLs, VCOs, multipliers, modulators, etc; high-frequency and noise performance of active and passive circuits, particularly those using transistors; microwave ICs; microstrip, thick-film and thin-film circuits; design of large electronic systems.

6.341G Signal Analysis

Excluded: 6.042, 6.484G, 32.621G or similar.


The fundamental aspects of the analysis and processing of digital and analogue signals, with emphasis on random signals and noise. Includes: Generalized Fourier analysis; convolution, correlation, energy and power density spectra; Hilbert transforms; analytic signals and signals in systems. Sampling and digital processing of analogue signals. The discrete Fourier transform (DFT) and the use of fast Fourier transform (FFT) algorithms. Random processes, the transmission of signals and noise through linear systems and non-linear devices. Poisson and Gaussian random processes. Estimation and measurement of power density spectra.

6.343G Digital and Analogue Communications

Co-requisite: 6.042 or 6.341G or similar. Excluded: 6.323 or similar.

Prerequisite or co-requisite for 6.347G Digital Communications and 6.349G Optical Communications.

Fundamentals of modern telecommunications systems, including theoretical and practical aspects of: linear and non-linear analogue modulation (AM, SSB, FM, etc), digital signal transmission, pulse code modulation, computer communication, effects of noise in analogue and digital systems, error control, multichannel systems (FDM, TDM, etc), synchronization, relay systems, optimum transmitters and receivers.

6.344G Communication Theory

Prerequisite: 6.341G or similar.

An advanced subject, mainly for potential research workers, concerned with the theoretical basis of information transmission and the design of optimum analogue and digital communication systems. Topics: Information theory of discrete and continuous systems, channel capacity, rate distortion theory and fidelity criteria. Information theory for two-way communication. Optimum detection and estimation of analogue and digital signals using maximum likelihood (ML), maximum a posteriori (MAP), minimum mean-square error (MMSE) etc, criteria. Includes Wiener and Kalman filtering, and optimum detection and estimation of linearly and non-linearly modulated, analogue or digital, signals.

6.345G Analogue and Digital Filters


Theory and practice of modern filter design, particularly the design of active, digital and switched-capacitor filters. Includes: overview of modern filter methods, the approximation problems for analogue and digital filters, and the design of active, digital and switched-capacitor filters. In addition: classical LC filters, sensitivity and parasitics, equalizer design.

6.347G Digital Communications

Prerequisite: 6.343G or similar.

Advanced and unified treatment of digital transmission systems. Principal topics are: Baseband ASK digital communication Systems including inter-symbol interference, eye patterns, power spectral density, probability of error estimates and bounds, Nyquist criterion partial response signals (eg simple and modified duobinary). Digital Modulation including various types of shift keying modulation such as amplitude, amplitude and phase, offset amplitude and phase, phase, frequency and minimum shift keying (ASK, APSK, OAPS, PSK, FSK and MSK), power spectral density, probability of error, signal constellations and system comparison. Line Coding including linear codes, alphabetic codes, non-alphabetic codes and their comparison. Equalization including linear, non-linear, adaptive and automatic equalization and Viterbi decoders.

6.348G Optical Communications

Co-requisites: 6.167G, 6.343G or similar.

Optical communications, with emphasis on optical fibre communication. Includes: theory of optical fibre propagation, cable technology, LED and laser sources, integrated optical components; optical detectors and receiver design, measurements on optical fibres, system performance, wide-band systems and future systems. Applications of optical fibre in power distribution, sensors, LAN's, etc.

6.349G Radar and Navigation Aids

Co-requisites: 6.167G and 6.341G or similar.

Theory, performance and applications of various electronic location and navigation systems. Includes: review of basic radar theory, CW radar, pulse radar, pulse-Doppler radar, tracking radar, detection of radar signals in noise, error analysis, clutter suppression, multiple-target detection, theory of high-resolution radar, synthetic aperture radar, terrain-avoidance and terrain-following radar; aircraft landing systems; DME; radio ranges; hyperbolic navigation systems. Doppler navigation, satellite navigation.

6.433G Applied Microprocessor Design

Prerequisite: 6.060G.

Aims to familiarize the systems designer with the architecture and applications of the rapidly expanding family of microprocessor hardware support devices for dedicated control functions. Topics include: review and comparison of bus protocols of common systems; architecture, programming and applications of specialized system support devices and peripheral control chips; single chip microprocessors, architecture and applications to dedicated control tasks. Laboratory work includes individual design projects involving typical systems application of these devices.
6.452G Feedback Control 1

Excluded: 6.412.

An intensive series of lectures and tutorials for upgrading at graduate level those students who are deficient in the basics of control. Material covered includes both time and frequency domain approaches to the design of control systems for linear, continuous single input/single output plants. Topics include: Nyquist stability theory; root locus diagrams; Nichols charts; state feedback and observer design. Computer-aided design techniques are applied where appropriate.

6.452G Feedback Control 1

6.459G Control Computing

Prerequisites: 6.412, 6.021D.

Review of fundamental principles of digital and analog computation with special reference to the solution of engineering and control problems. Topics include: small computer systems architecture; process control interfacing techniques; machine language programming; operation of hybrid computers and their applications.

6.459G Control Computing

6.460G Real Time Computing and Simulation

Simulation of industrial processes by the use of real time modelling techniques is now an acceptable method for the study of complex industrial plant, eg, fossil-fired boiler-turbines; 747 aircraft; nuclear reactors. The fundamentals of real time computing, with examples carried out on an EAI 2000 — PDP-11 computing system. Analog, digital and hybrid simulation techniques as applied to the solution of lumped and distributed parameter systems.

6.460G Real Time Computing and Simulation

6.464G Digital Estimation, Prediction and Control

Prerequisites: 6.452G, 6.472G.

Topics selected from: optimal linear filtering, recursive filters, Kalman filters; optimal smoothing algorithms; and least squares estimation. The real time digital implementation of the algorithms is emphasized in the laboratory using both a PDP11/34 minicomputer and Motorola 6800 microcomputer. Specific applications relate to on-line digital control and signal processing.

6.466G Computer-Aided Design of Multivariable Control Systems

Many control problems result from interaction between key variables and can only be solved by a multivariable analysis. This can be approached in the time domain, eg the linear quadratic regulator, or the frequency domain, eg the inverse Nyquist array. Methods available, their limitations and strengths, and integration and comparison of the time and frequency approach. Laboratory work using interactive programs on the Department's PDP-11/34 computer. Topics include: time domain methods, pole shifting, state decoupling, optimal control; frequency domain methods, inverse and direct Nyquist methods, characteristic locus.

6.466G Computer-Aided Design of Multivariable Control Systems


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 sensing, labelling, shadows, shape information; structural descriptions and representing knowledge; computer vision for robots.
6.468G Computer Display Systems and Interactive Instrumentation  
**Prerequisite:** 6.060G.

Men-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.

6.470G Advanced Topics in Control — Robotics, Automation and Productivity Technology  
**Prerequisite:** 6.060G. Excluded: 6.412, 6.413.

Principles of Robotics relevant to future trends in automating the manufacturing process. Such aspects as arm configurations, dynamics and control with relevant sensing methods; image understanding for inspection, assembly and control together with trends in artificial intelligence for Robotics are discussed.

6.471G Systems and Control Elective — Medical Systems Analysis  
**Prerequisite:** 6.060G. Excluded: 6.412, 6.413.

Compartmental system analysis, an important branch of system theory and design, serves to unify modeling and analysis in many diverse fields. It has wide application in pharmacokinetic, metabolic, ecosystem and chemical kinetic modeling, and in the future will be applied increasingly to engineering systems. Topics include: classes of compartmental structure; fundamental properties; rate processes; inferred parameters; input-dependent kinetics; optimal input design; algorithms for indentification and control.

6.472G Feedback Control 2  
**Prerequisite:** 6.452G. Excluded: 6.412, 6.413.

Models of Linear and Nonlinear Systems including lumped and distributed systems, continuous and sampled data systems. Fitting parameters to linear models by batch and recursive methods. State estimation. Systems with time delays and types of nonlinearities. Introduction to digital process control including algorithms for 3-term controllers, dead beat response systems and optimal control.

6.481G Introductory Physiology for Engineers  
**Prerequisite:** 6.060G. Excluded: 6.402.

An introduction to biophysics and physiology for Engineers. Cells, tissues and organ systems with emphasis on their functional and regulatory characteristics and their interaction. An introduction to computer models of physiological control systems demonstrating their value in understanding the dynamics of complex neural, hormonal and circulatory responses to changes in homeostasis.

6.484G Biological Signal Analysis  
**Prerequisite:** 6.341G.

Digital computer methods of extracting information from biological signals using filtering and averaging, expectation density functions, correlation functions, spectral analysis and other techniques. Methods of constructing models of biological systems.

6.550G Solid State Electronics Elective  
**Prerequisite:** 6.060G. Excluded: 6.412, 6.413.

This syllabus changes from one occasion to the next, allowing presentation of a modern topic at graduate level, particularly by visiting academics of eminence.

6.573G Advanced Semiconductor Devices  
**Prerequisite:** 6.452G. Excluded: 6.512.

Theory and operating characteristics of a range of semiconductor devices including bipolar diodes and transistors, MOS devices and circuit connections, charge coupled devices, solar cells, light emitting diodes and semiconductor lasers.

6.575G Integrated Circuit Technology  
**Prerequisite:** 6.060G. Excluded: 6.512.


6.576G Reliability Engineering  
**Prerequisite:** 10.361 or equivalent. Excluded: 6.044.

Principles and applications of the reliability engineering concept, with equal emphasis on design analysis, developmental engineering, calculation and prediction of reliability and associated parameters, quality control, failure mechanisms, reliability testing, economic basis of reliability and on reliability improvement techniques. Applicable to both electronic and non-electronic systems.

6.577G Integrated Circuit Design  
**Prerequisite:** 6.0316 or 6.322.

May be taken concurrently with 6.856J Computer Science Elective — VLSI System Design.

An advanced treatment of the design of integrated circuits with emphasis on the relationships between technology, device characteristics and circuit design. Includes properties and modelling of bipolar and MOS circuit components, circuit analysis and simulation, layout rules, analog functions such as operational and power amplifiers; multiplexers, D/A and A/D converters. Digital circuits include gates, compound functions, RAM, ROM, speed and power analysis. Economics and yield analysis for MSI, LSI and VLSI devices.

6.578G Solar Energy Conversion  
**Prerequisite:** 6.0316 or 6.322.

Harnessing of sunlight by using solar cells to convert it directly to electricity. The properties of sunlight and of the semiconductors used in solar cells are reviewed and their interaction described. Factors important in the design of solar cells and the current technology used to produce cells. Likely future developments in this technology. System applications ranging from systems which are currently viable economically to residential and central power systems which may be a possibility for the future.

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 classification methods; 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 (H-stream); implementation of classification methodologies; introduction to image processing hardware and associated operating systems; interactive image processing.

6.650G Computer Science Elective — VLSI System Design C3
Prerequisites: 6.021E, 6.631, 6.0313 or similar. Excluded: 6.607A.
Introduction to the design and implementation of very large scale integrated systems, using NMOS technology. Basic information about integrated devices, circuits, digital subsystems and system architecture. Design procedures, including structured design methodology, symbolic layout, use of scalable design rules, delay time estimates. Fabrication procedures and computer aided design. Scaling effects. A design project in LSI is an integral part of this course. Selected projects are fabricated and returned to students for testing and bonding.

6.651G Digital Electronics C3
Prerequisite: 6.021E and 6.0313, or 6.631.
Digital circuits and principles, sub-system organization, microprocessors, memory technology, interface design, integrated circuit technologies and characteristics.

6.654G Digital Systems C3
Prerequisite: 6.021E. Excluded: 6.612.
Computer architecture, implementation and realization. Use of hardware description languages for the analysis, design and specification of arithmetic units, storage and control Microprogramming techniques.

6.655G Computer Organization and Architecture C3
Prerequisite: 6.0318 or 6.613.
Basic principles of computer architecture. A comparative study of the architectural features of a number of significant computer systems.

6.656G Software Systems A C3
Prerequisite: 6.641 (Pass Conceded (PC) awarded prior to Session 2, 1983, is not acceptable for this subject). Excluded: 6.643, 6.602D, 6.672.
A theoretical and practical basis for subject matter within the following areas: compiler organization: data structures, table organization, list structures, (trees, stacks, etc), lexical analysis, syntax analysis, code generation, code optimization. Portability: solutions to the problems of moving software systems between different mechanics. Compiler compilers: translator writing systems designed to provide facilities to aid the compiler writer.

6.657G Software Systems B C3
Overview of operating systems, sequential processes, concurrent processes, processor management, store management, scheduling algorithms, resource protection, data communication case studies.

6.659G Data Bases and Networks C3
Data management, compression techniques, redundancy coding; indexing; hashing encryption and decryption. Data base management systems; data description languages; data manipulation languages; integrity and recovery. The relational view of data. Computer networks; digital data transmission; communication protocols; circuit switching, packet switching; packet routing, network performance. Current international standards and practice. Distributed data bases.

