How to use this Handbook

The information in this book has been divided into **seven parts**.

**General Information** (the *India* coloured pages) 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.

**Graduate Study** is about higher degrees.

**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 unit values, credit hours, teaching hours per week, sessions when taught

**Financial Assistance to Students** is a list of scholarships and prizes, available at undergraduate and graduate level in the faculty.

**Staff list.**

For detailed reference, see the list of **Contents**.
The University of New South Wales
PO Box 1 Kensington NSW Australia 2033 Phone 663 0351

Engineering

1984
Faculty Handbook
The address of the University of New South Wales is:

PO Box 1, Kensington
New South Wales, Australia 2033

Telephone: (02) 663 0351
Telegraph: UNITECH, SYDNEY
Telex AA26054
Subjects, courses and any arrangements for courses including staff allocated, as stated in the Calendar or any Handbook or any other publication, announcement or advice of the University, are an expression of intent only and are not to be taken as a firm offer or undertaking. The University reserves the right to discontinue or vary such subjects, courses, arrangements or staff allocations at any time without notice.

Information in this Handbook has been brought up to date as at 12 September 1983, but may be amended without notice by the University Council.

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- Combined Course...
- 3730 Combined Course (BE BSc) in Civil Engineering

### School of Electrical Engineering and Computer Science
- 3640 Electrical Engineering (BE)
- 3650 Electrical Engineering (BSc(Eng))
- Combined Courses...
- 3725 BE BSc in Electrical Engineering
- 3720 BE BA in Electrical Engineering

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

### School of Mechanical and Industrial Engineering
- 3680 Mechanical Engineering (BE)
- 3681 Mechanical Engineering Combined Course (BE BSc)

### School of Surveying
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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 Deputy Registrar (Student Services), Mr Peter O'Brien, and members of his staff, are located on the first floor of the Chancellery. They 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 they are especially concerned with the problems of overseas, Aboriginal, and physically handicapped and disabled students. Enquire at Room 148E, phone 2482.

The Assistant Registrar (Admissions and Examinations), Mr Jack Hill, is located on the ground floor of the Chancellery. General inquiries should be directed to 3715. For information regarding examinations, including examination timetables and clash of examinations, contact the Senior Administrative Officer, Mr John Grigg, phone 2143.

Note: All phone numbers below are University extension numbers. If you are outside the University, dial 6630351 and ask for the extension. Alternatively you may dial 662 and then the extension number. This prefix should only be used when you are certain of the extension that you require as callers using 662 cannot be transferred to any other number.
The Assistant Registrar (Student Records and Scholarships — Undergraduate and Postgraduate), Mr Graham Mayne is located on the ground floor of the Chancellery. For particular enquiries regarding illness and other matters affecting performance in examinations and assessment, academic statements, graduation ceremonies, prizes, release of examination results and variations to enrolment programs, phone 3317.

The Adviser for Prospective Students, Mrs Fay Lindsay, is located in the Chancellery and is available for personal interview. For an appointment phone 3453.

The Assistant Registrar (Careers and Employment), Mr Jack Foley, is located in the Chancellery. Enquiries should be directed to 3259.

The Off-campus Housing Officer, Mrs Judy Rawson, is located in Room 148E in the Chancellery. For assistance in obtaining suitable accommodation phone 3260.

Student Loans enquiries should be directed to Mrs Judy Rawson, Room 148E in the Chancellery, phone 3164.

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 2679, 2678 or 2677.

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 3681 or 3685 for an appointment.

The University Librarian is Mr Allan Horton. Library enquiries should be directed to 2048.

The Chaplaincy Centre is located in Hut E15A at the foot of Basser Steps.

The Students' Union is located on the second floor of Stage III of the University Union, where the SU President, Secretary-Treasurer, Education Vice-President, Women's Officer, Director of Overseas Students and a full-time solicitor employed by the Students' Union are available to discuss any problems you might have.

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.

### 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 five 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.

#### 1984

**Faculties other than Medicine**

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**Faculty of Medicine**

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<td>21 May to 17 June</td>
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<td>Term 4 (10 weeks)</td>
<td>3 September to 11 November</td>
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<td>Term 5 (8 weeks)</td>
<td>23 January to 18 March</td>
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<td>Term 2 (8 weeks)</td>
<td>26 March to 20 May</td>
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<td>Term 3 (8 weeks)</td>
<td>28 May to 22 July</td>
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Term 4 (8 weeks) 30 July to 23 September
Term 5 (8 weeks) 2 October to 25 November

April
Thursday 19
Last day for undergraduate students to
discontinue without failure subjects
which extend over Session 1 only

Friday 20
Good Friday — Public Holiday

Saturday 21
Easter Saturday — Public Holiday

Monday 23
Easter Monday — Public Holiday

Wednesday 25
Anzac Day — Public Holiday

May
Wednesday 2
Confirmation of Enrolment forms
despachted to all students

Friday 11
Last day for acceptance of corrected
Confirmation of Enrolment forms

Monday 14

Monday 16

Wednesday 16

Last day for undergraduate students
completing requirements for degrees at
the end of Session 1 to submit
Application for Admission to Degree forms

Thursday 17
Publication of provisional timetable for
June/July examinations

Sunday 20

Friday 25
Last day for students to advise of
examination clashes

June

Tuesday 5
Publication of timetable for June/July
examinations

Monday 11
Queen’s Birthday — Public Holiday

Sunday 17
Session 1 ends

Monday 18
Midyear Recess begins

Tuesday 19
Examinations begin

July

Wednesday 4
Examinations end

Monday 16
Examination results mailed to students

Tuesday 17
Examination results displayed on
University noticeboards

To Friday 20 July: Students to amend
enrolment programs following receipt of
June examination results

Friday 20

Sunday 22
Midyear Recess ends

Monday 23
Session 2 begins
August
Friday 3
Last day for students to discontinue without failure subjects which extend over the whole academic year

Monday 27
August Recess begins

Tuesday 28
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

September
Sunday 2
August Recess ends

Wednesday 5
List of graduands for October graduation ceremonies published in The Sydney Morning Herald

Monday 10
Last day for notification of correction of details published in The Sydney Morning Herald on 5 September concerning October graduation ceremonies

Friday 14
Last day for undergraduate students to discontinue without failure subjects which extend over Session 2 only

Monday 24
Confirmation of Enrolment forms despatched to all students

Friday 28
Last day to apply to UCAC for transfer to another tertiary institution in New South Wales

November
Sunday 4
Session 2 ends

Monday 5
Study Recess begins

Sunday 11
Study Recess ends

Monday 12
Examinations begin

Friday 30
Examinations end

December
Monday 17
Examination results mailed to students
List of graduands in Medicine for February Graduation Ceremony published in The Sydney Morning Herald

Tuesday 18
Examination results displayed on University noticeboards

Tuesday 25
Christmas Day — Public Holiday

Wednesday 26
Boxing Day — Public Holiday

1985

October
Monday 1
Eight Hour Day — Public Holiday

Wednesday 3
Last day for acceptance of corrected Confirmation of Enrolment forms

Thursday 4
Publication of provisional examination timetable

Friday 5
Last day for applications from undergraduate students completing requirements for degrees at the end of Session 2 to submit applications for Admission to Degree forms

Friday 12
Last day for students to advise of examination timetable clashes

Thursday 25
Publication of examination timetables

Faculties other than Medicine and Military Studies

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<td>20 May to 16 June</td>
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<td>Midyear Recess: 17 June to 21 July</td>
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<td>Examinations 18 June to 3 July</td>
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</table>

<table>
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<tr>
<th>Session 2</th>
<th>(14 weeks)</th>
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<td>August Recess: 26 August to 1 September</td>
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<td>2 September to 3 November</td>
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Faculty of Medicine

First and Second Years
As for other faculties

Third and Fourth Years
Term 1 (10 weeks) 21 January to 31 March
Term 2 (9 weeks) 9 April to 12 May
May Recess: 13 May to 19 May
20 May to 16 June
Term 3 (9 weeks) 24 June to 25 August
August Recess: 26 August to 1 September
Term 4 (10 weeks) 2 September to 10 November

Fifth Year
Term 1 (8 weeks) 21 January to 17 March
Term 2 (8 weeks) 25 March to 19 May
Term 3 (8 weeks) 27 May to 21 July
Term 4 (8 weeks) 29 July to 22 September
Term 5 (8 weeks) 30 September to 24 November

January
Tuesday 1
Public Holiday (New Year)

Friday 11
Last day for acceptance of applications by office of the Admissions Section for transfer to another undergraduate course within the University

Monday 14
Last day for applications for review of results of annual examinations

Monday 28
Australia Day — Public Holiday

February
Monday 19
Enrolment period begins for second and later year undergraduate students and graduate students enrolled in formal courses

March
Monday 4
Session 1 begins — all courses except Medicine III, IV and V

April
Friday 5 to Monday 8
Easter — Public Holiday

Thursday 25
Anzac Day — Public Holiday

Organization of the University

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

In 1983 the University had 18,376 students and over 3,600 staff who worked in more than eighty buildings. These figures include staff and students at Broken Hill (W.S. and L.B. Robinson University College), Duntroon (the Faculty of Military Studies) and Jervis Bay.

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', 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 44 members from the State Parliament, industry and commerce, agriculture, the trade unions, professional bodies, the staff, the students and the graduates of the University.

The Council meets six 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 eleven faculties are Applied Science, Architecture, Arts, Biological Sciences, Commerce, Engineering, Law, Medicine, Military Studies, Professional Studies and Science. In addition, the Board of Studies of the Australian Graduate School of Management (AGSM) and the Board of Studies in General Education 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 (eg 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 two Pro-Vice-Chancellors, Professor Ray Golding and Professor Athol Carrington, together with the Deans and the three heads of the administrative divisions.

General Administration

The administration of general matters within the University comes mainly within the province of the Registrar, Mr Ian Way, the Bursar, Mr Tom Daly, and the Property Manager Mr Peter Koller.

The Registrar’s Division is concerned chiefly with academic matters such as the admission of students, and the administration of examinations as well as the various student services (health, employment, amenities, and counselling).

The Bursar’s Division is concerned with the financial details of the day-to-day administration and matters to do with staff appointments, promotions, etc.

The Property division is responsible for the building program and the ‘household’ services of the University, including electricity, telephones, cleaning, traffic and parking control and maintenance of buildings and grounds.

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, as the faculties have their own rules for the conduct of open meetings.

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 $500 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) are available from individual schools.

Co-operative Bookshop
Membership is open to all students, 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 3476.

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 450 men and women students, as well as tutorial and administrative staff members. Fees are payable on a session basis. Apply in writing to the Master, PO Box 24, Kensington, NSW 2033.

International House
International House accommodates 154 male and female students from Australia and up to thirty other countries. Preference is given to more senior undergraduates and graduate students. 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 sponsors a wide range of sporting and social activities. Apply to the Master, New College, Anzac Parade, Kensington 2033 (telephone 662 6066).