6.660G Design and Analysis of Algorithms C3
Prerequisites: 6.641 (Pass Conceded (PC) awarded prior to Session 2, 1983, is not acceptable for this subject). Excluded: 6.642.
Techniques for the design and performance analysis of algorithms for a number of classes of problems. Analysis of algorithms: order notation, recurrence equations, worst case and expected order statistics. Design of efficient algorithms: recursion, divide and conquer, balancing; backtracking algorithms, branch and bound, dynamic programming; set manipulation problems; fast search algorithms, balanced optimal and multway trees; graph representations and algorithms; pattern matching algorithms. NP — complete problems. Design and specification of programs: modularization, interface design, introduction to formal specification techniques.
6.651G Business Information Systems C3


6.662G Computing Practice C3


For students majoring in Computer Science who seek a programming career in government or commercial industry. Topics, related to current computing practice include: comparative study of computer hardware in current popular use: comparative study of the 'popular' programming languages, eg COBOL, RPG, BASIC, FORTRAN, PL/1, APL. Job control language. Data Preparation procedures. Key-board entry. Verification. Word processing; report preparation; documentation. Social implications of computing. Professional responsibilities and ethics. Project management, software engineering; psychology of computer programming.

6.909G Project C9

6.918G Project Report C18

6.936G Thesis C36

8.401G Human Factors in Transport SS C3

Human capabilities, ergonomic principles, attitudes to new concepts, planning, the law; application to transport planning, design and implementation. The human as a processor of information, influence on design of transport facilities particularly information displays, signals signs and lighting.

8.402G Transport, Environment, Community F C6


8.403G Theory of Land Use/Transport Interaction S1 C3

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 modeling (land use, generation, distribution, modal assignment, network assignment, evaluation). Planning methodologies (short-, medium-, long-term; action planning, strategic planning; local, urban, regional, national).

8.404G Local Area Transport Planning S1 C3

Application of theoretical methods to local area planning. Local government planning and engineering: pedestrian planning, frontage land use problems, analysis of residential areas, industrial estates, shopping centres and recreational facilities, accessibility studies, environmental studies, parking studies.

8.405G Urban Transport Planning Practice SS C3


8.406G Regional Transport Planning S2 C3

The role of transport in economic and social development in regions including Third World countries; historical and contemporary analysis. Analytical techniques for regional planning. Planning practice, feasibility studies, evaluation methods. Case studies.

8.407G Transport System Design (Non-Urban) S1 C3

Process of location of road, railway and airport facilities. Data collection alternative routes; public discussion, methods, techniques, aids, plans and diagrams produced. Geometric form: differences between road, railway and airport carriageway layout. Optical guidance, design models, landscape, provision for surface-water signposting, fencing and posts.

8.408G Transport System Design (Urban) S2 C3

Types of urban transport facilities. Distributors, streets, bicycle routes, walk-oriented areas, bus lanes and rapid transit lines, stops and change terminals, noise control. Minimum geometric form; speed range controls, provision for surface water on urban roads, landscape. Design of intersections and parking areas.

8.409G Interchange Design SS C3

Central projection theory and application to alignment design; perspective drawing methods, introduction to arial and terrestrial photogrammetry; photomaps and photomontage as applied to transport facilities. Speed change lanes, exit and entrance terminals, ramp types, ramp speeds and design. Interchange location and layout, provision for surface water, signposting. Computer use. Safety measures during maintenance.

Civil Engineering
8.410G Highway Engineering Practice Part 1 S1 C3

8.411G Highway Engineering Practice Part 2 S2 C3

8.412G Economics for Transportation Studies S1 C3

8.413G Transport Economics S2 C3
Cost and price analysis for 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.

8.414G Transport Systems Part 1 S1 C3

8.415G Transport Systems Part 2 S2 C3
Historical introduction to transport systems and development of various transport modes, road (vehicles, pedestrians, cycles), conveyor, rail, sea and air. Analysis of the operational characteristics of vehicles in the transport modes of road, rail and air. Analysis of the requirements of the rights of way for each transport mode. Development of optimum criteria for the distribution of cargo and passenger traffic. Terminals and mode transfer facilities. Development of system operational models. Energy consideration, new systems.

8.416G Traffic Engineering F C6
Road inventory; traffic measurements; flow, speed, origin-destination, accidents, road structure. Road capacity; controlled and uncontrolled intersections, highways and freeways. Signal systems. Traffic operations and control; arterial and network systems. Parking. Hazard analysis and safety improvement. Enforcement. Bus service operation.

8.417G Transport and Traffic Flow Theory F C6
Analysis of deterministic and stochastic models of the traffic stream. Topics covered include the following: Definition and measurement of traffic stream parameters. Space and time distribution of speed. Overtaking models and the moving-observer method. Fundamental diagram of traffic. Car-following theory. Headway and counting distributions. Introduction to queuing theory. Simulation techniques. Sig-nalized and unsignalized intersections.

8.418G Statistics for Transport Studies Part 1 S1 C3
Topics covered include the following: Definition and measurement of traffic stream parameters. Space and time distribution of speed. Overtaking models and the moving-observer method. Fundamental diagram of traffic. Car-following theory. Headway and counting distributions. Introduction to queuing theory. Simulation techniques. Signaled and unsignalized intersections.

8.419G Statistics for Transport Studies Part 2 S2 C3

8.420G Transport Engineering Elective SS C3
An occasional offering in a specialized Transport and Highways topic selected according to current demand and/or availability of a local or visiting specialist.

8.701G Economic Decision Making in Civil Engineering SS C3
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.

8.702G Network Methods in Civil Engineering SS C3
Graphs, flow-in networks, optimal paths, critical path schedule, resources levelling, simulation networks, stochastic networks, project management, further applications.

8.703G Optimization Techniques in Civil Engineering SS C3
Search, linear programming, non-linear programming, geometric programming, calculus of variations, maximum principle, applications.

8.704G Stochastic Methods in Civil Engineering SS C3
Queueing, Markov processes, theory of storage, reliability, renewal, application, transportation and allocation.

8.705G System Modelling SS C3
The development of system models for specific problem areas and decision positions. Problem environment, goals, objectives, and definition established by field contact and team discussion. Information flow requirements and the design of user-oriented decision processes. Class size is limited to selected students.
8.706G Experimental Methods in Engineering Research SS C3
Purposes of experimentation in engineering research. Design of experiments; factorial and other designs; replication. Analysis of experimental data: analysis of variance and covariance; special analysis; other statistical methods. Decision theory.

8.707G Numerical Methods in Civil Engineering SS C3

8.710G Advanced Topics in Optimization in Civil Engineering SS C3
Special studies in optimization in Civil Engineering design and construction to be offered from time to time by appropriate specialists.

8.714G Advanced Topics in System Modelling SS C3
Special studies in system modelling to be offered from time to time by appropriate specialists.

8.723G Construction Design SS C3
Design of field services and structures; compressed air services, cofferdams, ground anchors, floating plant, formwork and falsework, bridge centring, well-points and dewatering systems.

8.724G Construction Technology SS C3
A selection of topics from: drilling, blasting techniques, tunnelling, rock-bolting and other ground support, earth/rock transport, harbours, railways, dams, bridges, structural steelwork techniques, pipeline construction, foundation grouting, compressed air work.

8.725G Construction Accounting and Control SS C3

8.726G Construction Law and Professional Practice SS C3

8.727G Construction Planning and Estimating F C6
Project initiation and development, feasibility studies, planning and estimating procedures, contract administration; estimating cost of labour plant and materials, indirect cost and overheads; profit; construction administration. Preparation of cost estimate for a major civil engineering project.

8.728G Design of Construction Operations F C6
Heavy equipment, labour intensive, and composite operations; spatial layout and material flow concepts; the modelling of operations at the micro, macro, and systems level; engineered estimates and productivity prediction models; analysis of construction operations by time-lapse methods; field methods at foreman, superintendent, engineer, and project manager levels; field studies of specific construction operations.

8.731G Project Management SS C3
A problem-oriented approach to Project and Mission Management: the nature of engineering and construction projects; the project team; behavioural aspects of project management; the organization and management of project resources; short term field planning and management strategies.

8.732G Advanced Project Management Theory SS C3
A theoretical and formative approach to Project and Mission Management; management strategies and project success evaluation techniques; organizational and behaviour aspects of the project team structure; behaviour norms and their impact on project team motivation; project management decision processes; case studies in project management.

8.748G Pavement Materials 1 SS C3
Properties and usage of soil and rock as pavement materials in road, rail or other construction work. Modification and evaluation of these properties; criteria for use and acceptance testing; variability and quality control; requirements of crushed rock for surfacing; use of non-standard materials in pavement; materials resources; in service conditions and their effect on materials performance.

8.749G Pavement Materials 2 SS C3

8.750G Pavement Design and Evaluation 1 SS C3
Pavement types for road, rail, airfield and other works; Stress distribution in pavements, theoretical and actual; sub-grade conditions and traffic loadings; design principles methods and criteria for flexible pavements; design principles, methods and criteria for rigid and semi-rigid pavements, including stabilized soil and multilayer pavements; design principles, methods and criteria for design of railtracks. Design of special-duty and temporary pavements.

8.751G Pavement Design and Evaluation 2 SS C3
**8.752G Terrain Engineering**

Basic geology, geological processes and geomorphology as they affect the planning of engineering works and construction. Specific civil engineering applications for highways, water storages, buildings, civil and military transport operations, etc. Photo interpretation, ground surveying, terrain mapping, information storage and retrieval.

**8.753G Soil Engineering**


**8.754G Applied Soil Mechanics**

A detailed study of rigid and flexible retaining structures, and of slope stability using both traditional and recent analytical methods. Applications of plasticity theory, refined failure surface analysis and the finite element method.

**8.755G Materials of Construction (Concrete Technology) 1**

Concrete as a structural material. Basic Structure; strength micro-cracking and failure mechanisms; significance of tests and relation to design requirements. Variability, target strength, code and special criteria for acceptance and rejection of concrete. Non-destructive testing. Accelerated curing and special high-strength concretes for column and prestressed construction. Recent developments in constituent materials, special cements and admixtures. Workability, mix design theories and practical applications.

**8.756G Materials of Construction (Concrete Technology) 2**

Concrete as a structural material, with special application to marine structures. Volume changes, shrinkage and thermal stresses; creep; predicated and design values. Cracking of plain and reinforced concrete, fracture toughness and extensibility; cracking problems caused by volume changes and creep effects in mass and offshore-type structures. Bond and impact strengths. Durability and fatigue of reinforced and prestressed concrete. Types of durability breakdown, sea water attack, FIP and other design recommendations and current research for marine structures. Special concretes.

**8.760G Geotechnical Aspects of Natural Hazards**

Basic principles involved in earthquake engineering; seismic waves; earthquake effects on foundations of buildings, dams slopes and embankments, intake towers, etc. Criteria for earthquake resistant design; landslides and their effects on soil slopes; probabilistic evaluation of slope failures; treatment of slopes; liquefaction.

**8.766G Welding in Structural Engineering**

Terminology, welding processes, metallurgy, weldability of ferrous and non-ferrous metals, pre-heat and post-heat treatments residual stresses and distortion, weld quality levels, destructive and non-destructive testing, economic welded design, quality assurance.

**8.767G Foundation Engineering**

A specialized study of theoretical and practical aspects of geotechnical engineering directly relevant to the analysis and design of foundation systems. The primary object of the course is to establish the state-of-the-art with particular emphasis on the application of recent theoretical developments to foundation engineering, including piles, rafts, raft-piles, laterally loaded piles, retaining structures and techniques of strengthening soils.

**8.771G Materials of Construction (Metals) 3**

Previously 8.756G.

Use of metals as structural materials; specification; structural aluminium alloys, modern steels, philosophy of material selection; properties, applications, limitations; behaviour under mechanical loading; effects of environment; corrosion and corrosion protection.

**8.772G Soil Dynamics**

Fundamentals of vibrations; wave propagation in elastic, homogeneous, medium; wave propagation in layered medium; vertical, sliding, torsional and rocking motion of footings on elastic half-space; behaviour of dynamically loaded soils; design procedures for dynamically loaded foundations.

**8.773G Numerical Methods In Geomechanics**

Fundamentals of finite element and boundary element methods; deformation and flow problems; linear and non-linear analysis; applications to underground opening, stability of slopes, foundations, mining excavation, subsidence and consolidation; soil-structure interaction problems; earth pressures, retaining walls and buried pipes; thermal stress analysis.
8.778G Geotechnical Processes for Energy Resources  SS C3
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.

8.779G Building Materials Technology in Third World Countries  SS C3
Appropriate technology and building, traditional materials; cement and concrete, bricks, soil and stabilized soil, timber and timber products, composite materials, ferrocement; material selection.

8.780G Geological Engineering  SS C3

8.802G Elastic Stability 1  SS C3
Euler strut; uniform and non-uniform cross sections. Eccentric loading; stressing beyond the elastic limit. Struts continuous over several supports. Stability of frames.

8.803G Elastic Stability 2  SS C3
Energy methods of formation of stability problems. Approximate methods. Thin-walled open section struts; lateral buckling of beams; bending and buckling of thin plates.

8.804G Vibration of Structures 1  SS C3
Review of basic aspects. Analysis of lumped mass systems with various degrees of freedom. Vibration in beams and other continuous structures.

8.805G Vibration of Structures 2  SS C3

8.806G Prestressed Concrete 1  SS C3
Historical development. Methods of prestressing. Elastic analysis and design. Flexural capacity and shear capacity of prestressed elements.

8.807G Prestressed Concrete 2  SS C3

8.808G Prestressed Concrete 3  SS C3
Partially prestressed concrete; cracked section analysis; crack control and deflection calculations; determination of appropriate level of prestress; strength calculations. Rational design procedures for prestressed members. Continuous beams; secondary moments; practical design procedures.

8.809G Reinforced Concrete 1  SS C3
Historical development. Methods of analysis and design, including limit state concepts. Analysis and design for bending, compression and combined bending and compression. Shear and torsion. Serviceability requirements.

8.810G Reinforced Concrete 2  SS C3

8.811G Reinforced Concrete 3  SS C3

8.812G Plastic Analysis and Design of Steel Structures 1  SS C3
The perfectly plastic material, the plastic hinge; plastic collapse of beams and frames; upper and lower bound theorems; introduction to design principles and methods.

8.813G Plastic Analysis and Design of Steel Structures 2  SS C3
Estimation of deflections; factors affecting plastic moment; shake down; three-dimensional plastic behaviour; minimum weight design.

8.814G Analysis of Plates and Shells  SS C3

8.817G Experimental Structural Analysis 1  SS C3
Dimensional analysis and principles of similarity, model analysis and design of models. Instrumentation and special methods of measurement. Evaluation of data.

8.818G Bridge Design 1  SS C3
8.819G Bridge Design 2  SS C3

8.820G Structural Analysis and Finite Elements 1  SS C3

8.821G Structural Analysis and Finite Elements 2  SS C3

8.822G Structural Analysis and Finite Elements 3  SS C3
Application of the finite element method to analysis of structures. Verification of the results of standard computer programs. Structural stability and vibration of structures.

8.830G Hydromechanics  SS C3
General equation of fluid motion, potential flow, conformal mapping, laminar flow, Navier-Stokes equations; turbulence, shear flows, jets and wakes, boundary layers, turbulent mixing, diffusion, air entrainment, cavitation, stratification.

8.831G Closed Conduit Flow  SS C3
Theories for energy loss in conduit flows, roughness at pipe walls and tunnels, design applications. Cavitation in conduits, transport of waterborne mixtures in pipes, accuracy of flow measurement in pipe lines.

8.832G Pipe Network and Transients  SS C3

8.833G Free Surface Flow  SS C3
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.

8.835G Coastal Engineering 1  SS C3
Theory of periodic waves as applied to tides and wind generated waves in water of varying depths. Wave and tide prediction.

8.836G Coastal Engineering 2  SS C3
Wave forces on structures, shore processes and beach erosion. Estuarine hydraulics, wave and tide models.

8.837G Hydrological Processes  SS C3
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  SS C3
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 Reservoir Design and Yield Determination  SS C3
Storage-yield analysis, extension of runoff records, deterministic catchment models, stochastic hydrology, storage probability studies, spillway capacity and reservoir flood routing.

8.841G Hydrometeorology  SS C3
Water and energy balances, atmospheric moisture, precipitation, evaporation and transpiration, snow and snowmelt, extreme precipitation.

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 Soil-Water Hydrology  SS C3
Hydrologic characteristics of unsaturated media, hysteresis, theory of infiltration, drainage and redistribution studies, laboratory and field instrumentation, applications to field problems.

8.846G Urban Drainage Design  SS C3
Excluded: 8.838G.
Introduction to flood estimation design, rainfall data hydrograph analysis, storm runoff, loss rates, rational method. Urban drainage design.

8.847G Water Resources Policy  SS C3
Resource economics, water supply, water demand, multiple objective planning, multiple purpose projects, water law, water administration, case studies.
<table>
<thead>
<tr>
<th>Course Code</th>
<th>Title</th>
<th>Division</th>
</tr>
</thead>
<tbody>
<tr>
<td>8.848G</td>
<td>Water Resource System Design</td>
<td>SS C3</td>
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<tr>
<td></td>
<td>Principles of the optimal design and operation of multiple purpose, multiple component, water resource systems; evaluation of cost and benefits in complex and simple systems.</td>
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<tr>
<td>8.849G</td>
<td>Irrigation</td>
<td>SS C3</td>
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<td>Soils, soil-water relationships, plants, climate, crop requirements; water budgets, sources, quality, measurement; irrigation efficiency. Design of irrigation systems, appurtenant works, distribution.</td>
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<tr>
<td>8.850G</td>
<td>Drainage of Agricultural Land</td>
<td>SS C3</td>
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<td></td>
<td>Characteristics of drainage systems, steady and unsteady state drainage formulae, conformal transformation solutions, soil characteristics field measurement of hydraulic conductivity and soil water pressure, significance of unsaturated zone, practical aspects.</td>
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<tr>
<td>8.851G</td>
<td>Unit Operations in Public Health Engineering</td>
<td>SS C3</td>
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<tr>
<td></td>
<td>Theory of physical, chemical, biological, and hydraulic processes used in both water and wastewater treatment. Applications where these are common to both water and wastewater treatment.</td>
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<tr>
<td>8.852G</td>
<td>Water Distribution and Sewage Collection</td>
<td>SS C3</td>
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<td></td>
<td>Water collection, transmission and distribution systems — layout design and analysis, reservoirs, pumping. Sewage collection design and analysis — capacities, corrosion, pumping.</td>
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<tr>
<td>8.854G</td>
<td>Solid and Liquid Waste Management</td>
<td>SS C2</td>
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<td></td>
<td>Sources and nature of refuse-collection and transportation-disposal: sanitary landfill, incineration, pyrolysis, resource recovery, composting. Collection, treatment and disposal of strong liquid wastes.</td>
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<tr>
<td>8.855G</td>
<td>Water and Wastewater Analysis and Quality Requirements</td>
<td>SS C3</td>
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<td></td>
<td>The effects of impurities in water and wastewater on its suitability for various beneficial uses, and methods used for detecting impurities. Analytical methods used in water and wastewater treatment for monitoring and process control.</td>
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<tr>
<td>8.856G</td>
<td>Water Treatment</td>
<td>SS C3</td>
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<td></td>
<td>Application of processes and process variations used to upgrade the quality of water for specified uses, with particular reference to the treatment of water for municipal use.</td>
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<tr>
<td>8.857G</td>
<td>Sewage Treatment and Disposal</td>
<td>SS C3</td>
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<td>Application of processes and process variations used to improve the quality of sewage effluent, and the disposal of the effluent. Re-use of effluents where applicable. Sludge treatment and disposal.</td>
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<tr>
<td>8.858G</td>
<td>Water Quality Management</td>
<td>SS C3</td>
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<td></td>
<td>Fundamental concepts; systems approach to quality aspects of water resource systems; quality interchange systems; quality changes in estuarine, surface, and ground water. Quality management by engineered systems. Economic criteria relating to water use and re-use systems.</td>
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<tr>
<td>8.860G</td>
<td>Investigation of Groundwater Resources</td>
<td>SS C3</td>
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<td>Occurrence and extraction of groundwater. Investigation and drilling methods, systems approach, optimization techniques, conjunctive use studies, quality of groundwater.</td>
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<tr>
<td>8.861G</td>
<td>Investigation of Groundwater Resources</td>
<td>SS C3</td>
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<td>Geophysical methods, remote sensing, photo-interpretation, arid-environment studies, analog models, case studies.</td>
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<tr>
<td>8.862G</td>
<td>Fluvial Hydraulics</td>
<td>SS C3</td>
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<td>Unsteady and varied flow in non-uniform channels, secondary currents, sediment transport, channel morphology, scour and shoaling, river control works, modelling of fluvial processes.</td>
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<tr>
<td>8.863G</td>
<td>Estuarine Hydraulics</td>
<td>SS C3</td>
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<tr>
<td>8.864G</td>
<td>Arid Zone Hydrology</td>
<td>S1 L1 T1 C3</td>
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<td>Co-requisite: 8.837G, 8.838G.</td>
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<td>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.</td>
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<tr>
<td>8.865G</td>
<td>Arid Zone Water Resources Management</td>
<td>SS L1 T1 C3</td>
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<td></td>
<td>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.</td>
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<tr>
<td>8.866G</td>
<td>Public Health Science</td>
<td>S1 C3</td>
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<td></td>
<td>Impact of water and wastewater treatment on disease transmission. Monitoring methods used for pathogens and indicator organisms, structure and degradation of large molecules, biochemical pathways of anabolism and catabolism and the characterization of microorganisms.</td>
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</tbody>
</table>
8.869Q Instrumentation and Control in Water Supply and Wastewater Engineering

Principles of primary elements, instrument response and reliability, control methods and the response of plants to control conditions in water and wastewater treatment and supply systems.

8.870G Hydraulics and Design of Water and Wastewater Treatment Plants

Co-requisites: 8.656G, 8.857G.

Application of hydraulic principles to flows within treatment plants. Selection and integration of unit processes required for water and wastewater treatment, plant layout, plant design including hydraulic profiles, the influence of flow and load variability, instrumentation and control strategies.

8.871G Water Supply and Sanitation in Developing Countries

Prerequisites: 8.851G, 8.855G, 8.868G.

Selection of appropriate technology for water supply and wastewater treatment and disposal to account for hot climates and low per capita incomes. Design basis for systems and the operating requirements.

8.901G Civil Engineering Elective 1

A Session 1 occasional elective on a civil engineering topic, selected according to current demand and availability of local and visiting specialists.

8.902G Civil Engineering Elective 2

A Session 2 occasional elective on a civil engineering topic, selected according to current demand and availability of local and visiting specialists.

8.909G Project

A minor research investigation involving analysis and interpretation of data, or a critical review and interpretation of literature on a selected topic, or a design project.

8.918G Project Report

As for 8.909G but involving more substantial investigation.

8.936G Thesis

Mathematics

10.061G Advanced Mathematics for Electrical Engineers

Boundary value problems in partial differential equations. Selected topics from complex variable analysis, integral transforms, and orthogonal functions and polynomials.

10.361G Statistics

Probability theory, a survey of random processes with engineering applications — processes in discrete and continuous time. Markov processes, ergodicity, stationarity, auto-correlation, power spectra, estimation of auto-correlation and power spectra.

10.371G Statistics

Revision of probability and distribution theory, including estimation of hypothesis testing. Extension of this to include topics such as more complex probabilistic modeling, analyses of modified data (ensored, truncated and missing observations), general statistical inference (decision theory), acceptance testing, and reliability analysis (hazard functions).

32.012G Biomedical Statistics

Statistical assessment of normal and diseased states. Statistical relationships between multiple variables used to assess disease; analysis of variance, regression, factor analysis, discriminant analysis. Progression of diseases over time. Diagnosis and assessment of treatments. Experimental design and sampling. Computation methods.

32.101G Mathematical Modelling for Biomedical Engineers

Model formulation and validation of ordinary and partial differential equations by analytical and numerical techniques.

Accountancy

14.062G Accounting for Engineers

Problems related to industrial situations, and their relevance in decision-making. Manufacturing and cost accounts, budgeting and budgetary control, cost analysis and control and profit planning.
to illustrate these methods.

Data drawn from the health planning field used in time series analysis. Estimation and hypothesis testing; statistical decision theory; normal, Poisson and binomial distributions; linear regression; index numbers; economic aspects of experimental design; analysis of variance or randomized block, latin square and factorial experiment designs.

Health Administration

16.901G Health Services Statistics 1

Statistical methods and theory: frequency distributions and their descriptions; an introduction to probability; principles of sampling; estimation and hypothesis testing; statistical decision theory; normal, Poisson and binomial distributions; linear regression; index numbers; time series analysis. Data drawn from the health planning field used to illustrate these methods.

Industrial Engineering

Industrial Engineering is a Department within the School of Mechanical and Industrial Engineering.

18.061G Industrial Experimentation 1

Design of experiments with reference to industrial problems; planning experiments; significance testing; simple comparative experiments, accelerated experiments; fatigue testing, tool life testing; economic aspects of experimental design; analysis of variance or randomized block, latin square and factorial experiment designs.

18.062G Industrial Experimentation 2

Regression analysis; use of orthogonal polynomials in regression analysis and analysis of variance; confounding in factorial design; response surfaces and determination of optimum conditions.

18.074G Industrial Management

Definitions of management; evolution of management thought, classical, quantitative and behavioural schools; interactions between organizations and their environment. The planning process; strategic and tactical planning, developing planning premises, nature of managerial decision making, quantitative aids, management by objectives. Organizational structures; co-ordination and spans of control, the informal organization, authority delegation and decentralization, groups and committees, managing organizational change and conflict. Motivation, performance and satisfaction; leadership, interpersonal and organizational communication, staffing and the personnel function. The control process; budgetary and non-budgetary methods of control, use of management information systems.

18.075G Decision Support Systems

Perspectives on organizational and individual decision making; basic philosophy of Decision Support Systems; knowledge representation techniques; DSS models and operators; Data Base Management systems in DSS; iterative design techniques; the DSS/user interface; practical design and implementation of a Decision Support System.

18.171G Inspection and Quality Control

Economics of measurement; advanced measuring and inspection methods; non-destructive testing; quality control systems; sampling by attributes and variables; standardization; case studies; process capability and variability; machine tools acceptance testing; alignment procedures.