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

Warrane College
Warrane College provides accommodation for 200 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 male 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. 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 contact the Housing Officer in the Chancellery, Room 149E for assistance 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. Accom
modation 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.

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. See the General Information section of the Faculty Handbooks for details.

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.

Deputy Registrar (Student Services)

The Deputy Registrar (Student Services), Mr Peter O'Brien, and his Administrative Assistant, Mrs Anne Beaumont, are located on the first floor of the Chancellery.

They will help those students who have problems and need advice but who do not seem to be provided for by the other organizations and services mentioned. As well as dealing with those enquiries, 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 148E or by telephoning extension 2482 (general enquiries).
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 38 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 phone on the following extensions: Recreation Program 3271; Grounds Bookings 2235; Tennis Bookings 2617; Sports Association 2673.

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. The recreational program includes intramurals, teaching/coaching, camping. The Centre is located on the lower campus adjacent to High Street. The Supervisor at PERC may be contacted on extension 3271.

Student Counselling and Research Unit

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

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 phoning extension 3685 or 3681 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.

The Section is located in Undercroft Room LG05 in the Chancellery.

For further information, telephone as follows: careers and employment assistance 3259 or 3630; long vacation industrial training 2086.

Student Health Unit

A student health clinic and first aid centre is situated within the University. The medical service although therapeutic is not intended to replace private or community health services. Thus, where chronic or continuing conditions are revealed or suspected the student may be referred to a private practitioner or to an appropriate hospital. The health service is not responsible for fees incurred in these instances. The service is confidential and students are encouraged to attend for advice on matters pertaining to health.

The service is available to all enrolled students by appointment, free of charge, between 9 am and 5 pm Mondays to Fridays. For staff members, immunizations are available, and first aid service in the case of injury or illness on the campus.

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

Appointments may be made by calling at the centre or by telephoning extension 2679, 2678 or 2677 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 598 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. All alumni of the University are eligible for Life 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.

A full-time President, elected each year by popular ballot, directs the entire administration of the Students' Union and its activities, assisted by a Secretary-Treasurer.

Other officers are the Education Vice-President who works towards the implementation of Students' Union education policy; the Welfare-Research Officer concerned with helping students with problems they may encounter in the University; the Electronic Media Officer; and the Director of Overseas Students who deals with specific problems these students may encounter while in Australia.

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.
10. Organization of Foundation Day.

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), the other is on the Second Floor of the Squarehouse (above the bar) at the bottom end of campus.

The University Library

The University libraries are mostly situated on the upper campus. The library buildings house the Undergraduate Library on Level 3, the Social Sciences and Humanities Library on Level 4, the Physical Sciences Library on Level 7 and the Law Library on Level 8. 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 Royal Military College, Duntroon, 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.

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

The University Union provides the facilities students, staff and graduates require in their daily University life and thus an opportunity for them to know and understand one another through associations outside the lecture room, the library and other places of work.

The Union is housed in three buildings near the entrance to the Kensington Campus from Anzac Parade. These are the Roundhouse, the Blockhouse and the Squarehouse. 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 full range of facilities provided by the Union includes a cafeteria service and other dining facilities, a large shopping centre (including clothing shop and delicatessen); travel service; banking, pharmaceutical, optometrical and hairdressing facilities; showers; common, games, reading, meeting, music, practice, craft and dark rooms. The Union also has shops on Campus which cater for student needs, including art materials and calculators. The Union also operates various Food Service Points on the Upper Campus including the Sciences Cafeteria, Golf House and the Undercroft with a late night service in the Sciences Cafeteria. Photocopying, sign printing, and stencil cutting services are also available.

The Union also sponsors special concerts (including lunchtime concerts) and conducts courses in many facets of the arts including weaving, photography, creative dance and yoga. Full information concerning courses is contained in a booklet obtainable from the Union’s program department.

The University Union should not be confused with the Students’ Union or Students’ Representative Council as it is known in some other universities. This latter body has a representative function and is the instrument whereby student attitudes and opinions are crystallized and presented to the University and the community.

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 incomes from vacation or part-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
- Master’s 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.

Tertiary students receiving an allowance, and prospective tertiary students, will be sent application forms in January 1984. Forms are also available from the Admissions Section or the Careers and Employment Section, or from the Director, Department of Education, 59 Goulburn Street, Sydney, NSW 2000 (telephone 2188800). Continuing students should submit applications as soon as examination results are available. New students should do so as soon as they are enrolled. All students should apply by 31 March 1984, otherwise benefits will not be paid for the earlier months of the year.

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. Early in 1973 the Commonwealth Government 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.

From the same source students who are in extremely difficult financial circumstances may apply for assistance by way of a non-repayable 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 generous 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 the Deputy Registrar (Student Services), Room 148E, in 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, the University may assist Aboriginal students with loans to meet some essential living expenses.

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. The University is engaged in consultations with groups and individuals for advice on the most effective ways of using the funds and has established a committee to advise the Vice-Chancellor in the matter.

Enquiries relating to these matters should be made at the office of the Deputy Registrar (Student Services), Room 148E, in 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 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 5 pm, Monday to Friday. During enrolment it is also open for some part of the evening.

Information may be obtained here about 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. 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.

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.

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.

Details of the procedure to be followed by students seeking entry to first year undergraduate degree courses at the University may be obtained from the Student Enquiry Counter or the Universities and Colleges Admissions Centre.

An Adviser for Prospective Students, Mrs Fay Lindsay, is located in the Chancellery, 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 eighteen institutions in the State including the University of Wollongong and the three universities in the Sydney Metropolitan area (Macquarie University, the University of New South Wales and the University of Sydney) are required to lodge a single application form with the Universities and Colleges Admissions Centre, Challis House, 10 Martin Place,
Sydney 2000 (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 three universities and fifteen other tertiary institutions. Students are notified individually of the result of their applications and provided with information regarding the procedures to be followed in order to accept the offer of a place at this university. Enrolment is completed at the Enrolment Bureau, Unisearch House, 221 Anzac Parade, Kensington.

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 1984

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 may 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 in which to pay fees from the office of the Deputy Registrar (Student Services) (Room 148E, 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 registration number be given accurately. Cash should not be sent through the mail.

2. New Undergraduate Enrolments

Persons who are applying for entry in 1984 must lodge an application for selection with the Universities and Colleges Admissions Centre, GPO Box 7049, Sydney 2001, by 1 October 1983.

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 Enquiries Counter in the Chancellery and from School offices. Those 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 1983.

4. Restrictions Upon Re-enrolling

Students who in 1983 have infringed the rules governing re-enrolment should not attempt to re-enrol in 1984 but should follow the written instructions they will receive from the Registrar.

5. New Research Students

Students enrolling for the first time in graduate research degree courses will receive an enrolment form by post. They have two weeks from the date of offer of registration in which to lodge the enrolment form with the Cashier. Completion of enrolment after this time will incur a penalty (see section 16. below).

6. Re-enrolling Research Students

Students undertaking purely research degree programs (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 programs (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 thesis or 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 — ie as a student not proceeding to a degree or diploma — may be permitted provided that in every case the Head of School offering the subject considers that the student will benefit from the enrolment and provided also that accommodation is available and that the enrolment does not prevent a place in that subject being available to a student proceeding to a degree or diploma.

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

(3) A student who is under exclusion from any course in the University may not be permitted to 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.

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 (16 March 1984) except with the express approval of the Deputy Registrar (Student Services) 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 (30 March 1984) except with the express approval of the Deputy Registrar (Student Services) 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 (3 August 1984) except with the express approval of the Deputy Registrar (Student Services) and the Heads of the Schools concerned.

10. University of New South Wales and University Union Membership Card

All students enrolled in degree or diploma courses or as miscellaneous students, except those exempt from University Union fees under provisions of section 17. below, are issued with a University of New South Wales and University Union Membership Card. This card must be carried during attendance at the University and shown on official request.

The number appearing on the front of the card above the student's name is the student registration number used in the University's records. This number should be quoted in all correspondence.

The card must be presented when borrowing from the University libraries, when applying for travel concessions, and when notifying a change of address. It must also be presented when paying fees on re-enrolment each year when it will be made valid for the year and returned. Failure to present the card could result in inconvenience in completing re-enrolment.

Life members of the University Union and those exempt from payment of University Union fees, if enrolled in degree or diploma courses or miscellaneous students use the University's fees receipt in place of the card when applying for travel concessions and when notifying a change of address. The University Library issues a library borrowing card on production of the fees receipt.

A student who loses a card must notify the University Union as soon as possible.

New students are issued with cards on enrolment if eligible.

New graduate students should complete an application for a card when they enrol unless they already possess one from previous study at the University. The card can be collected from the second floor of the University Union Blockhouse approximately three weeks after enrolment. The fees receipt may be used as necessary until the card is available.

11. Payment of Fees

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

12. Assisted Students

Scholarship holders and sponsored students who have not received an enrolment voucher or appropriate letter of authority from their sponsor at the time when they are enrolling should complete their enrolment by paying their own fees.

A refund of fees 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 to the office of the Deputy Registrar (Student Services) (Room 148E, the Chancellery) for an extension of time 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 to the office of the Deputy Registrar (Student Services) (Room 148E, the Chancellery) for an extension of time, which may be granted in extenuating circumstances. Such applications must be made before the due date.

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 ceases to be entitled to the use of University facilities. Such students are not permitted to register 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 (27 April 1984). 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 (31 August 1984).

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 $35

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 are current in 1983 and are therefore subject to an increase in 1984.

University Union annual subscription $101
Sports Association annual subscription $21
Students' Union Annual Subscription

Students enrolling in full-time courses $30
Students enrolling in part-time courses or as miscellaneous students $25

These two fees will be increased for 1984, the amounts have yet to be determined at the time of publication.

Miscellaneous Fund annual fee $35

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, not at the office of the Deputy Registrar (Student Services) or at the Cashier's office.
(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 W. S. and L. B. Robinson University College and in the Faculty of Military Studies 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 Deputy Registrar (Student Services) 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 degree 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 dean of the appropriate faculty and 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 Deputy Registrar (Student Services) 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 Deputy Registrar (Student Services) 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 form available from the appropriate Course Authority.

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

(3) Enrolment in additional subjects
Applications for enrolment in additional subjects must be submitted by:
30 March 1984 for Session 1 only and whole year subjects;
17 August 1984 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 (20 April or 7 September)
(b) for whole year subjects, the end of the second week of Session 2 (3 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 by the Student Records and Scholarships Office 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 (30 March 1984) 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 (20 April 1984) a refund of three-quarters of the Student Activities Fees paid will be made; if notice is given before the beginning of Session 2 (23 July 1984) a refund of one-half of the
Student Activities Fees paid will be made; if notice is given before the end of the seventh week of Session 2 (7 September 1984) 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 (30 March or 17 August 1984) 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 (20 April or 7 September 1984) 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 Deputy Registrar (Student Services) to a student unable to notify the Student Records and Scholarships Office in writing by the times required provided evidence is supplied that the student has ceased attendance by those times.