18.260G Computer Aided Programming for Numerical Control


18.261G Computer Automation

Computer architecture including central processor, random-access memory, read only memory, input/output ports, peripherals, and the relationships between each. A systematic study of the requirements for interfacing computers to the real world. Machine code, assembly language, and high level languages such as BASIC or FORTRAN with a comparison of each for particular applications. Development of small computer system for machine tool control, automated inspection, supervision, stock control, etc.

18.360G Ergonomics

Applied anatomy and kinesiology; anthropometry; application to work place arrangement, seating and bench design, tool and equipment design; lifting techniques, consumer product and architectural design. Physiological and psychological aspects of work and fatigue.
measurement of energy consumption, limits to energy expenditure at work, static muscular fatigue, boredom. Environment effects: natural and artificial lighting arrangements, problems of perception, colour, noise and vibration, preventive measures; heat and ventilation, thermal regulation in humans, criteria for comfort, effects of pollutants. Man-machine interface. Displays, machine controls, reaction times, vigilance. Applications of ergonomics to occupational safety and health. Ergonomic research methodology.

Note: A project forms a substantial proportion of the assessment for this subject.

18.371G Factory Design and Layout  
Prerequisite: 18.303 or 18.380G or equivalent.


Note: A project forms a substantial proportion of the assessment for this subject.

18.380G Methods Engineering  

18.461G Design Production  
Influence of manufacturing processes on design; design simplification and standardization; value engineering; economics of process selection; case studies.

18.464G Value Analysis and Engineering  
Cost reduction through value analysis/engineering illustrated by case studies. Selection of projects to be studied, collection of information, creative problem solving, development of alternatives, functional analysis system technique, functional evaluation, cost-function relationship, decision making, communication and implementation of the proposal. Applications to engineering design and services.

18.465G Computer-Aided Manufacturing  

18.471G Design Communication  
Communication systems in design; aids to design communication; engineering drawing practice; standardization; interpretation of design information.

18.571G Operations Research 1  
Excluded: 18.503, 18.551, 18.580G.

The formation 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 and simulation. These techniques are applied to situations drawn from industrial fields, for example, production planning and control. Practical problems of data collection, problem formulation and analysis.

18.574G Management Simulation  

18.579G Case Studies in Operations Research  
Problems confronting management are seldom in the form of clear cut textbook type exercises; rather they are often ill-structured and ambiguous. A variety of such problems in operations research/management science is considered with emphasis on the common pitfalls that arise in solving real world problems and the comparison of different strategies for solution. Students are expected to prepare written reports on certain cases considered suitable for submission to management.

18.580G Operations Research  
Excluded: 18.503, 18.551, 18.571G.

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.

18.671G Decision Theory  
Excluded: 18.672G.

Theories of choice, value, risk and uncertainty for the individual and for multi-person situations. Statistical decision theory. Bayes and minimax rules. Optimum sampling.

18.672G Decision Theory for Industrial Management  
18.573G Energy Modelling, Optimization and Energy Accounting C3
The analysis of energy systems using computer models. Applications of such models range from policy analysis at government level to investment analysis within individual industries. Covers both the formulation of energy models and the techniques used to obtain optimized solutions, with examples from actual studies. Effects of uncertainty and the use of energy accounting as an analytical tool.

18.675G Economic Decisions in Industrial Management C3
General aspects: the economic objective, the single-period investor's model, economic criteria, the mathematics of finance. Deterministic models: project evaluation using discounted cash flow analysis; capital structure; debt and equity financing; cost of capital and the minimum acceptable rate of return; taxation; inflation and its effects. Probabilistic models: multiple objectives and multi-attribute value systems based on means and variances of cash flows. Particular applications of economic decision-making: venture and risk analysis, risk management, static and dynamic replacement models, rent-or-buy decisions, break-even analysis, expansion and economic package concepts, analysis of projects with public financing.

18.681G Engineering Economic Analysis C3
Price-output decisions under various competitive conditions. The time-value of money, net present worth and DCF rate of return, and their application in the selection and replacement of processes and equipment. Construction and optimization of particular models, eg replacement, capital rationing. Measures of profitability.

18.760G Discrete-Event Simulation Languages C3
Prerequisite: 18.503 or 6.646 or 18.761G.
Basic elements of simulation languages: random number generation, process generation, list and set processing, data structures, time advance and event scanning, gathering and resetting statistics, graphics, Simulation language world views. Comparative review of commercially available simulation languages such as Simscript, GPSS, ECSL, and Simula, and a study of one of them in depth. Simulation using personal computers. Simulation language preprocessors.

18.761G Simulation in Operations Research C3
Excluded: 18.503, 6.646.

18.763G Variational Methods in Operations Research C2
The variational problem and its history. The modern formulations. Mathematical Theory. Application to a wide range of problem areas such as production and inventory control, advertising, machine maintenance and natural resource utilization.

18.764G Management of Distribution Systems C2
Prerequisite: 18.503.
The distribution system: single depot location, multi-depot location, vehicle scheduling, vehicle loading, fleet size, case studies.

18.765G Optimization of Networks C2
Prerequisite: 18.551.

18.770G Stochastic Control C2

18.772G Information Processing Systems in Organizations C2
The place of operations research in information processing systems. Computer hardware and software. Data structures and data manipulation techniques. Typical structures of suites of programs. The life cycle of information processing systems. System design. Applications packages with emphasis on systems for production and inventory control. Major problems in information processing systems.

18.773G Optimal Control in Operations Research C2
Brief survey of dynamic optimization techniques. Introduction to the calculus of variations and the maximum principle for both continuous and discrete systems. Applications to operations research problems drawn from the areas of production and inventory control, machine maintenance, investment and natural resource utilization.

18.774G Applied Stochastic Processes C2
Examples of stochastic processes, basic concepts and Markov chains. Renewal theory. Applications to queues, inventory replacement, risk, business and marketing. Markov decision processes.

18.775G Networks and Graphs C2
Basic concepts. Application of Hamiltonian paths, Euler cycles, trees, planar graphs, dominating and independent sets to operations research problems. Shortest route algorithms. Concept of maximum flow in a network applied to transportation assignment and scheduling problems.

18.776G Production and Inventory Control C2
Overview of the basic issues in Production and Inventory control. Material Requirements Planning: the Master Production Schedule; structuring Bills of Materials for MRP; Capacity planning and control; shop floor scheduling and lead time reduction; cycle counting; lot sizing techniques; implementation of MRP systems in practice. Just-in-Time (JIT) production; the Kan Ban system; production planning and control in Flexible Manufacturing Systems (FMS); the relation between MRP, JIT and FMS.
18.777G Time Series Forecasting C2

18.778G Scheduling and Sequencing C2
Criteria for evaluation schedules. Scheduling of single machines. Job-shop scheduling with two or three or more machines. Permutation schedules. Groups of machines. Scheduling constrained resources.

18.779G Game Theory C2

18.780G Production Control C2
Modes of manufacture: information flow in multi-stage production systems; classical production and inventory models and control techniques; Material Requirements Planning; Just-in-Time Production; Flexible Manufacturing Systems and their control.

18.862G Linear Programming C2

18.863G Nonlinear Programming C2

18.864G Applied Geometric Programming C2
Optimization concepts developed for function of polynomial form. Solution techniques for such problems, sensitivity of solution. Applications of geometric programming to problems from engineering and operations research.

18.868G Industrial Applications of Mathematical Programming C3

18.870G Large Scale Optimization in Industry C3
Excluded: 5.1245.
Large-scale linear programming: sparse constraint matrices, updating basis factorizations. Large-scale nonlinear programming: the limitations of classical quasi-Newton and conjugate gradient methods, sparse Hessian approximations, superbasic variables, augmented Lagrangian methods for sparse nonlinear constraints. Applications, examples and case studies from industry: optimal power flow, steam and power plant design, pipeline network optimization and other.

18.871G Mathematics for Operations Research C2

18.874G Dynamic Programming C2

18.875G Geometric Programming C2
The geometric programming theory is developed for convex and non-convex mathematical programs. The theory is applied to polynomial and posynomial programming. As projects actual polynomial and posynomial programs will be solved.

18.876G Advanced Mathematics for Operations Research C2
A survey of mathematical ideas which are of value in operations research. Topics will be selected from the following areas: set theory, real analysis, matrix theory, topology, function spaces, linear operator theory, inequalities, stability, complex analysis, convex analysis, distribution theory, group theory and measure-theoretic probability theory.

18.879G Mathematical Programming Analysis C3
On-requisites: 18.871G; Linear Programming section of 18.571G.
Methods for the analysis of mathematical programs. Analysis of the properties of linearity, separability, convexity, quasi-convexity and duality, providing the basis of the conversion of mathematical programs to potentially simpler formulations. Includes the areas of geometric programming, convex programming and quasi-convex programming.
Engineering

18.909G Project C9
18.918G Project Report C18
18.936G Thesis C36
18.965G Seminar (Industrial Management) C0
18.967G Advanced Topic In Production Engineering C2
18.968G Advanced Topic In Production Engineering C2
18.969G Advanced Topic In Production Engineering C2

Not all subjects are available in any one year.

Nuclear Engineering

23.014G Fewgroup Reactor Theories S2 L2½T½ C3
Not offered in 1986.

The derivation and use of few group reactor models for the macroscopic analysis of finite reactor criticality, burnup and control.

23.015G Multigroup Reactor Theories S2 L2½T½ C3
A selection of topics from general reactor theory, variational principles, perturbation theory, and multigroup transport theory, for the general problem of three-dimensional fine scale neutron flux distribution analysis.

23.016G Neutron Kinetics and Reactor Dynamics S1 L2½T½ C3
Not offered in 1986.

The derivation and application of point reactor kinetic models to the study of macroscopic power reactor dynamics, stability and control, and the development of general space-time kinetic models.

23.023G Reactor Thermal Performance S1 L2½T½ C3
The processes of heat generation, conduction, heat transfer and heat and momentum transport in fluids, in relation to the thermal performance of reactor channels and cores.

23.024G Boiling and Two Phase Flow S1 L2½T½ C3
Not offered in 1986.

Subcooled and bulk boiling, boiling crises, and the special problems associated with the analysis of reactor channel and core performance under boiling and two-phase flow conditions.

23.025G Reactor Structural Mechanics S1 L2½T½ C3
Not offered in 1986.

A study of theoretical models and numerical techniques required for the analysis of mechanical and thermal stress, deformation, and failure modes of reactor core components and containment structures under high temperature, neutron and gamma irradiation.

23.026G Reactor Systems Analysis S2 L2½T½ C3
Not offered in 1986.

Nonlinear and linear system dynamics and stability theory applied to reactor processes and components, for the development and use of overall reactor and power system dynamics models.

23.027G Boiling Reactor Dynamics S1 L2½T½
Not offered in 1986.

The special problems associated with the dynamics and stability of fluid cooled reactors under boiling conditions.

Neutron and nuclear reactions, the formation of neutron spectra in infinite multiplying media, transport and diffusion theories, and their application to the analysis of heterogeneous reactor lattices.
23.028G Reactor Accident and Safety Analysis S2 L2½T½ C3
The mathematical modeling and computation of ideal and actual reactor accident histories, particularly for fluid cooled systems, and the application of probability theory to reactor hazard evaluation.

23.032G Mathematical Analysis and Computation S1 L2½T½ C3
Mathematical methods, partial differential equations, special functions, and numerical methods for digital computation, relevant to Nuclear Engineering.

23.033G Matrix Theory and Computation S2 L2½T½ C3
Matrix theory and matrix computations required for the numerical solution of problems in neutronics, fluid dynamics, structural mechanics, etc., arising in the analysis and prediction of nuclear power system performance.

23.034G Random Processes and Reactor Noise S2 L2½T½ C3
Not offered in 1986.
The mathematics of random processes applied to fluctuation phenomena in nuclear reactors, and the practical application of noise analysis techniques to reactor monitoring, control, and parameter estimation.

23.042G Nuclear Fuel and Energy Cycles S1 L2½T½ C3
The utilization of nuclear energy, the thermodynamics of nuclear power systems and applications, and the study of nuclear fuel cycles.

23.043G Nuclear Power Costing and Economics S2 L2½T½ C3
The principles of nuclear power cost estimation for various reactor types and applications, the comparative evaluation of nuclear power systems, and the problem of reactor strategy.

23.044G Nuclear Engineering Optimization S2 L2½T½ C3
Not offered in 1986.
The theory and application of function and functional minimization techniques to problems of design, control and operation of nuclear reactors and associated nuclear fuel supply complexes.

23.045G Uranium Enrichment Technology S1 L2½T½ C3
The theory and technology of uranium enrichment by the diffusion, ultra-centrifuge and nozzle processes, the economics of enrichment within the nuclear reactor fuel cycle, in relation to optimal reactor strategy and resources utilization.

23.090G Project F C9

23.918G Project Report F C18

23.936G Thesis F C36

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; multitemporal 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 L1½T1½ C3
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.

27.872G 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

Offered subject to availability of staff.


27.911G Soil Erosion and Conservation


Marketing

28.913G Marketing Management

Prerequisites: 28.911G and 28.912G.

Conceptual framework relevant to the practice of marketing management developing an understanding of the market function. Emergence of a broader concept of marketing; relationship between corporate and marketing strategy; the marketing environment; market segmentation; marketing planning; determination of product, price, channel, advertising and salesforce policies; marketing control.