(6) Acknowledgements
The Student Records and Scholarships Office 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 (20 April or 7 September) will be incorporated in the Confirmation of Enrolment Program notice forwarded to students on 30 April or 20 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 Student Records and Scholarships Office.

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.

Students who withdraw from the first year of their course are not granted leave of absence and must again apply for a place through the Universities and Colleges Admissions Centre.

Course Transfers

Students wishing to transfer from one course to another must complete and submit an application form, obtainable from the office of the Admissions Section, the Chancellery, by Friday 13 January 1984.

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 1983 of their intention to transfer.

Admission with Advanced Standing

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

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

2. where students transfer from another university such students shall not in general be granted standing in this Univer-
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 requirements 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.

Examinations

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

Provisional timetables indicating the dates and times of examinations are posted on the University noticeboards.

Students must advise the Examinations Section (the Chancellor) of any clash in examinations. Final timetables indicating the dates, times, locations, and authorized aids 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:

<table>
<thead>
<tr>
<th>Grade</th>
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<tbody>
<tr>
<td>High Distinction</td>
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</tr>
<tr>
<td>Credit</td>
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</tr>
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</tr>
<tr>
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Pass Conceded

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

Pass Terminating

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

Availability of Results

Final examination results will be posted to a student's term address, or vacation address if requested. Forms requesting that results be posted to a vacation address are included in the examination timetable (November/December only) and change of address forms are obtainable at the Student Enquiry Counter, the Chancellor. Forms can be accepted up to Friday 1 July for Session 1 results and Friday 2 December for Session 2 and whole year results. Results are available for students two weeks before the end of each session.

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 absence. If these instructions are not fully understood or have been lost, students should contact the Office of the Admissions 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 Admissions Centre before 1 October in the year preceding that in which they wish to resume studies.

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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 are included in the examination timetable (November/December only) and change of address forms are obtainable at the Student Enquiry Counter, the Chancellor. Forms can be accepted up to Friday 1 July for Session 1 results and Friday 2 December for Session 2 and whole year results. Results are available for students two weeks before the end of each session.

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also posted on School noticeboards and in the University Library. Results on noticeboards are listed by Student Registration Number.

No examination results are given by telephone.

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

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

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

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

Special Consideration
Students who believe that their performance in a subject, either during session or in an examination, has been adversely affected by sickness or any other reason should inform the Registrar and ask for special consideration in the determination of their standing.

Such requests should be made as soon as practicable after the occurrence. Applications made more than seven days after the final examination in a subject will only be considered in exceptional circumstances.

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 Student Records (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 the Examinations Section to make special arrangements for their examinations, should contact Student Records as soon as the final timetable becomes available.

Use of Electronic Calculators
Where the use of electronic calculators has been approved by a faculty or school, examiners may permit their use in examinations. Authorized electronic calculators are battery operated with the minimum operations of addition, subtraction, multiplication and division and are of a type in common use by university students. They are not provided by the University, 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. The examination paper will be available for reading ten minutes before commencement.

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 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: use of unauthorized aids in an examination; submitting work for assessment knowing it to be the work of another person; improperly obtaining prior knowledge of an examination paper and using that knowledge in the examination; failing to acknowledge the source of material in an assignment.

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

1. Candidates are required to obey any instruction given by an examination supervisor for the proper conduct of the examination.
2. Candidates are required to be in their places in the examination room not less than fifteen minutes before the time for commencement.

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

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

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

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

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

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

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

10. A candidate who commits any infringement of the rules governing examinations is liable to disqualification at the particular examination, to immediate expulsion from the examination room and to such further penalty as may be determined in accordance with the By-Laws.

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 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 their academic record.

(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 examinations 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 Professional Board, or if its chairman is unable to serve, a member of the Professional Board, nominated by the Chairman of the Professional Board, or when the Chairman of the Professional 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 the program where the unit value for each subject in a course is defined as follows:

<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, 4190-4220</td>
<td>One-session subjects: UV 1 Two-session subjects: UV 2</td>
</tr>
<tr>
<td>Architecture</td>
<td>Half the program</td>
<td>3270, 3330, 3320, 3360, 3380</td>
<td>Elective subjects: UV 0 All other subjects: appropriate UV corresponding to credit points* All subjects: UV equal to the allocated hours*</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>artisans: 0</td>
</tr>
<tr>
<td>Medical Sciences</td>
<td>Half the program</td>
<td>3610, 3620, 3800</td>
<td>Science subjects: appropriate UV* Arts subjects: 6 credit points = UV 1 12 credit points = UV 2</td>
</tr>
<tr>
<td></td>
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<td></td>
<td>All subjects: UV 1</td>
</tr>
<tr>
<td>Professional Studies</td>
<td>Half the program</td>
<td>3640, 3740-3760, 4710-4790</td>
<td>One-session subjects: UV 1 Two-session subjects: UV 2</td>
</tr>
<tr>
<td></td>
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<td></td>
<td>All subjects: UV 1</td>
</tr>
<tr>
<td>Science</td>
<td>Half the program</td>
<td>3810, 3850</td>
<td>All subjects: UV 1</td>
</tr>
<tr>
<td></td>
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<td></td>
<td>General Studies: UV 1</td>
</tr>
<tr>
<td>Arts</td>
<td>18 first-level credit points</td>
<td>3400, 3420</td>
<td>Science subjects: appropriate UV* Arts subjects: 6 credit points = UV 1 12 credit points = UV 2</td>
</tr>
<tr>
<td>Biological Sciences</td>
<td>3430</td>
<td></td>
<td>Science and Mathematics 2 units 3970</td>
</tr>
</tbody>
</table>

*For details see the appropriate Faculty Handbook.
Admission to Degree or Diploma

Students whose current program will enable them to complete all requirements for the degree or diploma, including industrial training where necessary, should lodge with the Registrar the form Application for Admission to Degree/Diploma and return it to the Registrar by the second Monday in May for the October ceremonies, and the first Tuesday 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 Enrolment Details form 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 December.

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 second 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 second Wednesday in March.

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

Attendance at Classes

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

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

Absence from Classes

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

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

Student Records

Confirmation of Enrolment Program notices are sent to all students on 30 April and 24 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 Registrar's Division 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 Advice forms are available at Faculty and School offices and from the Student Enquiry Counter in the north wing of the Chancellery.

All communications from the University will be sent to the Session or Term address except when arrangements are made otherwise in the case of results of assessment (see Examinations: Availability of Results, earlier in this section). Change of Address Advice forms will be accepted up to Friday 25 November, 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.

Academic Dress

Information about the University's academic dress requirements may be obtained from the Alumni and Ceremonials Section, Room 148E, the Chancellery (phone extension 2998).

Further Information

Lost Property

All enquiries concerning lost property should be made to the Superintendent on extension 3892 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.

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.

Vice-Chancellor's Official Welcome to New Students

All students initially enrolling in the University are officially welcomed by the Vice-Chancellor and Principal at the following times:

Faculties of Architecture, Arts, Biological Sciences, Commerce, Law:
Tuesday 28 February 1984
9 am in the Clancy Auditorium

Faculties of Applied Science, Engineering, Medicine, Professional Studies, Science, and the Board of Studies in Science and Mathematics:
Tuesday 28 February 1984
11 am in the Clancy Auditorium

Meeting for Parents of New Students

Friday 2 March 1984
7.30 pm in the Clancy Auditorium
Foreword

This handbook aims to provide information concerning the requirements for admission, enrolment and conditions for the award of degrees and diplomas in the Faculty together with descriptions of the subjects available. It is important that each student in the Faculty becomes well acquainted with the information presented here. In addition to this Handbook, pamphlets and brochures issued in conjunction with the enrolment period and Orientation Week are available. These should be consulted, together with the University Calendar, for further information on problems associated with courses.

The Faculty consists of five Schools: Civil Engineering, Electrical Engineering and Computer Science, Mechanical and Industrial Engineering, Nuclear Engineering, Surveying and the Centre for Biomedical Engineering. In addition, the Faculty of Engineering has joined with the Faculty of Applied Science in establishing the Centre for 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. The School conducts both part-time and full-time undergraduate courses in Civil Engineering. In addition, the School conducts graduate courses and carries out graduate research programs in many fields.

The Department of Civil Engineering Materials includes the fields of Soil Mechanics, Rock Mechanics, Concrete Technology, Plastics and Timber, Metals and Welding Technology, Pavement Engineering, and Continuum and Statistical Mechanics. The Materials Laboratories are located at Kensington.

The Department of Engineering Construction and Management is responsible for the fields of Civil Engineering Systems, Engineering Economy, Project Planning and Management and Civil Engineering Construction.

The Department of Structural Engineering covers the fields of Structural Analysis, Structural Design, Stress Analysis and Solid Mechanics. The Model Structures, Experimental Stress Analysis and Structural Dynamics Laboratories are at Kensington. The Structural Testing Laboratory is at King Street, Randwick.

The Department of Transport Engineering is concerned with the planning, design, construction and operation of transport systems by the application of engineering techniques, statistical analysis, land use and transport modelling, economic evaluations and environmental impact studies.

The Department of Water Engineering encompasses the fields of Hydraulics, Hydrology, Water Resources and Public Health Engineering. The Public Health Engineering Laboratory is located
at Kensington and there is a pilot scale laboratory at Randwick for research and teaching. The Hydrology research centre is also at Kensington, but a substantial amount of investigation is carried out in the field. The Water Research Laboratory is located at Manly Vale and is the centre for instruction and research in hydraulics.

The School of Electrical Engineering and Computer Science comprises five departments — Communications, Computer Science, Electric Power Engineering, Electronics, and Systems and Control. The School also houses the Joint Microelectronics Research Centre. Special laboratories are equipped for work in the areas of Microelectronics, Microwaves, Digital Systems, Power Systems, Computer Control, Machines and Acoustics. A Measurements Laboratory provides a calibrating service under certificate from the National Association of Testing Authorities.

The School offers undergraduate courses leading to the award of the degree of Bachelor of Engineering which may be taken on either a full-time basis, normally over four years, or on a part-time basis, normally over six years, or a combination of these. The School continues to offer the later stages of the six year part-time courses leading to the award of the degree of Bachelor of Science (Engineering) although no new enrolments are now being accepted. Students have considerable choice of subjects in the latter half of the courses so they may concentrate, if desired, on one of the main streams of modern electrical engineering, namely electronics (including microelectronics and communications), electric energy, or computers and systems.

A major in Computer Science is available in the three year BSc program in the Faculty of Science. There are also combined courses (normally five years full-time) which lead to the award of two degrees (BE and BSc, or BE and BA).

In addition to the supervision of programs of advanced study and research for candidates undertaking a research degree leading to the award of the degree of Master of Engineering, Master of Science or Doctor of Philosophy, the School offers formal graduate courses leading to the award of the degree of Master of Engineering Science or a Graduate Diploma in Engineering Developments.

Undergraduate courses leading to the award of the degree of Bachelor of Engineering are offered in Mechanical, Industrial, and Aeronautical Engineering, and in Naval Architecture. These courses may be taken either on a full-time basis, normally over four years or on a part-time basis, normally over six years, or on a combined full-time/part-time basis, subject to approval by the Head of School.