Surveying

29.102G Characteristics of Optical Surveying Instrumentation

Sources of error in modern optical surveying instruments. Methods of testing and calibration. Observational techniques for reducing effects of errors. Developments in circle reading and level sensing systems. Design of instrument testing facilities.

29.103G Precise Engineering Surveys

Techniques and instrumentation for precise surveys. Applications in industry and engineering: deformation and settlement surveys, surveys for large constructions, optical tooling, special measurement problems.

29.106G Special Topic in Surveying A

A special subject to be lectured on by visiting professors or other visiting staff. Details of syllabus and lecturer to be communicated to the Higher Degree Committee on each occasion when the subject runs.

29.107G Special Topic in Surveying B

A special subject taken by an individual student or a small group of students by private study in conjunction with tutorial sessions with the member(s) of staff in charge of the subject.

29.151G Adjustment of Control Surveys


29.217G Gravimetric Geoid Evaluations


29.218G Doppler Positioning


29.219G Aspects of Electromagnetic Distance Measurement


29.530G Analytical Photogrammetry

Fundamental relationships, image and object space. Interior orientation, deviations from collinearity, use of reseau. General orientation of one and two images by collinearity and coplanarity conditions. Calibration of metric and non-metric cameras. Principles of analytical plotters, software design. Special applications of photogrammetry.
29.531G Photogrammetric Block Adjustment
SS L2T1 C3

29.532G Computer-Assisted Mapping
SS L2T1
Introduction to principles of computer-assisted mapping. Sources of data, ground survey maps, images. Collection and editing of feature coded digital terrain data, points, lines and areas. Digital elevation models, acquisition and interpolation, breaklines, contouring. Accuracy of heights from digital elevation models. Design of mapping programs based on computer-assisted techniques.

29.600G Principles of Remote Sensing
S1 L2T1 C3

29.601G Remote Sensing Principles and Procedures
S1 L2T1 and S2 L1 1/2 T1 1/2 C6

29.603G Statutory Controls of Land Development
SS L2T1 C3
Detailed examination of the subdivision and development process in N.S.W., with particular emphasis on the statutory procedures and controls at the local government level. The Local Government Appeals Tribunal and its major relevant decisions. Local Government and land development law. Case studies in land development.

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.

29.608G Cadastral Systems
SS L2T1 C3

29.909G Project
C9

29.918G Project Report
C18

29.936G Thesis
C36

Organizational Behaviour

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.

Biomedical Engineering

32.009G Project
C9

32.010G Biomedical Engineering Practice
S2 L2 C2
Introduction to clinical situations in hospitals. Presentation of guest lectures by eminent people working in this field. Lecture topics include cardiology, neurology, orthopaedics, rehabilitation, etc. Visits to various biomedical engineering units.
32.012G Biomedical Statistics  
S1 L2½ T1½ C4

Statistical assessment of normal and diseased states. Statistical relationships between multiple variables used to assess disease; analysis of variance, regression, factor analysis, discriminant analysis. Progression of diseases over time. Diagnosis and assessment of treatments. Experimental design and sampling. Computation methods.

32.018G Project Report  
C18

32.020G Radiation Physics  
S1 L3T1 C4

Sources, effects and uses of radiation on human tissues. Ultrasonic, X-ray and nuclear radiations are included together with ultraviolet, infrared, laser, microwave and longer wavelength electromagnetic effects.

32.030G Project Report  
C30

32.040G Analogue Electronics for Biomedical Engineers  
S1 L2 T2 C4

Basic theory of passive components, simple network analysis, small signal amplifiers, feedback and oscillators, operational amplifiers and their uses, analogue integrated circuits. Boolean logic NOT, AND, OR, exclusive-OR functions, truth tables, flip-flops, latches. Safety requirements for medical instruments, circuit diagram analysis and component identification. Laboratory work involves both design and construction of analogue circuits.

32.050G Microprocessors and Circuit Design for Biomedical Engineers  
S2 L2T2 C4

Prerequisite: 32.040G and 32.501G or equivalents.

Examination of the fundamental analogue and digital circuits commonly found in medical applications. Emphasis is given to project-oriented practical experience involving aspects of biological signal acquisition by microcomputers.

32.101G Mathematical Modelling for Biomedical Engineers  
S1 L3T1 C4

Model formulation and validation, solution of ordinary and partial differential equations by analytical and numerical techniques.

32.311G Mass Transfer in Medicine  
S2 L2T2 C4

Material and energy balances, modelling of intrabody mass transfer, elementary treatment of diffusion, convection, hydraulic permeability and osmosis in biological and synthetic membranes. Applications to hemodialysis, blood oxygenators, artificial pancreas and slow release drug delivery systems.

32.321G Physiological Fluid Mechanics  
S2 L2T2 C4

Fundamentals of biological fluid flow by way of the governing equations. Kinematics and dynamics, viscous and inertial flow, boundary layers, separation, physiological flows (cardiac, vascular, pulmonary, urinary, etc.) and flow in artificial organs.

32.332G Biocompatibility  
S2 L2T1 C3

Interaction of biological fluids and cells with foreign surfaces, in vitro tests to assess biocompatibility and thrombogenicity, current status of biocompatible materials as applied to hemodialysis, hemofiltration, membrane oxygenation and prosthetic devices.

32.501G Computing for Biomedical Engineers  
S1 L2T2 C4

Algorithm design and documentation, printer plotting, computer graphics, editing, using the VAX/VMS systems. Overview of computers in biomedical engineering and hospitals, including aspects of automated patient monitoring, laboratory testing, data storage and information retrieval.

32.510G Introductory Biomechanics  
S1 L2T1 C3

The principles of the mechanics of solid bodies: force systems; kinematics and kinetics of rigid bodies; stress-strain relationships; stress analysis of simple elements application to musculoskeletal system problems.

32.541G Mechanics of the Human Body  
SS L2T1 C3

Prerequisite: 32.510G or equivalent.

Statics and dynamics of the musculoskeletal system: mathematical modelling and computer simulation, analysis of pathological situations.

32.551G Biomechanics of Physical Rehabilitation  
SS L2T1 C3

Prerequisite: 32.510G or equivalent.

The application of biomechanics principles to the areas of: performance testing and assessment, physical therapy, design of rehabilitation equipment, design of internal and external prostheses and orthoses.

32.561G Mechanical Properties of Biomaterials  
SS L2T1 C3

Prerequisite: 32.510G or equivalent.

The physical properties of materials having significance to biomedical engineering: human tissues; skin; soft tissues; bone; metals; polymers and ceramics: the effects of degradation and corrosion.

32.611G Medical Instrumentation  
S2 L2T1 C3

Prerequisite: 32.040G or equivalent.

A critical survey of the theory and practical applications of medical transducers and electromedical equipment in common use in hospitals and research laboratories.

32.621G Biological Signal Analysis  
S1 L3 C3

Digital computer methods of extracting information from biological signals using filtering and averaging, expectation density functions, correlation functions, spectral analysis and other techniques. Methods of constructing models of biological systems.
32.701G Dynamics of the Cardiovascular System

Structure of the heart; organization of the mammalian vasculature; mechanical, electrical and metabolic aspects of cardiac pumping; the solid and fluid mechanics of blood vessels; rheology of blood.

Biotechnology

42.211G Principles of Biology

A study of the characteristics of living systems, including a functional treatment of cytology, metabolism, bioenergetics; structure, function and characteristics of single and multicellular systems; growth; cell division; reproduction; heredity and evolution.

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 anaerobic 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.

42.214G 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 fermentor 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.

Building

35.426G Building Services

Prerequisite: Nil.

A study of thermal, electrical, hydraulic and mechanical services in buildings with regard to flexibility, space usage, long-term efficiency, design life and economy.

Graduate School of the Built Environment

39.908G Community Noise Control

Introduction; sound and sound propagation; sound power; sound pressure, decibels; sound perception, psychoacoustics; loudness, annoyance, phons and dB(A); hearing conservation; acoustic measuring and analysing instruments — sound level meters, filters, analysers, recorders; sound sources; community noise assessment; the NSW Noise Control Act; practical exercises in sound recording, analysis and assessment; noise control — source noise reduction, use of barriers, enclosures, distance, sound absorbing materials; sound transmission through building elements; noise components of environmental impact statements.

Safety Science

47.015G Programming in BASIC

Nature and description of information in digital form, processing of information with special reference to the computer, microprocessor and microcomputer. Identification and statement of information flow problems, construction of models for computer solution, flow charts and control node diagrams, basis of a computer high-level language. Programming in BASIC, fundamental statements, loops and arrays, character strings and word processing, graphs, histograms and tables. Peripheral hardware, storage and filing, examples of operating systems.
47.051G Principles of Solid Mechanics

The principles of the mechanics of solid bodies: force systems; kinematics and kinetics of rigid bodies; stress-strain relationships; stress analysis of simple elements. Applications to the safety of structures.

47.052G Introduction to Safety Engineering

Management of dangerous materials; fire and explosion; ventilation; occupational toxicology; noise control; radiation protection; electrical safety; microbiological safety; machine dangers and machine guarding; safety of structures; plant safety assessment.

47.054G Machines and Structures Safety

Machinery contact dangers; machine guarding; safety during maintenance. Deformation failures; fracture; failure of pressure vessels, lifting equipment, excavations, scaffolding. Deterioration due to wear, corrosion, fire. Inspection and control (including non-destructive testing). Maintenance and reliability.

47.060G Electrical Safety

Electric current; effects of current flow and electric fields; elementary circuit representation; typical supply situations; likely dangerous conditions; static electricity; hazardous location; some special problem areas; codes of safe working; treatment of electric shock.

47.070G Ventilation


47.120G Human Behaviour and Safety Science

Industrial relations and implementation of a safety program. Learning and safety programs. Attitudes and attitude change. Safety compliance — individual and group factors affecting compliance. Work motivation and safety practice. Accident proneness and personnel selection. Individual differences in attitudes to work.

47.180G Management for Safety

Accounting; risk management; safety management and loss control; organization and management for safety; cost effectiveness of safety programs. Selection and training of personnel. Communication: modes of communication; preparation of safety and accident reports; presentation of evidence. Management of occupational health problems through prevention, early reporting and rehabilitation.

47.230G Radiation Protection

Radiation physics; radiation dosimetry; radiation biology; shielding and control of radiation; administration; waste management; emergency procedures; environmental impact, non-ionizing radiation. Special topics; practical work and site visit.

47.330G The Accident Phenomenon

Causes of accidents and defensive strategies; energy storage and transfer; risk benefit concepts; epidemiology of accidents; reduction of loss from accidental injury; human factors; the environment and accidents; system reliability and fault-tree analysis in the study and control of accidents; study of some major accidents; accident investigation and analysis; case studies in transport, industry, recreation and the home.

47.480G Fire and Explosion

Chemistry and physics of combustion reactions; types of flames; deflagration and detonation; ignition; fire point; flammable limits. Industrial fuel-fired appliances; fire risks in buildings; fire fighting equipment; flame proofing; fire and explosive risks in chemical process industries; case studies. Use of appropriate standards and legislation. Fire prevention and extinguishing, explosion relief. Fire research; insurance.

47.481G Management of Dangerous Materials


47.900G Introductory Law

The concept of law; the creation and interpretation of statutes; the judicial and court systems; locus standi; common law and equity; basic principles of legal liability (civil and criminal); basic principles of administrative law and the liability of the Crown; the common law of employment; statutory regulation of employment; compulsory arbitration of industrial disputes.

47.903G Special Report in Safety Science

Only for students enrolled in the Graduate Diploma course in Safety Science.

47.909G Project

C9

47.918G Research Project

C18
Anatomy

70.201G Introductory Functional Anatomy
An overview of human anatomy with special reference to the effects of chemical and physical trauma under industrial conditions. Includes reference to the musculoskeletal system, nervous system, lungs, kidneys, liver, brain, eyes, ears, all of which may be affected by industrial trauma.

Pathology

72.402G Principles of Disease Processes S1 L3 C3
Prerequisites: 73.111 or equivalent, 70.011G or equivalent.

The reaction of cells to injury, the inflammatory reaction; necrosis-vascular changes and infarction; reparative processes; fracture healing; neoplasia; reaction to implants; specific processes requiring prosthetic assistance.

Physiology and Pharmacology

73.111 Physiology 1A F L2 T4
Prerequisites: 17.031 & 17.041; 2.121 & 2.131, or 2.141; 10.001 or 10.011 or 10.021 B & C. Excluded: 73.121, 73.011A. Co-requisite: 41.101.

Introduction to fundamental physiological principles, dealing first with basic cellular function in terms of chemical and physical principles, and, second, with the operation of the various specialized systems in the body, for example, the cardiovascular system, whose function it is to transport materials to and from the tissues of the body; the respiratory system which must maintain the exchange of oxygen and carbon dioxide between the atmosphere and the blood; the gastrointestinal system which enables food materials to be modified by digestion and absorbed into the circulation; the kidney which is involved in the regulation of body fluid and electrolyte balance and with the excretion of the waste products of metabolism; the endocrine system which releases chemical messengers, called hormones, that are carried in the blood stream to regulate a great variety of body functions, eg metabolism and reproductive activity; the nervous system which by means of very rapidly propagated electrical impulses is responsible for all our movements, sensations, memories, emotions and consciousness itself. A substantial series of practical class experiments on these different areas of physiology is included in the course. This subject is taken by students enrolled in any of the Physiology programs.