The first two years of the degree, taken full-time, or the first three years, taken part-time, are common to all four courses within the School. Thus a final decision on the discipline to be followed need not be made until the end of Year 2 for full-time and the end of Year 3 for part-time students.

The School offers combined courses (normally five years full-time) which lead to the award of two degrees (BE BSc). These courses enable students to major in Computer Science, Materials Science, Mathematics, Physics or Statistics while pursuing their chosen engineering speciality.

Formal graduate courses of study, leading to the award of the degree of Master of Engineering Science or to the award of a Graduate Diploma in Engineering Developments, are available. The areas of specialization cover the major fields of Mechanical and Industrial Engineering.


Undergraduates who are interested in working for a research degree should consult the Head of School towards the end of their final year. Advice will be given to all students during their third year so that each can select the best possible combination of final year elective subjects.

The School of Nuclear Engineering operates at the graduate level in the Faculty of Engineering. A fourth year undergraduate subject in Nuclear Power Technology is provided as an elective for other Schools (23.051 Nuclear Power Technology).

In addition to the supervision of programs of advanced study and research for candidates undertaking a research degree leading to the award of Master of Engineering, Master of
Science or Doctor of Philosophy, the School offers a formal graduate course leading to the award of the degree of Master of Engineering Science. This formal course aims specifically at the education of engineers for the detailed understanding, analysis and assessment of nuclear reactors and nuclear power systems. Particular attention is given to the mathematical, numerical and computational techniques which are relevant to nuclear engineering.

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.

Special digital and analogue equipment for the analysis and recording of random signals has been acquired for experimental noise research. Through the Australian Institute of Nuclear Science and Engineering, the special facilities of the Australian Atomic Energy Commission's Research Establishment at Lucas Heights can be made available for research purposes. Close personal contact is maintained between members of the School and the Nuclear Technology Division at Lucas Heights.

The School of Surveying offers a full-time course of four years' duration leading to 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.) In addition to surveying, the course also includes studies in geodesy, photogrammetry and cartography, astronomy, computations and land studies.

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

The graduate courses offered are Master of Surveying Science and the Graduate Diploma in Surveying. The research degrees available are the Master of Surveying and Doctor of Philosophy.

The School is located in the Geography and Surveying Building. Facilities include four photogrammetry laboratories with several equipment types, an observatory platform for positional astronomy and a comprehensive range of field equipment for surveying and geodesy. Computing facilities include a number of terminals to the University's time-shared central computer, a control minicomputer within the School's Image Data Analysis Centre, and several programmable desk calculators. A library of programs is maintained for use with the different computers.

Current research is in the fields of satellite geodesy and geodynamics, atmospheric refraction, photogrammetry, remote sensing, positional astronomy, advanced surveying, cadastral systems and land management.

The Centre was established in 1976 as an interdisciplinary unit to promote and co-ordinate 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 offers graduate programs leading to the award of the degree of Master of Biomedical Engineering and the degree of Doctor of Philosophy. The Master's degree is obtained primarily through course work but includes a research project which is supervised in one of the Centre's associated laboratories, either on campus or in affiliated teaching hospitals. The doctorate is primarily a research degree which normally involves some formal course work.

The MBiomedE degree course is designed to cater for students with either a medical or engineering/science background and involves eighteen months of full-time study. Part-time students are also catered for. Initially, students with a medical background study basic engineering subjects such as mathematics, mechanics, electronics and computing, whilst students with a non-medical background take courses in biology, physiology, anatomy, pathology and biochemistry. At a later stage, students from both backgrounds choose electives.
from biomechanics, biophysics, biomaterials, medical instrumentation and mass transfer in medicine, as well as undertaking a research project.

The Centre was established in 1981 as a joint enterprise of the Faculties of Engineering and Applied Science to promote and co-ordinate 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.

The Centre offers graduate programs leading to the award of the degree of Master of Engineering Science or Master of Applied Science and supervision for the degree of Doctor of Philosophy. A Graduate Diploma program in Remote Sensing is also available. The Masters' programs encompass the fundamentals of remote sensing and remote sensing systems, ground investigations, concepts of data processing and pattern recognition, numerical analysis of data and information extraction leading to specific application studies. They are organized around a group of compulsory subjects, elective subjects and a project or research project which is supervised in one of the schools associated with the Centre.

Students from a wide variety of backgrounds can undertake the programs on a one year full-time or two year part-time basis and these may include engineering, geography, geology, surveying, planning, biology and agricultural or environmental sciences.

Safety Science

The Faculty offers a graduate program leading to the award of the degree of Master of Safety Science. A Graduate Diploma program in Safety Science is also available. These courses are provided in conjunction with the Facilities of Medicine, Commerce, Law and Applied Science. They are organized around a group of introductory subjects, core subjects and Safety Engineering elective subjects. Students from a wide variety of backgrounds may undertake the programs on a full-time or part-time basis.

Faculty of Applied Science

Courses in Chemical Engineering, Ceramic Engineering, Metallurgy, Metallurgical Process Engineering, Mining Engineering and Textile Engineering are offered by the Faculty of Applied Science. For further information on these courses students should consult the Calendar and Faculty of Applied Science Handbook.
Message from the 
Dean and the Chairman

A great deal of discussion has taken place within the Faculty in recent years concerning the type of education appropriate for an engineer and surveyor. Central to this discussion are the basic objectives which are implicit in the various engineering and surveying courses. These are to impart to and foster within its students the following:

- 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 new ideas and practices.
- The ability to evaluate independently and to criticise constructively their own work and the work of other engineers.

We hope to do much more than merely impart a body of knowledge to our 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.

It is also important for you, as a student, to join in the development of yourself as a professional engineer. Engineering is a co-operative profession where teamwork is very important. Whilst at university you should take as many opportunities as you can 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 your work as an engineer.

The staff and students collectively create an atmosphere of scholarship and learning. Staff are involved in research as well as in teaching. This research is vital if the quality of teaching is to be kept at a high intellectual standard. In addition the interested student will find a very wide
range of research activities. The common thread, however, will be the engineering method which is applied.

Students should take steps to ensure that the staff are fully aware of their problems and attitudes. There are committees in the schools which are concerned with student matters. The Faculty has student representation on its Education Committee, the Faculty and Faculty Executive Committees. We seek for membership of these committees articulate students who are able to assist in the development of a true university spirit of learning and enquiry.

N. L. Svensson  
Dean  
Faculty of Engineering

D. T. Howell  
Chairman  
Faculty of Engineering
Faculty Information

Who to Contact

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: Associate Professor J. Y. Harrison, 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 J. V. Fonseka, 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 1984 or enrolling in graduate courses should obtain a copy of the free booklet *Enrolment Procedures 1984* 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 Library.

The Physical Sciences Library

This library situated on Levels 6 and 7 of the Library tower, caters for the information needs of staff, graduate students and senior 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

The Undergraduate Library

This library caters for the library needs of first and second year students and other groups where large numbers require mass teaching.

The Undergraduate Library provides a reader education program and reader assistance service aimed at teaching students the basic principles of finding information. Services of particular interest to undergraduates and academic staff are:

- The Open Reserve Section, housing books and other material which are required reading.
- The Audio Visual Section, containing cassette tapes, mainly lectures and other spoken word material. The Audio Visual Section has wired study carrels and cassette players for student use.

Undergraduate Librarian  Pat Howard

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 object '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 (StudE.Aust).
Student members receive the fortnightly publication *Engineers, Australia* advising of site tours, conferences, technical meetings of all branches, harbour cruises, film nights, etc. They also receive *The Transactions* which contains articles on a particular branch of engineering for a small fee.

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, *The Australian Surveyor* and *The NSW Surveyors' Monthly Bulletin* 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 degree of Bachelor of Engineering, and part-time courses leading to the degree of Bachelor of Engineering. The School of Surveying offers full-time courses, which may also be taken in a sandwich form, leading to the degrees of Bachelor of Surveying and 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. 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 the degrees of Bachelor of Surveying and Bachelor of Surveying Science.

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.

A student 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 he does not take out the BSc(Eng) degree. Further, provided he continues as a registered student on transfer from one course to the other, he 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, ie 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. A course is also available for the award of the degree of BE BA in Electrical Engineering.

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.

Faculty of Engineering Prerequisite Requirements

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</th>
<th>Percentile Range Required</th>
</tr>
</thead>
<tbody>
<tr>
<td>Engineering</td>
<td>2 u Mathematics* or</td>
<td>71-100</td>
</tr>
<tr>
<td>Aeronautical</td>
<td>3 u Mathematics or</td>
<td>21-100</td>
</tr>
<tr>
<td>Civil</td>
<td>4 u Mathematics and</td>
<td>1-100</td>
</tr>
<tr>
<td>Engineering</td>
<td>2 u Science (Physics) or</td>
<td>31-100</td>
</tr>
<tr>
<td>Electrical</td>
<td>4 u Science (multistrand)</td>
<td>31-100</td>
</tr>
<tr>
<td>Industrial Engineering</td>
<td>2 u Mathematics* or</td>
<td>71-100</td>
</tr>
<tr>
<td>Naval Architecture</td>
<td>3 u Mathematics or</td>
<td>21-100</td>
</tr>
<tr>
<td></td>
<td>4 u Mathematics and</td>
<td>1-100</td>
</tr>
<tr>
<td></td>
<td>2 u Science (Physics) or</td>
<td>31-100</td>
</tr>
<tr>
<td></td>
<td>4 u Science (multistrand)</td>
<td>31-100</td>
</tr>
<tr>
<td>Surveying</td>
<td>2 u Mathematics* or</td>
<td>71-100</td>
</tr>
<tr>
<td>Surveying</td>
<td>3 u Mathematics or</td>
<td>21-100</td>
</tr>
<tr>
<td>Science</td>
<td>4 u Mathematics and</td>
<td>1-100</td>
</tr>
<tr>
<td></td>
<td>2 u Science (Physics) or</td>
<td>31-100</td>
</tr>
<tr>
<td></td>
<td>4 u Science (multistrand)</td>
<td>31-100</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).

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 recorded.

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 R. W. Woodhead

Executive Assistant to Head of School
Dr D. K. Robinson

Senior Administrative Officer
Mr R. W. Prior

The School of Civil Engineering offers a course 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, a seven-stage part-time basis or any approved combination of full-time and part-time study.

A five year full-time course leading to the award of the degrees of Bachelor of Engineering and Bachelor of Science (BE BSc) is offered.

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.

Bachelor of Engineering — Full-time Course

Year 1

<table>
<thead>
<tr>
<th>Course</th>
<th>Hours per week</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.981 Physics ICE*</td>
<td>5  3</td>
</tr>
<tr>
<td>2.981 Chemistry ICE†</td>
<td>6  2</td>
</tr>
<tr>
<td>5.0201 Engineering Dynamics</td>
<td>0  3</td>
</tr>
<tr>
<td>8.0102 Introduction to Engineering Design</td>
<td>2  0</td>
</tr>
<tr>
<td>8.0301 Engineering Drawing</td>
<td>0  3</td>
</tr>
<tr>
<td>8.170 Statics</td>
<td>3  0</td>
</tr>
<tr>
<td>8.171 Mechanics of Solids</td>
<td>0  3</td>
</tr>
<tr>
<td>8.271 Introduction to Materials</td>
<td>0  2</td>
</tr>
<tr>
<td>8.360 Computing</td>
<td>0  3</td>
</tr>
<tr>
<td>8.670 Introduction to Engineering Construction</td>
<td>1  0</td>
</tr>
<tr>
<td>10.011 Mathematics ‡</td>
<td>6  6</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>23  25</strong></td>
</tr>
</tbody>
</table>

*Students are advised to attempt 1.981 Physics ICE but if timetabling difficulties arise or other exceptional circumstances prevail permission will be given to attempt 1.001 Physics I or 1.011 Higher Physics I. On successful completion of one of these latter subjects students will be exempted from one Technical Elective. Students who intend to apply for transfer to the Combined BE BSc degree program in physics and mathematics in Year 2 must enrol in 1.001 or 1.011.

†Students who have not satisfied the science prerequisite for 2.981 Chemistry ICE (ie 2 unit Science including Physics or Chemistry or 4 unit Science (multi-strand) in the percentile range 31-100) are advised to apply to enrol in two acceptable alternative subjects, 2.111 Introductory Chemistry and 2.121 Chemistry 1A which together are equivalent to 2.981.

‡Students who have achieved a certain standard may attempt 10.011 Higher Mathematics ‡.
### Year 2

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Hpw S1</th>
<th>Hpw S2</th>
</tr>
</thead>
<tbody>
<tr>
<td>8.172</td>
<td>Mechanics of Solids II</td>
<td>4</td>
<td>0</td>
</tr>
<tr>
<td>8.1811</td>
<td>Structural Design IA</td>
<td>3</td>
<td>0</td>
</tr>
<tr>
<td>8.1812</td>
<td>Structural Design IB</td>
<td>0</td>
<td>3</td>
</tr>
<tr>
<td>8.2721</td>
<td>Civil Engineering Materials I</td>
<td>4</td>
<td>0</td>
</tr>
<tr>
<td>8.2722</td>
<td>Civil Engineering Materials II</td>
<td>0</td>
<td>4</td>
</tr>
<tr>
<td>8.311</td>
<td>Systems Engineering I</td>
<td>2</td>
<td>0</td>
</tr>
<tr>
<td>8.312</td>
<td>Systems Engineering II</td>
<td>0</td>
<td>2</td>
</tr>
<tr>
<td>8.571</td>
<td>Hydraulics I</td>
<td>0</td>
<td>3</td>
</tr>
<tr>
<td>8.671</td>
<td>Engineering Construction</td>
<td>3</td>
<td>0</td>
</tr>
<tr>
<td>10.022</td>
<td>Engineering Mathematics II</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>
<tr>
<td></td>
<td>One General Studies elective**</td>
<td>4</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td><strong>See Electives on following page.</strong></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*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>Hpw S1</th>
<th>Hpw S2</th>
</tr>
</thead>
<tbody>
<tr>
<td>8.173</td>
<td>Structural Analysis I</td>
<td>3</td>
<td>0</td>
</tr>
<tr>
<td>8.174</td>
<td>Structural Analysis II</td>
<td>0</td>
<td>3</td>
</tr>
<tr>
<td>8.1821</td>
<td>Structural Design IIIA</td>
<td>3</td>
<td>0</td>
</tr>
<tr>
<td>8.1822</td>
<td>Structural Design IIB</td>
<td>0</td>
<td>3</td>
</tr>
<tr>
<td>8.2731</td>
<td>Geotechnical Engineering I</td>
<td>2</td>
<td>0</td>
</tr>
<tr>
<td>8.2732</td>
<td>Geotechnical Engineering II</td>
<td>0</td>
<td>2</td>
</tr>
<tr>
<td>8.2733</td>
<td>Rock Engineering</td>
<td>0</td>
<td>2</td>
</tr>
<tr>
<td>8.362</td>
<td>Engineering Computations</td>
<td>3</td>
<td>0</td>
</tr>
<tr>
<td>8.400</td>
<td>Transport Engineering I</td>
<td>0</td>
<td>3</td>
</tr>
<tr>
<td>8.572</td>
<td>Hydraulics II</td>
<td>3</td>
<td>0</td>
</tr>
<tr>
<td>8.573</td>
<td>Hydraulics III</td>
<td>0</td>
<td>3</td>
</tr>
<tr>
<td>8.581</td>
<td>Water Resources I†</td>
<td>3</td>
<td>0</td>
</tr>
<tr>
<td>8.582</td>
<td>Water Resources II</td>
<td>0</td>
<td>3</td>
</tr>
<tr>
<td>8.672</td>
<td>Planning and Management I</td>
<td>0</td>
<td>4</td>
</tr>
<tr>
<td></td>
<td>One General Studies elective**</td>
<td>4</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td><strong>See Electives on following page.</strong></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*Includes 8 hours of Saturday fieldwork.*

### Year 4

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Hpw S1</th>
<th>Hpw S2</th>
</tr>
</thead>
<tbody>
<tr>
<td>8.001</td>
<td>Industrial Training</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>8.191</td>
<td>Structural Engineering</td>
<td>3</td>
<td>0</td>
</tr>
<tr>
<td>8.2741</td>
<td>Concrete Technology</td>
<td>0</td>
<td>4</td>
</tr>
<tr>
<td>8.2742</td>
<td>Metals Engineering</td>
<td>2</td>
<td>0</td>
</tr>
<tr>
<td>8.401</td>
<td>Transport Engineering II</td>
<td>0</td>
<td>3</td>
</tr>
<tr>
<td>8.583</td>
<td>Water Resources III</td>
<td>3</td>
<td>0</td>
</tr>
<tr>
<td>8.673</td>
<td>Planning and Management II</td>
<td>3</td>
<td>0</td>
</tr>
<tr>
<td>8.674</td>
<td>Planning and Management III</td>
<td>0</td>
<td>3</td>
</tr>
<tr>
<td>8.651</td>
<td>Design Project—Materials</td>
<td>0</td>
<td>1¾</td>
</tr>
<tr>
<td>8.652</td>
<td>Design Project—Structures</td>
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<td>1¾</td>
</tr>
<tr>
<td>8.653</td>
<td>Design Project—Water</td>
<td>0</td>
<td>1¾</td>
</tr>
<tr>
<td>8.664</td>
<td>Design Project—Construction</td>
<td>0</td>
<td>1¾</td>
</tr>
<tr>
<td></td>
<td>One General Studies elective**</td>
<td>4</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td>Five Technical Electives**</td>
<td>6</td>
<td>9</td>
</tr>
<tr>
<td></td>
<td><strong>See Electives on following page.</strong></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*Includes 28 hours of Saturday fieldwork as an essential part of the subject.*

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### 3620 Civil Engineering — Part-time Course

#### Bachelor of Engineering

<table>
<thead>
<tr>
<th>Stage 1</th>
<th>Hours per week</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>S1</td>
</tr>
<tr>
<td>1.001</td>
<td>Physics I* or</td>
</tr>
<tr>
<td>1.981</td>
<td>Physics ICE*</td>
</tr>
<tr>
<td>10.001</td>
<td>Mathematics I‡</td>
</tr>
<tr>
<td></td>
<td><strong>17</strong></td>
</tr>
</tbody>
</table>

*1.001 requires attendance in the evening and one afternoon, 1.981 in daytime only. See also footnote after Year 1, Full-time.*

†See the footnote following Year 1, Full-time.

#### Stage 2

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Hours per week</th>
</tr>
</thead>
<tbody>
<tr>
<td>2.981</td>
<td>Chemistry ICE†</td>
<td>6</td>
</tr>
<tr>
<td>5.0102</td>
<td>Introduction to Engineering Design</td>
<td>0</td>
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<td>5.0201</td>
<td>Engineering Dynamics</td>
<td>0</td>
</tr>
<tr>
<td>5.0301</td>
<td>Engineering Drawing</td>
<td>0</td>
</tr>
<tr>
<td>8.170</td>
<td>Statics</td>
<td>3</td>
</tr>
<tr>
<td>8.171</td>
<td>Mechanics of Solids</td>
<td>0</td>
</tr>
<tr>
<td>8.271</td>
<td>Introduction to Materials</td>
<td>2</td>
</tr>
<tr>
<td>8.360</td>
<td>Computing</td>
<td>3</td>
</tr>
<tr>
<td>8.670</td>
<td>Introduction to Engineering Construction</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td><strong>14</strong></td>
<td><strong>14</strong></td>
</tr>
</tbody>
</table>

†See this footnote below Year 1 (previous page).

#### Stage 3

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Hours per week</th>
</tr>
</thead>
<tbody>
<tr>
<td>8.172</td>
<td>Mechanics of Solids II</td>
<td>0</td>
</tr>
<tr>
<td>8.2721</td>
<td>Civil Engineering Materials I</td>
<td>0</td>
</tr>
<tr>
<td>8.2722</td>
<td>Civil Engineering Materials II</td>
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<tr>
<td>10.022</td>
<td>Engineering Mathematics II</td>
<td>4</td>
</tr>
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<td>29.441</td>
<td>Surveying for Engineers†</td>
<td>6</td>
</tr>
<tr>
<td>29.491</td>
<td>Survey Camp†</td>
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<td></td>
<td><strong>17</strong></td>
<td><strong>12</strong></td>
</tr>
</tbody>
</table>

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

#### Stage 4

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Hours per week</th>
</tr>
</thead>
<tbody>
<tr>
<td>8.1811</td>
<td>Structural Design IA</td>
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</tr>
<tr>
<td>8.2731</td>
<td>Geotechnical Engineering I</td>
<td>0</td>
</tr>
<tr>
<td>8.2733</td>
<td>Rock Engineering</td>
<td>2</td>
</tr>
<tr>
<td>8.311</td>
<td>Systems Engineering I</td>
<td>0</td>
</tr>
<tr>
<td>8.571</td>
<td>Hydraulics I</td>
<td>3</td>
</tr>
<tr>
<td>8.671</td>
<td>Engineering Construction</td>
<td>0</td>
</tr>
<tr>
<td>10.381</td>
<td>Statistics SC</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td>Two and a Half General Studies electives**</td>
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</tr>
<tr>
<td></td>
<td><strong>13</strong></td>
<td><strong>14</strong></td>
</tr>
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</table>