Medicine

80.701G Occupational Disease S2 L3 C3
Prerequisite: 70.201G or equivalent.

Physical environment and disease: Musculoskeletal system, physical trauma; heat and cold, burns, electric shock; radiation; pressure, vibration, noise, hearing. Chemical environment and disease: Metallic poisons, toxic compounds, gaseous poisons, carcinogens, allergens. Microbial environment and disease.

Systems approach: Gastrointestinal tract; renal system; central and peripheral nervous systems; visual system, respiratory system, airborne particulates; skin.

80.702G Occupational Health Control S1 L3 C3
Prerequisite: 80.701G or equivalent.

Introduction; dose response; risk; codes of safe practice; protection of the worker; design of safe workplace; protective equipment; occupational health surveillance; epidemiology; occupational safety program; emergency arrangements; environmental health; non-occupational safety; safety services.
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.

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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.

Qualifications

2. (1) A candidate for the degree shall have been awarded an appropriate degree of Bachelor with Honours from the University of New South Wales or a qualification considered equivalent from another university or tertiary institution at a level acceptable to the Committee.

(2) In exceptional cases an applicant who submits evidence of such other academic and professional qualifications as may be approved by the Committee may be permitted to enrol for the degree.

(3) If the Committee is not satisfied with the qualifications submitted by an applicant the Committee may require the applicant to undergo such assessment or carry out such work as the Committee may prescribe, before permitting enrolment as a candidate for the degree.

Enrolment and Progression

3. (1) An application to enrol as a candidate for the degree shall be made on the prescribed form which shall be lodged with the Registrar at least one calendar month before the commencement of the session in which enrolment is to begin.

(2) In every case, before permitting a candidate to enrol, the head of the school* in which the candidate intends to enrol shall be satisfied that adequate supervision and facilities are available.

(3) An approved candidate shall be enrolled in one of the following categories:

(a) full-time attendance at the University;
(b) part-time attendance at the University.

*Or department where a department is not within a school.
(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;

(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.
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 Biomedical Engineering (MBimedE)

1. The degree of Master of Biomedical Engineering may be awarded by the Council to a candidate who has satisfactorily completed a program of advanced study.

Qualifications

2. (1) A candidate for the degree shall have been awarded an appropriate degree of Bachelor from the University of New South Wales or a qualification considered equivalent from another university or tertiary institution at a level acceptable to the Higher Degree Committee of the Faculty of Engineering (hereinafter referred to as the Committee).

(2) In exceptional cases an applicant who submits evidence of such other academic and professional qualifications as may be approved by the Committee may be permitted to enrol for the degree.

(3) If the Committee is not satisfied with the qualifications submitted by an applicant the Committee may require the applicant to undergo such assessment or carry out such work as the Committee may prescribe, before permitting enrolment.

Enrolment and Progression

3. (1) An application to enrol as a candidate for the degree shall be made on the prescribed form which shall be lodged with the Registrar at least two calendar months before the commencement of the session in which enrolment is to begin.

(2) A candidate for the degree shall be required to undertake such formal subjects and pass such assessment as prescribed, and shall submit a project report. The program of advanced study, including the preparation of the project report, shall total a minimum of 60 credits. The number of credits allocated for each subject shall be determined by the Committee on the recommendation of the Director of the Centre for Biomedical Engineering (hereinafter referred to as the head of the school).

*Or department where a department is not within a school.
Graduate Study: Conditions for the Award of Higher Degrees

(3) The progress of a candidate shall be reviewed at least once annually by the Committee and as a result of its review the Committee may cancel enrolment or take such other action as it considers appropriate.

(4) No candidate shall be awarded the degree until the lapse of two academic sessions from the date of enrolment in the case of a full-time candidate or five sessions in the case of a part-time candidate. The maximum period of candidature shall be five academic sessions from the date of enrolment for a full-time candidate and eight sessions for a part-time candidate. In special cases an extension of these times may be granted by the Committee.

4. (1) A candidate shall be required to undertake a project on an approved topic.

(2) The work shall be carried out under the direction of a supervisor appointed from the full-time academic members of the University staff.

(3) The candidate shall give in writing to the Registrar two months notice of intention to submit a report on the project.

(4) Three copies of the project report shall be presented in a form which complies with the requirements of the University for the preparation and submission of project reports for higher degrees.

(5) It shall be understood that the University retains the three copies of the project report submitted for examination and is free to allow the project report to be consulted or borrowed. Subject to the provisions of the Copyright Act, 1968, the University may issue the project report in whole or in part, in microfilm or other copying medium.

5. (1) There shall be not fewer than two examiners of the project report, 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 project report and shall recommend to the Committee that:

(a) the project report be noted as satisfactory; or

(b) the project report be noted as satisfactory subject to minor corrections being made to the satisfaction of the head of the school; or

(c) the project report be noted as unsatisfactory but that the candidate be permitted to resubmit it in a revised form after a further period of study and/or research; or

(d) the project report be noted as unsatisfactory and that the candidate be not permitted to resubmit it.

(3) The Committee shall, after considering the examiners' reports and the candidate's results of assessment in the prescribed formal subjects, recommend whether or not the candidate may be awarded the degree. If it is decided that the project report is unsatisfactory the Committee shall determine whether or not the candidate may resubmit it after a further period of study and/or research.

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 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.
Enrolment and Progression

3. (1) An application to enrol as a candidate for the degree shall be made on the prescribed form which shall be lodged with the Registrar at least one calendar month before the commencement of the session in which enrolment is to begin.

(2) In every case, before permitting a candidate to enrol, the head of the school* in which the candidate intends to enrol shall be satisfied that adequate supervision and facilities are available.

(3) An approved candidate shall be enrolled in one of the following categories:

(a) full-time attendance at the University;
(b) part-time attendance at the University;
(c) external — not in regular attendance at the University and using research facilities external to the University.

(4) A candidate shall be required to undertake an original investigation on an approved topic. The candidate may also be required to undergo such examination and perform such other work as may be prescribed by the Committee.

(5) The work shall be carried out under the direction of a supervisor appointed from the full-time members of the University staff.

(6) The progress of a candidate shall be reviewed annually by the Committee following a report by the candidate, the supervisor and the head of the school* in which the candidate is enrolled and as a result of such review the Committee may cancel enrolment or take such other action as it considers appropriate.

(7) No candidate shall be granted the degree until the lapse of three academic sessions in the case of a full-time candidate or four academic sessions in the case of a part-time or external candidate from the date of enrolment. In the case of a candidate who has been awarded the degree of Bachelor with Honours or who 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

*Or department where a department is not within a school.
(d) the candidate be not awarded the degree but be permitted to resubmit the thesis in a revised form after a further period of study and/or research; or
(e) the candidate be not awarded the degree and be not permitted to resubmit the thesis.

(3) If the performance at the further examination recommended under (2)(c) above is not to the satisfaction of the Committee, the Committee may permit the candidate to re-present the same thesis and submit to a further oral, practical or written examination within a period specified by it but not exceeding eighteen months.

(4) The Committee shall, after consideration of the examiners' reports and the reports of any oral or written or practical examination, recommend whether or not the candidate may be awarded the degree. If it is decided that the candidate be not awarded the degree the Committee shall determine whether or not the candidate may resubmit the thesis after a further period of study and/or research.

6. A candidate shall pay such fees as may be determined from time to time by the Council.

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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 theCopyright 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:

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*Or department where a department is not within a school.
(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.

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.

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 Engineering Science (MEngSc) and Master of Surveying Science (MSurvSc)

1. The degree of Master of Engineering Science or Master of Surveying Science may be awarded by the Council to a candidate who has satisfactorily completed a program of advanced study.

Qualifications

2. (1) A candidate for the degree shall have been awarded an appropriate degree of Bachelor from the University of New South Wales or a qualification considered equivalent from another university or tertiary institution at a level acceptable to the Higher Degree Committee of the Faculty of Engineering (hereinafter referred to as the Committee).
(2) In exceptional cases an applicant who submits evidence of such other academic and professional qualifications as may be approved by the Committee may be permitted to enrol for the degree.
(3) If the Committee is not satisfied with the qualifications submitted by an applicant the Committee may require the applicant to undergo such assessment or carry out such work as the Committee may prescribe, before permitting enrolment.

Enrolment and Progression

3. (1) An application to enrol as a candidate for the degree shall be made on the prescribed form which shall be lodged with the Registrar two calendar months before the commencement of the session in which enrolment is to begin.
(2) A candidate for the degree shall:
(a) undertake such formal subjects and pass such assessment as prescribed, or
(b) demonstrate ability to undertake research by the submission of a thesis embodying the results of an original investigation on an approved topic, or
(c) undertake an approved combination of the above in which case the thesis component shall be referred to as a project report.
(3) The program of advanced study shall total a minimum of 36 credits. The number of credits allocated for each subject shall be determined by the Committee on the recommendation of the appropriate head of school*. A 9 credit project report shall be submitted for examination in accordance with the requirements of the appropriate head of school* and shall be assessed as a formal subject.
(4) A candidate's proposed program shall be approved by the appropriate head of school* prior to enrolment. For the purposes of this requirement the appropriate head of school* shall normally be the head of the school* providing supervision of the project report or thesis or, if there is no project report or thesis, the major field of study.

*Or department where a department is not within a school.
Graduate Study: Conditions for the Award of Higher Degrees

(5) The progress of a candidate shall be reviewed at least once annually by the Committee and as a result of its review the Committee may cancel enrolment or take such other action as it considers appropriate.

(6) No candidate shall be awarded the degree until the lapse of two academic sessions from the date of enrolment in the case of a full-time candidate or four sessions in the case of a part-time candidate. The maximum period of candidature shall be four academic sessions from the date of enrolment for a full-time candidate and eight sessions for a part-time candidate. In special cases an extension of these times may be granted by the Committee.

4. (1) A candidate who undertakes an 18 credit project or a 36 credit thesis shall carry out the work on an approved topic under the direction of a supervisor appointed from the full-time academic members of the University staff.

(2) The candidate shall give in writing to the Registrar two months notice of intention to submit a project report or thesis.

(3) The project report or thesis shall present an account of the candidate's own research. In special cases work done conjointly with other persons may be accepted, provided the Committee is satisfied about the extent of the candidate's part in the joint research.

(4) The candidate may also submit any work previously published whether or not such work is related to the thesis.

(5) Three copies of the project report or thesis shall be presented in a form which complies with the requirements of the University for the preparation and submission of project reports and theses for higher degrees.

(6) It shall be understood that the University retains the three copies of the project report or thesis submitted for examination and is free to allow the project report or thesis to be consulted or borrowed. Subject to the provisions of the Copyright Act, 1968, the University may issue the project report or thesis in whole or in part, in microfilm or other copying medium.

5. (1) There shall be not fewer than two examiners of the project report, 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 project report and shall recommend to the Committee that:

(a) the project report be noted as satisfactory; or

(b) the project report be noted as satisfactory subject to minor corrections being made to the satisfaction of the head of the school; or

(c) the project report be noted as unsatisfactory but that the candidate be permitted to resubmit it in a revised form after a further period of study and/or research; or

(d) the project report be noted as unsatisfactory and that the candidate be not permitted to resubmit it.

(3) The Committee shall, after considering the examiners' reports and the candidate's results of examination of the prescribed formal subjects, recommend whether or not the candidate may be awarded the degree. If it is decided that the project report is unsatisfactory the Committee shall determine whether or not the candidate may resubmit it after a further period of study and/or research.

6. (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 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

*Or department where a department is not within a school.
(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 may resubmit the thesis after a further period of study and/or research.

Fees

7. A candidate shall pay such fees as may be determined from time to time by the Council.

Master of Safety Science
(MSafetySc)

Qualifications

1. The degree of Master of Safety Science may be awarded by the Council to a candidate who has satisfactorily completed a program of advanced study.

2. (1) A candidate for the degree shall have been awarded an appropriate degree of Bachelor from the University of New South Wales or a qualification considered equivalent from another university or tertiary institution at a level acceptable to the Higher Degree Committee of the Faculty of Engineering (hereinafter referred to as the Committee).

(2) In exceptional cases an applicant who submits evidence of such other academic and professional qualifications as may be approved by the Committee may be permitted to enrol for the degree.

(3) If the Committee is not satisfied with the qualifications submitted by an applicant the Committee may require the applicant to undergo such assessment or carry out such work as the Committee may prescribe, before permitting enrolment.

Enrolment and Progression

3. (1) An application to enrol as a candidate for the degree shall be made on the prescribed form which shall be lodged with the Registrar at least two calendar months before the commencement of the session in which enrolment is to begin.

(2) A candidate for the degree shall be required to undertake such formal subjects and pass such assessment as prescribed. The program of advanced study shall total a minimum of 54 credits. The number of credits allocated for each subject shall be determined by the Committee on the recommendation of the Course Director (hereinafter referred to as the head of the school).

(3) The progress of a candidate shall be reviewed at least once annually by the Committee and as a result of its review the Committee may cancel enrolment or take such other action as it considers appropriate.

(4) No candidate shall be awarded the degree until the lapse of two academic sessions from the date of enrolment in the case of a full-time candidate or four sessions in the case of a part-time candidate. The maximum period of candidature shall be four academic sessions for a full-time candidate and eight sessions for a part-time candidate. In special cases an extension of these times may be granted by the Committee.