*Includes 28 hours of Saturday fieldwork as an essential part of the subject.*

**See Electives on following page.**
### Stage 5

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Hpw</th>
<th>S1</th>
<th>S2</th>
</tr>
</thead>
<tbody>
<tr>
<td>8.173</td>
<td>Structural Analysis I</td>
<td>0</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>8.1812</td>
<td>Structural Design I</td>
<td>3</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td>8.1821</td>
<td>Structural Design II A</td>
<td>0</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>8.2732</td>
<td>Geotechnical Engineering II</td>
<td>2</td>
<td>0</td>
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</tr>
<tr>
<td>8.312</td>
<td>Systems Engineering II</td>
<td>2</td>
<td>0</td>
<td></td>
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<tr>
<td>8.362</td>
<td>Engineering Computations</td>
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<td>8.400</td>
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<td>8.572</td>
<td>Hydraulics II</td>
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<td>3</td>
<td></td>
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<tr>
<td>8.672</td>
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<tr>
<td></td>
<td>One Half General Studies elective</td>
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<td></td>
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</table>

**See Electives below.**

### Stage 6

<table>
<thead>
<tr>
<th>Course Code</th>
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<tr>
<td>8.174</td>
<td>Structural Analysis II</td>
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<td>8.1822</td>
<td>Structural Design II B</td>
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<td>8.191</td>
<td>Structural Engineering</td>
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<td>8.2741</td>
<td>Concrete Technology</td>
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<td>8.2742</td>
<td>Metals Engineering</td>
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<td>8.573</td>
<td>Hydraulics III</td>
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<td>8.581</td>
<td>Water Resources I</td>
<td>0</td>
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<tr>
<td></td>
<td>Two Technical Electives**</td>
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<td></td>
<td></td>
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</table>

**See Electives below.**

**Includes 8 hours of Saturday fieldwork.**

### Stage 7

<table>
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<th>Course Title</th>
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<tr>
<td>8.001</td>
<td>Industrial Training</td>
<td>0</td>
<td>0</td>
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<tr>
<td>8.051</td>
<td>Design Project—Materials</td>
<td>0</td>
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<tr>
<td>8.052</td>
<td>Design Project—Structures</td>
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<tr>
<td>8.053</td>
<td>Design Project—Water</td>
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<td>1(\frac{1}{4})</td>
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<tr>
<td>8.054</td>
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<tr>
<td>8.401</td>
<td>Transport Engineering II</td>
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</tr>
<tr>
<td>8.582</td>
<td>Water Resources II</td>
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<td>0</td>
<td></td>
</tr>
<tr>
<td>8.583</td>
<td>Water Resources III</td>
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<td></td>
</tr>
<tr>
<td>8.673</td>
<td>Planning &amp; Management II</td>
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<tr>
<td>8.674</td>
<td>Planning &amp; Management III</td>
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<td></td>
<td>Three Technical Electives**</td>
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<td>14(\frac{1}{2})</td>
<td>14(\frac{1}{2})</td>
<td></td>
</tr>
</tbody>
</table>

**See Electives below**

### Electives

The requirements of the BE degree course include the completion of five Technical Electives, and three General Studies electives (56 hours each) or the equivalent. Students who have completed General Studies electives on the old basis (42 hours each) will be informed of their General Studies requirement by the School.


8.015 Road Engineering, 8.018 Construction Engineering, 8.021 Environmental Aspects of Civil Engineering, 8.023 Hydrodynamics, 8.027 New Materials I, 8.029 Continuum Mechanics, 8.041 Geological Engineering, 8.081 Probability and Statistics for Civil Engineers, 15.501 Introduction to Industrial Relations.


### Combined Course

#### 3730 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), with four instead of eight electives, and at least fourteen units of the Science and Mathematics Course (3970) within an approved program.

There are six approved programs but additional ones may be approved if they are relevant.

### Physical Metallurgy and Chemistry

#### Year 1
1.981*
2.981**
8.0102, 5.0201, 8.0301
8.170, 8.171, 8.271, 8.360, 8.670
10.001***

#### Year 2
2.002A, 2.042C
4.402, 4.512
8.172, 8.1811, 8.1812, 8.2721, 8.2722
10.022
1 General Studies elective†

#### Year 3
4.403, 4.703
8.173, 8.174, 8.1821, 8.1822, 8.311, 8.312, 8.362, 8.400, 8.571
10.381
29.441, 29.491
1 General Studies elective†

#### Year 4
2.003A, 2.003C, 2.013C
4.522
8.2731, 8.2732, 8.2733, 8.572, 8.573, 8.581, 8.582, 8.671, 8.672
1 General Studies elective†

#### Year 5
1 Technical elective†
Choose 2 units from Table 1 in the Sciences Handbook at Level II or higher.
8.001, 8.191, 8.2741, 8.2742, 8.401, 8.583, 8.673, 8.674, 8.051, 8.052, 8.053, 8.054
Note: All material not in italic typeface refers to the BE degree component of this combined course.

---

### Geography and Environmental Chemistry

#### Year 1
1.981*
2.981**
8.0102, 5.0201, 8.0301
8.170, 8.171, 8.271, 8.360, 8.670
10.001***

#### Year 2
2.002A, 2.002D, 2.042C
8.172, 8.1811, 8.1812, 8.2721, 8.2722
10.022
27.111

#### Year 3
2.043A
8.173, 8.174, 8.1821, 8.1822, 8.311, 8.312, 8.362, 8.400, 8.571
10.381
27.172
29.441, 29.491
1 General Studies elective†

#### Year 4
8.2731, 8.2732, 8.2733, 8.572, 8.573, 8.581, 8.582, 8.671, 8.672
27.133, 27.1711, 27.712
2 General Studies electives†
At least 1½ units chosen from:
27.143, 27.183, 27.153, 27.862, 27.863

#### Year 5
1 Technical Elective†
Choose 2 units from Table 1 in the Sciences Handbook at Level II or higher.
8.001, 8.191, 8.2741, 8.2742, 8.401, 8.583, 8.673, 8.674, 8.051, 8.052, 8.053, 8.054
Note: All material not in italic typeface refers to the BE degree component of this combined course.

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### Physics with Mathematics

#### Year 1
1.001 or 1.011
2.981**
8.0102, 5.0201, 8.0301
8.170, 8.171, 8.271, 8.360, 8.670
10.001***
### Mathematics

#### Year 1

1.981*
2.981**
8.0102, 5.0201, 8.0301
8.170, 8.171, 8.271, 8.360, 8.670
10.001***

#### Year 2

8.172, 8.1811, 8.1812, 8.2721, 8.2722
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
1 General Studies elective†

**Choose either 1. or 2.**

1. 10.311A or 10.321A,
   10.311B or 10.321B
2. Choose 3 units from:
   10.411 or 10.4211
   10.4112 or 10.4212
   10.331,
   10.2113 (or 10.2213) and 10.2115† (or 10.2215†)
   10.1111 and 10.1112

#### Year 3

8.173, 8.174, 8.1821, 8.1822, 8.311, 8.312, 8.362, 8.400,
8.571
10.381
29.441, 29.491
1 General Studies elective†

**Choose 4 units from Mathematics from Table 1 of the Sciences Handbook (at least one must be Level III).**

#### Year 4

8.2731, 8.2732, 8.2733, 8.572, 8.573, 8.581, 8.582, 8.671,
8.672
1 General Studies elective†

**Choose 3 Level (III (not Level III) Mathematics units from Table 1 of the Sciences Handbook.**

#### Year 5

8.001, 8.191, 8.2741, 8.2742, 8.401, 8.583, 8.673, 8.674,
8.051, 8.052, 8.053, 8.054
1 Technical Elective†

**Choose 1 or 2 units from Tables 1 or 3 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.

†See footnotes below.

‡‡ already taken, 10.2114 or 10.2214 are acceptable in place of 10.2115 or 10.2215 respectively.

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### Geology with some Mathematics

#### Year 1

1.981*
2.981**
8.0102, 5.0201, 8.0301
8.170, 8.171, 8.271, 8.360, 8.670
10.001***

#### Year 2

8.172, 8.1811, 8.1812, 8.2721, 8.2722
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
2 General Studies electives†

#### Year 3

2.042C
8.173, 8.174, 8.1821, 8.1822, 8.311, 8.312, 8.362, 8.400,
8.571
10.381
25.211, 25.221, 25.212
29.441, 29.491
1 General Studies elective†
Year 4
8.2731, 8.2732, 8.2733, 8.572, 8.573, 8.581, 8.582, 8.671, 8.672
Choose four units from the following:

Year 5
8.001, 8.191, 8.2741, 8.2742, 8.401, 8.583, 8.673, 8.674, 8.051, 8.052, 8.053, 8.054
1 Technical Elective†
Choose 1 or 2 units 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.
†See footnotes below.

Computing with some Mathematics

Year 1
1.981*
2.981**
8.0102, 5.0201, 8.0301
8.170, 8.171, 8.271, 8.360, 8.670
10.001***

Year 2
6.621, 6.631, 6.641
8.172, 8.1811, 8.1812, 8.2721, 8.2722
10.111A or 10.121A,
10.1113 or 10.1213,
10.1114 or 10.1214
2 General Studies electives†

Year 3
6.642, 6.643
8.173, 8.174, 8.1821, 8.1822, 8.311, 8.312, 8.362, 8.400, 8.571
10.381
10.2111 or 10.2211,
10.2112 or 10.2212
29.441, 29.491
Choose 1 Level II or Level III Mathematics unit from Table 1 in the Sciences Handbook.

Year 4
6.648, 6.647
One of 6.613, 6.632, 6.633
8.2731, 8.2732, 8.2733, 8.572, 8.573, 8.581, 8.582, 8.671, 8.672
1 General Studies elective†
Choose 1 Level II or Level III Mathematics unit from Table 1 in the Sciences Handbook.
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 2</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*</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. After Year 1 of the BE, a form of sandwich pattern is possible by arrangement with the Head of School.

Note 2 Course 3650
From 1983, 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 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.

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 3 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.

- 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 will be limited to 80% of a normal load in the following year.

- 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 1984 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.
### Course Outlines

#### 3640 Electrical Engineering — Full-time Course

**Bachelor of Engineering**

<table>
<thead>
<tr>
<th>Year 1</th>
<th>Hours per week</th>
<th>S1</th>
<th>S2</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.961</td>
<td>Physics I*</td>
<td>6</td>
<td>6</td>
</tr>
<tr>
<td>2.121</td>
<td>Chemistry</td>
<td>6</td>
<td>0</td>
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<tr>
<td>5.006</td>
<td>Engineering E</td>
<td>6</td>
<td>0</td>
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<tr>
<td>6.010</td>
<td>Electrical Engineering I</td>
<td>0</td>
<td>6</td>
</tr>
<tr>
<td>6.611</td>
<td>Computing I</td>
<td>0</td>
<td>6</td>
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<tr>
<td>10.001</td>
<td>Mathematics I*</td>
<td>6</td>
<td>6</td>
</tr>
<tr>
<td></td>
<td>General Studies elective</td>
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<td>2</td>
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</table>

*Students who have achieved a certain standard may attempt similar material at a higher level.

#### Year 3*

<table>
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<tr>
<th>S1</th>
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<tbody>
<tr>
<td>10.033 Electrical Engineering III</td>
<td>2</td>
<td>2</td>
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<tr>
<td>10.361 Statistics SE</td>
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<td>General Studies elective</td>
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</tr>
<tr>
<td>Technical Elective†</td>
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#### Electrical Engineering IV

<table>
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</tr>
</thead>
<tbody>
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<td>6.0311</td>
<td>Circuit Theory II</td>
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<tr>
<td>6.0312</td>
<td>Utilization of Electric Energy</td>
<td>4</td>
</tr>
<tr>
<td>6.0313</td>
<td>Electronics II</td>
<td>4</td>
</tr>
<tr>
<td>6.0314</td>
<td>Systems and Control I</td>
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<tr>
<td>6.0315</td>
<td>Electrical Energy</td>
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<td>6.0316</td>
<td>electronics II</td>
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<td>6.0317</td>
<td>Communications Systems I</td>
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</tr>
<tr>
<td>6.0318</td>
<td>Microprocessor Systems and Applications</td>
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</table>

*Students who intend to major in particular disciplines should note that certain subjects are prerequisites for the Professional Electives they choose in Year 4.
†Students who have achieved a certain standard may attempt similar material at a higher level.

#### Year 4

<table>
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<tr>
<th>Hpw</th>
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<th>S2</th>
</tr>
</thead>
<tbody>
<tr>
<td>General Studies elective†</td>
<td>4</td>
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</tr>
<tr>
<td>Technical Elective</td>
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</table>

#### Electrical Engineering IV

<table>
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<tr>
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<tr>
<td>6.911</td>
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<tr>
<td>6.903</td>
<td>Industrial Training‡</td>
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</table>

*Three electives are taken in Session 1 and two in Session 2. See list of Professional Electives later this section.
†Students are required to complete 168 hours of General Studies electives for the BE degree. If these have been completed by Year 4, no General Studies subject is required in that year's program.
‡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.

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### 3640 Electrical Engineering — Part-time Course

**Bachelor of Engineering**

<table>
<thead>
<tr>
<th>Hpw</th>
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<th>S2</th>
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</thead>
<tbody>
<tr>
<td>6.021A</td>
<td>Circuit Theory I</td>
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<tr>
<td>6.021B</td>
<td>Power</td>
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<tr>
<td>6.021C</td>
<td>Electronics I</td>
<td>0</td>
</tr>
<tr>
<td>6.021D</td>
<td>Computing</td>
<td>4</td>
</tr>
<tr>
<td>6.021E</td>
<td>Digital Logic and Systems</td>
<td>0</td>
</tr>
</tbody>
</table>

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

---

Compared with the full-time program above, three subjects (10.033, 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 could be replaced in lieu of those above with approval of the Head of School.
Stage 1

<table>
<thead>
<tr>
<th></th>
<th>Hours per week</th>
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</thead>
<tbody>
<tr>
<td></td>
<td>S1</td>
<td>S2</td>
</tr>
<tr>
<td>1.001 Physics I</td>
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<td>6</td>
</tr>
<tr>
<td>10.001 Mathematics I</td>
<td>6</td>
<td>6</td>
</tr>
<tr>
<td>5.006 Engineering E (or equivalent)</td>
<td>3</td>
<td>3</td>
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<tr>
<td></td>
<td>15</td>
<td>15</td>
</tr>
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Stage 2

<table>
<thead>
<tr>
<th></th>
<th>Hours per week</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>S1</td>
<td>S2</td>
</tr>
<tr>
<td>2.121 Chemistry</td>
<td>6</td>
<td>0</td>
</tr>
<tr>
<td>6.010 Electrical Engineering I</td>
<td>0</td>
<td>6</td>
</tr>
<tr>
<td>6.021A Circuit Theory I</td>
<td>0</td>
<td>4</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 Stage 6.
†See list of Technical Electives later this Section.
‡Two electives are taken in each session. See list of Professional Electives later this section.
**All students in the BE degree course must complete at least 50 days industrial experience.
††6.911 is done in the last two sessions of a students course. See subject description.

3650
Electrical Engineering
Bachelor of Science (Engineering)
BSc(Eng)

Please note that from 1983, no new enrolments are being accepted into the BSc(Eng) degree course.

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†See list of Technical Electives later this section

### Stage 5

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*Not required for students who have completed Stage 4 by the end of 1982.

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†Two electives are taken each session. See list later this section.
‡Students in the BSc(Eng) degree course must complete three years of concurrent appropriate industrial experience.
**Students enrol in the Project in the final stage of their course. See subject description

†Technical Electives available in 1984

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A free choice may not be possible.

††Electrical Engineering Professional Electives

Each elective is 5 hours per week for one session.

The list of electives is:

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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.

*Students who have completed the prerequisites may request substitution of approved Science 3 Computing Science electives.
# Prerequisites and Co-requisites
## Arranged in order of full-time Bachelor of Engineering Degree Course

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<td></td>
<td>6.202</td>
<td>6.0312, 6.0315</td>
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<td>6.303</td>
<td>6.0311, 6.0316, 6.0317</td>
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<td>6.313</td>
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<td>6.322</td>
<td>6.0313, 6.0316</td>
<td></td>
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<td></td>
<td>6.323</td>
<td>6.0317††, 10.033, 10.361</td>
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<td>6.333</td>
<td>6.0316, 6.0317</td>
<td></td>
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<tr>
<td></td>
<td>6.412</td>
<td>6.0311, 6.0314</td>
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<td></td>
<td>6.413</td>
<td>6.0314††, 10.033, 10.351</td>
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<td>6.0314, 6.0316, 6.0318††</td>
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<td>6.0314, 6.0316, 6.402</td>
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<td>6.0313</td>
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<td>6.522</td>
<td>6.0313, 6.0316</td>
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<td>6.532</td>
<td>6.021E, 6.0316</td>
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<tr>
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<td>6.612</td>
<td>6.0318 or 6.613</td>
<td></td>
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<td>6.622</td>
<td>6.641</td>
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<td></td>
<td>6.652</td>
<td>6.0318 or 6.613, 6.0317</td>
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<td></td>
<td>6.672</td>
<td>6.0318 or 6.613, 6.641</td>
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</tr>
<tr>
<td></td>
<td>6.911</td>
<td>(in graduating program only)</td>
<td></td>
</tr>
</tbody>
</table>

*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 in, transfer into, or continue in a combined course shall have complied with all the requirements for prerequisite study, sequencing and academic attainment (a creditable performance, i.e., 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 they will commence Year 3 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.
Table A

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Name</th>
<th>Points</th>
</tr>
</thead>
<tbody>
<tr>
<td>10.001</td>
<td>Mathematics I</td>
<td>12</td>
</tr>
<tr>
<td>10.111A</td>
<td>Pure Mathematics II</td>
<td>4</td>
</tr>
<tr>
<td>10.1113</td>
<td>Pure Mathematics II</td>
<td>2</td>
</tr>
<tr>
<td>10.1114</td>
<td>Pure Mathematics II</td>
<td>2</td>
</tr>
<tr>
<td>10.2111</td>
<td>Applied Mathematics II</td>
<td></td>
</tr>
<tr>
<td>10.2112</td>
<td>Applied Mathematics II</td>
<td>2</td>
</tr>
<tr>
<td>10.361</td>
<td>Statistics SE</td>
<td>2</td>
</tr>
<tr>
<td>1.961</td>
<td>Physics I</td>
<td>12</td>
</tr>
<tr>
<td>1.972</td>
<td>Electromagnetism</td>
<td>4</td>
</tr>
<tr>
<td>1.982</td>
<td>Solid-State Physics</td>
<td>4</td>
</tr>
<tr>
<td>6.021D</td>
<td>Computing</td>
<td>4</td>
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<tr>
<td>6.021E</td>
<td>Digital Logic and Systems</td>
<td>4</td>
</tr>
<tr>
<td></td>
<td></td>
<td>54</td>
</tr>
</tbody>
</table>

Major Study in BA Course 3400 or BSc course 3970

For studies in Computer Science to be regarded as being major studies, at least four Level III units of Computer Science must be included after completing Level I unit 6.611 and the three Level II units, 6.621, 6.631, 6.641.

Course 3400

For further details of major studies in Computer Science within the Bachelor of Arts degree course, please see the Arts Faculty Handbook.

Course 3970

Entry to a Computer Science major in course 3970 is normally by direct selection at University entry.

Year 1
6.611
10.001 (or 10.011)
5 other Level I units
1 General Studies elective

Open Study

Some students may 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.

Minor Study in BA Course 3400 or BSc course 3970

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

Students intending to proceed to Honours should choose:
4 Computer Science Level III units
3 other Level II or Level III units
1 General Studies elective

For further details see Sciences Handbook.

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

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 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.

Year 2
6.621
6.631
6.641
5 other Level II units
1 General Studies elective

Year 3
4 Computer Science Level III units
3 other Level II or Level III units
1 General Studies elective

Students intending to proceed to Honours should choose:
6.613, 6.632, 6.642 and 6.643

Year 4
6.606

*Enrolment in General Studies may be deferred until later years but three electives must be satisfactorily completed for degree requirements.

For further details see 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>Co-requisites</th>
<th>Excluded</th>
</tr>
</thead>
<tbody>
<tr>
<td>6.611</td>
<td>Computing I</td>
<td>I</td>
<td>As for 10.001</td>
<td>10.001 or 10.011</td>
<td>6.600</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>6.620</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>6.021D</td>
</tr>
<tr>
<td>6.621</td>
<td>Computing II A</td>
<td>II</td>
<td>6.611* and 10.001</td>
<td>10.011</td>
<td>6.620</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>or 10.011</td>
<td></td>
<td>6.021D</td>
</tr>
<tr>
<td>6.631</td>
<td>Computing II B</td>
<td>II</td>
<td>6.620* or 6.021D* or 6.621*</td>
<td></td>
<td>6.021E</td>
</tr>
<tr>
<td>6.641</td>
<td>Computing II C</td>
<td>II</td>
<td>6.620* or 6.021D* or 6.621*</td>
<td></td>
<td>6.0318</td>
</tr>
<tr>
<td>6.613</td>
<td>Computer Organization and Design</td>
<td>III</td>
<td>6.631* or 6.021E, 6.021D*</td>
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<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>or 6.620* or 6.621*</td>
<td></td>
<td></td>
</tr>
<tr>
<td>6.642</td>
<td>Design and Analysis of Algorithms</td>
<td>III</td>
<td>6.641*</td>
<td></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>
<td></td>
</tr>
<tr>
<td>6.646</td>
<td>Computer Applications</td>
<td>III</td>
<td>6.620* or 6.021D* or 6.621*</td>
<td></td>
<td>6.622</td>
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<tr>
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<td></td>
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<td></td>
<td>10.301, 10.331, 45.101 or</td>
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<td></td>
<td></td>
<td></td>
<td>14.605</td>
</tr>
<tr>
<td>6.649</td>
<td>Computing Practice††</td>
<td>III</td>
<td>6.641*</td>
<td>6.633 or 6.643 or</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>6.647</td>
<td></td>
</tr>
</tbody>
</table>

*Pass Conceded (PC) awarded prior to Session 2, 1983, is not acceptable.
†Students who have completed 6.600 at a grade of Credit or better may be permitted to undertake this subject.
‡Can only be counted with at least 3 other Computer Science Level III subjects.