Credit Project Report

4. (1) The program of advanced study may include an 18 credit project on an approved topic.

(2) The work shall be carried out under the direction of a supervisor appointed from the full-time academic members of the University staff.

(3) The candidate shall give in writing to the Registrar two months notice of intention to submit a report on the project.

(4) Three copies of the project report shall be presented in a form which complies with the requirements of the University for the preparation and submission of project reports for higher degrees.

(5) It shall be understood that the University retains the three copies of the project report submitted for examination and is free to allow the project report to be consulted or borrowed. Subject to the provisions of the Copyright Act, 1968, the University may issue the project report in whole or in part, in microfilm or other copying medium.

Examination of Credit Project Report

5. (1) There shall be not fewer than two examiners of the project report, appointed by the Professorial Board on the recommendation of the Committee.
(2) At the conclusion of the examination each examiner shall submit to the Committee a concise report on the project report and shall recommend to the Committee that:
(a) the project report be noted as satisfactory; or
(b) the project report be noted as satisfactory subject to minor corrections being made to the satisfaction of the head of the school; or
(c) the project report be noted as unsatisfactory but that the candidate be permitted to resubmit it in a revised form after a further period of study and/or research; or
(d) the project report be noted as unsatisfactory and that the candidate be not permitted to resubmit it.

(3) The Committee shall, after considering the examiners' reports and the candidate's results of assessment in the prescribed formal subjects, recommend whether or not the candidate may be awarded the degree. If it is decided that the project report is unsatisfactory the Committee shall determine whether or not the candidate may resubmit it after a further period of study and/or research.

6. A candidate shall pay such fees as may be determined from time to time by the Council.

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1. The degree of Master of Surveying by research may be awarded by the Council on the recommendation of the Higher Degree Committee of the Faculty of Engineering (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) 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) 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 of Surveying (hereinafter referred to as the head of the school) shall be satisfied that adequate supervision and facilities are available.

(3) An approved candidate shall be enrolled in one of the following categories:
(a) full-time attendance at the University;
(b) part-time attendance at the University;
(c) external — not in regular attendance at the University and using research facilities external to the University.

(4) A candidate shall be required to undertake an original investigation on an approved topic. The candidate may also be required to undergo such examination and perform such other work as may be prescribed by the Committee.

(5) The work shall be carried out under the direction of a supervisor appointed from the full-time members of the University staff.

(6) The progress of a candidate shall be reviewed annually by the Committee following a report by the candidate, the supervisor and the head of the school 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.
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 microform 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 thesis and submit to a further oral, practical or written examination within a period specified by it but not exceeding eighteen months.
(4) The Committee shall, after consideration of the examiners’ reports and the reports of any oral or written or practical examination, recommend whether or not the candidate may be awarded the degree. If it is decided that the candidate be not awarded the degree the Committee shall determine whether or not the candidate may resubmit the thesis after a further period of study and/or research.

Fees

6. A candidate shall pay such fees as may be determined from time to time by the Council.

Master of Surveying

without supervision (MSurv)

See Master of Engineering.

Master of Surveying Science (MSurvSc)

See Master of Engineering Science.
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>Years 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>Years of Tenure</th>
<th>Conditions</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Girls Realm Guild</strong></td>
<td>Up to $1500 pa</td>
<td>1 year renewable for the duration of the course subject to satisfactory progress and continued demonstration of need</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><strong>W. S. and L. B. Robinson</strong></td>
<td>Up to $3800 pa</td>
<td>1 year renewable for the duration of the course subject to satisfactory progress</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><strong>Universities Credit Union</strong></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>
<tr>
<td><strong>Electrical Engineering</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>The Tyree Electrical Company Pty Ltd</td>
<td>Up to $6720 over 4 years</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 Electrical Engineering</td>
</tr>
<tr>
<td><strong>Mechanical Engineering</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>The Fox Manufacturing Company</td>
<td>Up to $1500 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 Mechanical Engineering</td>
</tr>
<tr>
<td>James Howden &amp; Co Australia Pty Ltd</td>
<td>Up to $1000 pa</td>
<td>1 year</td>
<td>Permanent residence in Australia and eligibility for admission to the full-time degree course in Mechanical Engineering</td>
</tr>
<tr>
<td>Shell Refining Australia Pty Ltd</td>
<td>Up to $1500 pa</td>
<td>1 year renewable for the duration of the course, subject to satisfactory progress</td>
<td>Eligibility for admission to Year 2 of the full-time degree course in Mechanical Engineering</td>
</tr>
</tbody>
</table>

**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>Surveying</td>
<td>Up to $500 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 Surveying. Selection is based on academic merit, personal qualities and financial need.</td>
</tr>
</tbody>
</table>

### 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 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>Commonwealth Postgraduate Course Awards</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
### General (continued)

<table>
<thead>
<tr>
<th>Scholarship</th>
<th>Value</th>
<th>Years of Tenure</th>
<th>Conditions</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>The Caltex Woman Graduate Scholarships</strong></td>
<td>Six State awards of $5000 each</td>
<td>1 year</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>
<tr>
<td></td>
<td>One National award valued at $20,000 pa for study at an approved overseas institution.</td>
<td>2 years</td>
<td></td>
</tr>
<tr>
<td><strong>Commonwealth Scholarship and Fellowship Plan</strong></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><strong>The English-Speaking Union (NSW Branch)</strong></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><strong>Frank Knox Memorial Fellowships at Harvard University</strong></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 Registrar mid-October.</td>
</tr>
<tr>
<td><strong>Gowrie Scholarship Trust Fund</strong></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><strong>Harkness Fellowships of the Commonwealth Fund of New York</strong></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>
</tbody>
</table>

**Application forms must be obtained from the Australian representative of the Fund, Mr J. T. Larkin, Department of Trade, Edmund Barton Building, King's Avenue, Barton, ACT 2600. These must be submitted to the Registrar by 15 August.**
### 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><strong>General (continued)</strong></td>
<td></td>
<td></td>
<td></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>
<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>

### Engineering

<table>
<thead>
<tr>
<th>Donor</th>
<th>Value</th>
<th>Years of Tenure</th>
<th>Conditions</th>
</tr>
</thead>
<tbody>
<tr>
<td>Australian Institute of Nuclear Science and Engineering Studentships</td>
<td>Basic stipend $9163 pa plus allowances and some University expenses.</td>
<td>1-3 years</td>
<td>Applicants must be honours graduates in Science or Engineering. At least one quarter of the period of tenure must be spent at the Institute at Lucas Heights, NSW. Applications close early November.</td>
</tr>
<tr>
<td>Harold G. Conde Memorial Fellowship</td>
<td>$8116 pa plus allowances</td>
<td>Maximum of 3 years</td>
<td>Applicants should be honours graduates permanently domiciled in Australia. The Fellowship is for graduate study or research in a field related to the electricity industry.</td>
</tr>
<tr>
<td>IBM Research Scholarship in Microelectronics</td>
<td>$11850 pa where only scholarship held. $5000 pa where it supplements another scholarship.</td>
<td>Up to 3 years</td>
<td>To enable a suitable graduate to undertake a research degree in the Joint Microelectronics Research Centre. Applications close 31 October.</td>
</tr>
<tr>
<td>The Joseph Barling Fellowship</td>
<td>Not less than $8500</td>
<td>Maximum of 3 years</td>
<td>Candidates should be electrical engineering graduates of the University of New South Wales (in special circumstances mechanical and industrial engineering graduates may apply). The Fellowship is for full-time study for the award of the degree of Master of Business Administration or Doctor of Philosophy at the University. Applications close 30 November.</td>
</tr>
</tbody>
</table>

*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 2806.
Graduate Scholarships (continued)

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>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>

Faculty of Engineering

<table>
<thead>
<tr>
<th>Institution, Australia</th>
<th>Value</th>
<th>Awarded for</th>
</tr>
</thead>
<tbody>
<tr>
<td>Institution of Engineers, Australia</td>
<td>Medal and 100.00</td>
<td>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>Excellence in the first year or equivalent part-time years of a bachelor degree course offered by the Faculty of Engineering.</td>
</tr>
</tbody>
</table>

School of Chemical Engineering and Industrial Chemistry

<table>
<thead>
<tr>
<th>Company</th>
<th>Value</th>
<th>Awarded for</th>
</tr>
</thead>
<tbody>
<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 Chemical Engineering</td>
<td>200.00</td>
<td>Subject selected by Head of School</td>
</tr>
<tr>
<td>Australian Paper Manufacturers Ltd</td>
<td>100.00</td>
<td>48.163 Instrumentation and Process Control in Industrial Chemistry</td>
</tr>
<tr>
<td></td>
<td>100.00</td>
<td>48.163 Instrumentation and Process Control in Chemical Engineering</td>
</tr>
<tr>
<td>Chamber of Manufactures of New South Wales</td>
<td>250.00</td>
<td>Subject selected by Head of School</td>
</tr>
<tr>
<td>Chemical Technology Society</td>
<td>25.00</td>
<td>Best graduate in Bachelor of Science degree in Industrial Chemistry</td>
</tr>
<tr>
<td></td>
<td>25.00</td>
<td>Best graduate in Bachelor of Science degree course in Industrial Chemistry, Years 1 and 2 or Stages 1 to 4</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 Chemical Engineering and Industrial Chemistry (continued)</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>CSR Limited</td>
<td>50.00</td>
<td>Subject within the discipline of Industrial Chemistry, selected by Head of School</td>
</tr>
<tr>
<td>Esso Australia Ltd</td>
<td>200.00</td>
<td>Best performance in Year 2 Chemical Engineering</td>
</tr>
<tr>
<td>Institution of Chemical Engineers</td>
<td>100.00</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>and medal</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Shell</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></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>
<tr>
<td></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 Manufactures 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>
</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 Civil Engineering (continued)</strong></td>
<td></td>
<td></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>

**School of Electrical Engineering and Computer Science**

<table>
<thead>
<tr>
<th>Donor/Name of Prize</th>
<th>Value $</th>
<th>Awarded for</th>
</tr>
</thead>
<tbody>
<tr>
<td>Austral Crane</td>
<td>37.50</td>
<td>Bachelor of Engineering degree course in Electrical Engineering, Year 3</td>
</tr>
<tr>
<td></td>
<td>37.50</td>
<td>Power or Control elective</td>
</tr>
<tr>
<td>Chamber of Manufactures of New South Wales</td>
<td>250.00</td>
<td>Subject selected by Head of School</td>
</tr>
<tr>
<td>Electricity Supply Engineers Association of New South Wales</td>
<td>100.00</td>
<td>Overall performance including proficiency in Electric Power Distribution in Year 3 full-time or equivalent part-time degree course</td>
</tr>
<tr>
<td>IBM</td>
<td>150.00</td>
<td>6.611 Computing 1</td>
</tr>
<tr>
<td>J. Douglas Maclurcan</td>
<td>50.00</td>
<td>Control Systems</td>
</tr>
<tr>
<td>The Wilfred Holmes Memorial Award</td>
<td>150.00</td>
<td>A student eligible to enter the final year of the degree course and who is deemed to be in necessitous circumstances</td>
</tr>
</tbody>
</table>

**School of Mathematics**

<table>
<thead>
<tr>
<th>Donor/Name of Prize</th>
<th>Value $</th>
<th>Awarded for</th>
</tr>
</thead>
<tbody>
<tr>
<td>Applied Mathematics</td>
<td>50.00</td>
<td>Excellence in Level III Applied Mathematics subjects</td>
</tr>
<tr>
<td>Head of School's</td>
<td>50.00</td>
<td>Excellence in at least 5 Mathematics units in Year 2</td>
</tr>
<tr>
<td>IBM</td>
<td>150.00</td>
<td>Final year of an honours degree course</td>
</tr>
<tr>
<td>ICI Theory of Statistics IV</td>
<td>100.00</td>
<td>Best performance in 10.323 Theory of Statistics 4</td>
</tr>
<tr>
<td>I. P. Sharp Associates</td>
<td>75.00</td>
<td>Excellence in Higher Theory of Statistics 2</td>
</tr>
<tr>
<td>J. R. Holmes</td>
<td>50.00</td>
<td>Excellent performance in at least 4 pass-level (up to 1 pass-level unit may be replaced by a higher-level unit) Pure Mathematics Level III units taken over no more than two consecutive years</td>
</tr>
<tr>
<td>Donor/Name of Prize</td>
<td>Value ($)</td>
<td>Awarded for</td>
</tr>
<tr>
<td>---------------------</td>
<td>-----------</td>
<td>-------------</td>
</tr>
<tr>
<td><strong>School of Mathematics (continued)</strong></td>
<td></td>
<td></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>General proficiency – Theory of Statistics subjects</td>
</tr>
<tr>
<td>Theoretical Mechanics</td>
<td>50.00</td>
<td>Excellence in Level III Theoretical Mechanics subjects</td>
</tr>
</tbody>
</table>

| | | |
| **School of Mechanical and Industrial Engineering** | | |
| Atlas Copco | 125.00 | General proficiency in Bachelor of Engineering degree course in Mechanical Engineering |
| Austral Crane | 75.00 | General proficiency in full-time Year 3 Mechanical Engineering |
| Australian Institute of Refrigeration, Air Conditioning and Heating | Student membership of the Institute for 1 year plus Design Aid and Data Book | Best performance in 5.624 Refrigeration and Air Conditioning |
| Babcock Aust Ltd | 40.00 | Subject selected by Head of School |
| David Carment Memorial | 350.00 and medal | Highest proficiency in final year of Naval Architecture degree course |
| Chamber of Manufactures of New South Wales | 250.00 | Subject selected by Head of School |
| Commonwealth Aircraft Corporation Limited | 300.00 plus medal | Best performance in Year 4 of the Aeronautical Engineering degree course |
| Computer-Based Engineering Design | 75.00 | Best undergraduate or graduate thesis making a contribution to Computer-Based Engineering Design in the School of Mechanical and Industrial Engineering |
| CSR Limited | 60.00 | Subject selected by Head of School |
| Ford Motor Co of Aust Ltd | 100.00 | Subject selected by Head of School |
| Harbin Polytechnical Alumni Association | 100.00 | Best performance by a final year student in theory of machines |
| Jeremy Hirschhorn | 20.00 | | |
| The John Harrison | 100.00 | Best performance in 5.301 Mechanics of Machines 1 |
| The Hawker de Havilland Ltd | 200.00 | Best thesis in aeronautical engineering in the Bachelor of Engineering degree course |
| Royal Institution of Naval Architects | 50.00 | Best ship design in the final year |
### 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 Mechanical and Industrial Engineering (continued)</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Shell Refining (Australia) Pty Ltd</td>
<td>100.00</td>
<td>General proficiency in Year 1 of the full-time Mechanical Engineering degree course</td>
</tr>
<tr>
<td></td>
<td>100.00</td>
<td>Best undergraduate thesis in Year 4 of the Mechanical Engineering degree course</td>
</tr>
<tr>
<td></td>
<td>100.00</td>
<td>Best performance in 18.603 Management/Economics</td>
</tr>
<tr>
<td></td>
<td>100.00</td>
<td>Best performance in a subject selected by Head of School in an area relevant to refinery or oil industry practice</td>
</tr>
<tr>
<td>Staedtler (Pacific) Pty Ltd</td>
<td>100.00</td>
<td>General proficiency in Bachelor of Engineering degree course in Mechanical Engineering, Year 2</td>
</tr>
<tr>
<td></td>
<td>(open order)</td>
<td></td>
</tr>
<tr>
<td><strong>Department of Industrial Engineering</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Austral Crane</td>
<td>75.00</td>
<td>Bachelor of Engineering degree course in Industrial Engineering, Year 3</td>
</tr>
<tr>
<td>Chamber of Manufactures of New South Wales</td>
<td>250.00</td>
<td>Subject selected by Head of School</td>
</tr>
<tr>
<td>R. E. Jefferies Memorial</td>
<td>250.00</td>
<td>Performance in final year/stage of Bachelor of Engineering degree course in Industrial Engineering</td>
</tr>
<tr>
<td>TRW Australia Ltd</td>
<td>20.00</td>
<td>Bachelor of Science (Engineering) degree course in Industrial Engineering, Stage 6</td>
</tr>
<tr>
<td><strong>School of Physics</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>ETP-Oxford</td>
<td>200.00</td>
<td>Student(s) who prepare the most meritorious design study of an optical system in 1.713 Advanced Laser and Optical Applications</td>
</tr>
<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>and one year's membership of the Institute</td>
<td></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>
</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 Physics (continued)</strong></td>
<td></td>
<td></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, 1.0643, 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>
<tr>
<td><strong>School of Surveying</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Association of Consulting Surveyors NSW</td>
<td>150.00</td>
<td>Most outstanding student in the field of land studies</td>
</tr>
<tr>
<td>Australian Photogrammatic Society</td>
<td>80.00</td>
<td>Subjects in photogrammetry including electives</td>
</tr>
<tr>
<td>Board of Surveyors Medal</td>
<td>Medal</td>
<td>Bachelor of Surveying degree course, Final Year</td>
</tr>
<tr>
<td>R. S. Mather Memorial</td>
<td>100.00</td>
<td>Most outstanding student in Geodesy</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 Civil Engineering</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Institute of Advanced Motorists</td>
<td>20.00</td>
<td>Traffic Planning and Control</td>
</tr>
</tbody>
</table>
Staff

Comprises Schools of Civil Engineering, Electrical Engineering and Computer Science, Mechanical and Industrial Engineering (incorporating Aeronautical Engineering and Naval Architecture), Nuclear Engineering, and Surveying; and Centre for Biomedical Engineering.

Dean
Professor N. L. Svensson

Chairman
Associate Professor D. T. Howell

Executive Assistant
Dr Grier Cheng I Lin

Administrative Assistant
Patricia M. Rooney

Honorary Visiting Fellows
Derek Broadbent, BSc Birm., MEngSc PhD Melb., SMIEEE, FIEEEAust, MIEE
Colin Arthur Stapleton, BSc BE Syd., CEng, MIEAust, MIE, MIEEE

School of Civil Engineering

Professor of Civil Engineering, Head of School and of Department of Water Engineering
Thomas Grandin Chapman, BSc Leeds, PhD S’ton., FIEAust, MACS

Professor of Civil Engineering and Head of Department of Engineering Construction and Management
Ronald William Woodhead, BE Syd., ME N.S.W, FIEAust, FAIB

Visiting Professor of Civil Engineering and Head of Department of Civil Engineering Materials
Robin Fell, BE MEngSc Qld.

Professor of Civil Engineering and Head of Department of Structural Engineering
Hillary Max Irvine, ME Cant., CE Caltech., PhD Auck., MIPENZ, FIEAust

Professor of Transport Engineering and Head of Department of Transport Engineering
John Andrew Black, BA Manc., PhD Brad., MTCP Syd., MCIT

Senior Administrative Officer
Robert William Prior

Administrative Assistant
Robert Mathew Symington, BA N.S.W.

Honorary Associate
Alexander Wargon, MSc Harv., CE, FIEAust, FASCE, MIPENZ


Department of Civil Engineering Materials
Includes Soil Mechanics, Rock Mechanics, Concrete Technology, Plastics and Timber, Pavement Engineering, Continuum and Statistical Mechanics, Metals and Welding Technology.

Associate Professors
David John Cook, BE W.Aust., MSc PhD Caig., MIEAust
Somasundaram Valliappan, BE Annam., MS Northeastern, PhD DSc Wales, FIEAust, FASCE

Senior Lecturers
William Henry Cogill, MSc(Eng) CapeT., MSc Camb., PhD N.S.W., FIEAust, MIEAust
Arthur William Manton-Hall, BE MEngSc PhD N.S.W., MIEAust, LGE
Bruce John Francis Patten, BE Syd., PhD N.S.W., DIC Lond.
Brian Shackell, BE Sheff., MEngSc PhD N.S.W., MIEAust
John Maurice Wheatley, MA PhD Camb., CEng, FIM, FAusWl., MIEAust(Lond)
William Otho Yandell, ME PhD N.S.W., MIEAust

Lecturer
Harry Taylor, BSc(Eng) Birm., DipNAAC Syd., MIEAust

Tutor
Ashraf Hossain Khan, BSc Dhaka, ME Asian I.T. Bangkok

Dean of Civil Engineering Materials
Professor David John Cook, BE W.Aust., MSc PhD Caig., MIEAust

Department of Structural Engineering

Associate Professors
Victor Andrada Pulmano, BSCE Philippines, MEng A.I.T., PhD Northwestern
B. Vijaya Rangan, BE Madr., PhD I.I.S.Blore., MIEAust, MIEIndia

Senior Lecturers
Donald John Fraser, MEngSc PhD N.S.W., ASTC
Raymond Ian Gilbert, BE PhD N.S.W., MIEAust
Alexander Cuthbert Haney, BE MEngSc Metb., PhD Wat., MIEAust, MASCE, AMICE
Peter Walder Kneen, BE Metb., PhD Wat., MIEAust, IASS
Raymond Eric Lawther, BE PhD N.S.W.
Ian James Somervaille, BE PhD N.S.W., ASTC

Lecturers
Francis Shay Khiet Tin Loi, BE PhD Monash, MIEAust
Neil Colin Mickleborough, MEng Car., PhD Tas., DipCE Hobart T.C., MIEAust, MASCE, MCSCE, RPEQ

Department of Engineering Construction and Management
Includes Systems Engineering, Engineering Economy, Project Planning and Management.

Senior Lecturers
Arthur Gordon Douglas, ME N.S.W., PhD Mich. State, MIEAust
Graham Rush Easton, BSc BE Syd., MEngSc Birm., MIEAust, AlArbA
Robert Alexander Jones, BE W.Aust., ME Auck., MSc DIC Lond., MIEAust, LS(NZ)
Jonathan Brian O'Brien, BE N.S.W., MA Sc Tor., MIEAust
Victor John Summersby, BE MEngSc MCom N.S.W., ASTC, MIEAust

Lecturer
Michael Clarence Dunne, BSc PhD Adel.

Department of Transport Engineering
Senior Lecturers
Alec James Fisher, BSc Lond., PhD N.S.W., FIESAust
Theo ten Brummelaar, BE MEngSc N.S.W., MIEAust
John Irwin Tindall, BE OId., BCom ME N.S.W., MIEAust

Lecturer
Roger Roy Hall, BSc A.N.U., MSc N.S.W., FESANZ, MIESAust
Clement Edward Quinlan, GradDip N.S.W., ASTC, MIEAust
Andrzej Waldemar Raczkowski, Mgrinz T.J.Warsaw, MIEAust
Colin John Wingrove, BSc MEngSc N.S.W., AlArbA

Department of Water Engineering
School of Electrical Engineering and Computer Science

Associate Professors
David Barnes, BSc PhD Birm., MIWSE, MIEAust, AMICE
Ian Cordery, ME PhD N.S.W, MIEAust
Douglas Neil Foster, BE Syd., MIEAust, MASCE
David Trehella Howell, BE Syd., ME N.S.W, MIEAust, MAIAS
David Herbert Pilgrim, BE PhD DSc N.S.W, FIEAust
Keith Kingsford Watson, BE Syd., ME PhD DSc N.S.W, FIEAust
David Lyon Wilkinson, BE Syd., PhD N.S.W, MIEAust

Senior Lecturers
Peter John Bliss, BE N.S.W, MSc DIC Lond., ASTC, MIEAust
Colin Raymond Dudgeon, ME PhD N.S.W, MIEAust, MASCE
Trevor Regis Fietz, ME N.S.W
Brian Selby Jenkins, BE PhD N.S.W, ASTC, MIEAust, LGI
David Keith Robinson, BSc BE PhD N.S.W, MIEAust, MASCE

Professional Officers
David George Doran, BE DipCompSc Qld., MEngSc N.S.W, MIEAust, MACS
Kenneth Brian Higgs, MSc Aston, MAIP

Administrative Officer
Robyn Christine Horwood, BA DipEd N.S.W

Senior Tutor
Geoffrey Robert Whale, BE N.S.W

Tutors
Rodney John Savage, BE Darling Downs I.A.E., MEngSc N.S.W, DipEd Kuring-gai C.A.E., MIEE
Subramanian Sridharan, BSc S.Lanka, MSc Manc., CEng, MIEE
Digby Russell Simon Tarvin, BSc N.S.W
Max Brian Webster, BE N.S.W
Michael Joseph Wise, BA BE N.S.W

Professional Officers
Peter Ivanov, BSc MEngSc N.S.W
Jeffrey Stanley Skebe, BS Case W.R., MEngSc N.S.W

Analytic/Programmer
Kevin Frank Hill, BE N.S.W
Michael William Rourke, BSc N.S.W

Executive Assistant to Head of School
Dr H. S. Blanks

Professor of Electrical Engineering — Systems and Control and Head of School
Neville Waller Rees, BSc PhD Wales, FIEAust

Professor of Electrical Engineering — Communications
Antoni Emil Karbowiak, DSc(Eng) Lond., CEng, FIEAust, FTS, FIREE, MIEE, SMIEEE

Professor of Computer Science
Murray William Allen, BE Adel., PhD Syd., CEng, FTS, FACS, FIREE, MIEE, SMIEEE

Tyree Professor of Electrical Engineering — Electric Power Engineering
Vacant

Professor of Electrical Engineering — Electronics
Graham Austin Rigby, MSc Syd., PhD Calif., CEng, FTS, FIREE, MIEE

Executive Assistant to Head of School
Dr H. S. Blanks

Senior Administrative Officer
Kevin John Flynn, BE MEngSc N.S.W, ASTC

School of Electrical Engineering and Computer Science

Professor of Electrical Engineering — Systems and Control and Head of School
Neville Waller Rees, BSc PhD Wales, FIEAust

Professor of Electrical Engineering — Communications
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Engineering

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Incorporates Aeronautical Engineering and Naval Architecture.

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Graham Smith, BE MEngSc PhD N.S.W., ASTC, MIEAust, MACS

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Philip Mathew, BE PhD N.S.W., MIEAust

* Aeronautical engineering.
† Naval Architecture.
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Sabapathy Ganeshan, BSc Ceyl.,
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Professor N. L. Svensson

Director
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Professional Officer
Laura Anne Poole-Warren, BSc N.S.W.

§Conjoint appointment with Faculty of Medicine.
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</tbody>
</table>
The University of New South Wales Kensington Campus 1986

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