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### School of Mechanical and Industrial Engineering

**Head of School**
Associate Professor G. de Vahl Davis

**Executive Assistant to Head of School**
Associate Professor J. Y. Harrison

**Senior Administrative Officer**
Mr G. Dusan

The courses in the School 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, on a part-time basis or on a combined full-time/part-time basis subject to the approval of the Head of School. Students intending to enter part-time study are advised that many subjects in the later years of the course are only offered in the day-time. 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 one day per week.

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

The School also offers combined courses of five years full-time study leading to the award of the two degrees of Bachelor of Engineering and Bachelor of Science (BE BSc). These combined courses enable students to major in the areas of computer science, materials science, mathematics, physics or statistics, in addition to studying their chosen engineering specialty.

The study of the basic sciences — Mathematics, Physics and Chemistry — together with an introduction to Engineering, comprises Year 1. In Year 2 further mathematical studies are undertaken together with a study of the Engineering

The first half 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 the BE BSc combined degree course requires 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.

**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 part-time, or 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</td>
<td>Physics I (Mechanical Engineering)</td>
</tr>
<tr>
<td>2.951</td>
<td>Chemistry IME</td>
</tr>
<tr>
<td>5.010</td>
<td>Engineering A</td>
</tr>
<tr>
<td>5.030</td>
<td>Engineering C (Production Technology Option)</td>
</tr>
<tr>
<td>5.0303</td>
<td>Workshop technology</td>
</tr>
<tr>
<td>5.061</td>
<td>Technical Orientation</td>
</tr>
<tr>
<td>5.0721</td>
<td>Computing</td>
</tr>
<tr>
<td>5.421</td>
<td>Mechanics of Solids</td>
</tr>
<tr>
<td>10.001</td>
<td>Mathematics I or</td>
</tr>
<tr>
<td>10.011</td>
<td>Higher Mathematics I</td>
</tr>
<tr>
<td></td>
<td><strong>Total</strong></td>
</tr>
</tbody>
</table>

An alternative 'science 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>Subject</th>
<th>Hours per week</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.001</td>
<td>Physics I or</td>
</tr>
<tr>
<td>1.111</td>
<td>Higher Physics I</td>
</tr>
<tr>
<td>2.121</td>
<td>Chemistry IA* or</td>
</tr>
<tr>
<td>2.951</td>
<td>Chemistry IME*</td>
</tr>
<tr>
<td>5.010</td>
<td>Engineering A</td>
</tr>
<tr>
<td>5.0201</td>
<td>Engineering Dynamics IA†</td>
</tr>
<tr>
<td>5.421</td>
<td>Mechanics of Solids** or</td>
</tr>
<tr>
<td>8.171</td>
<td>Mechanics of Solids</td>
</tr>
<tr>
<td>5.030</td>
<td>Engineering C (Production Technology Option)</td>
</tr>
<tr>
<td>5.0303</td>
<td>Workshop Technology</td>
</tr>
<tr>
<td>5.061</td>
<td>Technical Orientation</td>
</tr>
<tr>
<td>5.0721</td>
<td>Computing</td>
</tr>
<tr>
<td>10.001</td>
<td>Mathematics I or</td>
</tr>
<tr>
<td>10.011</td>
<td>Higher Mathematics I</td>
</tr>
<tr>
<td></td>
<td><strong>Total</strong></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 prerequisite for 2.121 for 2.002A Physical Chemistry may be waived on application to the Head of the School of Chemistry.

†Students planning to take higher level Computer Science subjects should take 8.611 Computing I or 8.360 Computing instead of 5.0201 which must then be taken in a subsequent year prior to taking 5.300.

**Recommended.

†Students taking 5.0201 and 5.421 or 8.171 may enrol in subject 5.020 as an equivalent.
### Mechanical Engineering Technical Electives

**Year 2**

<table>
<thead>
<tr>
<th>Course Title</th>
<th>Hours per week</th>
</tr>
</thead>
<tbody>
<tr>
<td>Engineering Dynamics IA</td>
<td>S1: 3, S2: 0</td>
</tr>
<tr>
<td>5.072 Engineering Dynamics B</td>
<td>2: 3, 3: 0</td>
</tr>
<tr>
<td>5.073 Mechanical Engineering Design</td>
<td>3: 3, 3: 3</td>
</tr>
<tr>
<td>5.074 Engineering Dynamics C</td>
<td>0: 2, 2: 2</td>
</tr>
<tr>
<td>5.075 Mechanics of Solids II/</td>
<td>4: 4, 4: 4</td>
</tr>
<tr>
<td>5.076 Fluid Mechanics/Thermodynamics</td>
<td>4: 4, 4: 4</td>
</tr>
<tr>
<td>10.023 Engineering Mathematics II</td>
<td>4: 4, 4: 4</td>
</tr>
<tr>
<td>18.023 Industrial Orientation</td>
<td>0: 1, 1: 1</td>
</tr>
<tr>
<td>General Studies elective</td>
<td>2: 2, 2: 2</td>
</tr>
</tbody>
</table>

**Year 3**

<table>
<thead>
<tr>
<th>Course Title</th>
<th>Hours per week</th>
</tr>
</thead>
<tbody>
<tr>
<td>5.034 Engineering Experimentation</td>
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</tr>
<tr>
<td>5.043 Industrial Training I</td>
<td>0: 0, 0: 3</td>
</tr>
<tr>
<td>5.073† Numerical Analysis/Mathematics</td>
<td>3: 3, 3: 3</td>
</tr>
<tr>
<td>5.123 Mechanical Engineering Design</td>
<td>3: 3, 3: 3</td>
</tr>
<tr>
<td>5.333 Dynamics of Machines</td>
<td>3: 3, 3: 3</td>
</tr>
<tr>
<td>5.334‡ Linear Systems Analysis</td>
<td>0: 3, 0: 3</td>
</tr>
<tr>
<td>5.423‡ Mechanics of Solids III</td>
<td>2: 2, 2: 2</td>
</tr>
<tr>
<td>6.052 Two Fluid Mechanics/Thermodynamics Technical Electives</td>
<td>3: 3, 3: 3</td>
</tr>
<tr>
<td>18.603 Management/Economics</td>
<td>0: 3, 0: 3</td>
</tr>
<tr>
<td>General Studies elective</td>
<td>2: 2, 2: 2</td>
</tr>
</tbody>
</table>

**Year 4**

<table>
<thead>
<tr>
<th>Course Title</th>
<th>Hours per week</th>
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</thead>
<tbody>
<tr>
<td>5.044 Industrial Training II</td>
<td>0: 0, 0: 0</td>
</tr>
<tr>
<td>5.051 Thesis</td>
<td>6: 6, 6: 6</td>
</tr>
<tr>
<td>5.052 Communications</td>
<td>2: 2, 2: 2</td>
</tr>
<tr>
<td>5.344 Feedback Control</td>
<td>3: 3, 3: 3</td>
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<tr>
<td>Technical Electives</td>
<td>9: 12, 12: 12</td>
</tr>
<tr>
<td>General Studies elective</td>
<td>2: 2, 2: 2</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 courses 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.

*Excluded: 5.811 Aerodynamics I.
Industrial Engineering

<table>
<thead>
<tr>
<th>Course</th>
<th>Hpw</th>
<th>S1</th>
<th>S2</th>
</tr>
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<tbody>
<tr>
<td>18.004 Manufacturing Management</td>
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<td>2</td>
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<tr>
<td>18.224 Numerical Control of Machine Tools</td>
<td></td>
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<tr>
<td>18.303 Methods Engineering</td>
<td></td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>18.403 Production Design and Technology</td>
<td></td>
<td>4</td>
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</tr>
<tr>
<td>18.404 Design for Production</td>
<td></td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>18.503 Operations Research A</td>
<td></td>
<td>3</td>
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<tr>
<td>18.551 Operations Research</td>
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<tr>
<td>18.803 Optimization</td>
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<td>18.874G Dynamic Programming</td>
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Other Technical Electives

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<tr>
<td>4.913 Materials Science</td>
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<tr>
<td>5.074 Computing Science for Mechanical Engineers</td>
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<td>3</td>
<td>0</td>
</tr>
<tr>
<td>5.811 Aerodynamics 1</td>
<td>3</td>
<td>3</td>
<td></td>
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<tr>
<td>5.831 Aircraft Propulsion</td>
<td>2</td>
<td>2</td>
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<tr>
<td>23.051 Nuclear Power Technology</td>
<td>3</td>
<td>3</td>
<td></td>
</tr>
</tbody>
</table>

Excluded: 5.683 Potential Flow Theory

Note: The graduate subjects listed are 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 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 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. 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 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

18.020 Industrial Orientation
4 appropriate Level II units from Table 1 or Table 2 for course 3681.

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

Materials Science Majors

Year 2
2.002A, 4.402, 4.502, 5.300, 5.422
18.020
and either
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)
or
4.302, 4.602
10.022

Year 3
4.403, 4.703, 4.802
5.043, 5.122, 5.622
10.331
General Studies elective

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
1.9222 and 1.9322 (recommended), or 1.032 or 2.002A
3.300, 3.422
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. 18.020

Year 3
5.043, 5.122, 5.622
10.331
4 Level III units from School of Mathematics offerings in Table 1
General Studies elective

Computer Science Majors

Year 2
5.0201, 5.300, 5.422
6.621, 6.631, 6.641
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), 10.331
18.020

Year 3
1.9222 and 1.9322 (recommended), or 1.032, or 2.002A
5.043, 5.122, 5.622
6.646 plus 3 Level III units from Table 2 offerings of School of Electrical Engineering and Computer Science for course 3681.
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) 18.020
Year 3
1. 01311, 1.023, 1.03311, 1.04311
1 Level III unit from School of Physics offerings in Table 1
5.043, 5.122, 5.622
10.331
1 General Studies elective

Statistics Majors

Year 2
1. 9222 and 1.9322 (recommended), or 1.032, or 2.002A
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)
18.020

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 IA 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) The Level III units satisfy the relevant major requirements.
   (2) They include no more than 1 unit from schools other than Chemistry, Electrical Engineering and Computer Science, Mathematics, Metallurgy and Physics.
   (3) They include 1.032 Laboratory, 1.9222 Electronics plus 1.9322 Introduction to Solids, or 2.002A Physical Chemistry.
   (4) They include 10.311A Statistics or 10.311B Basic Inference.
   (5) 4.512 Mechanical Metallurgy and 4.512 Mechanical Properties of Solids are deemed to have reduced unit values of 1 and 1/2 respectively.
3. The prerequisite of 2.121 Chemistry IA may be waived on application to the Head of the School of Chemistry.
4. Materials Science majors may substitute 10.022 Engineering Mathematics II and 2 Level II units1 from School of Metallurgy offerings in Table 1 or from Table 2 for course 3661.
5. If 4.402 Physical Metallurgy I or 4.422 Metallurgical Phases II 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. Excluded for students in course 3661 who should substitute a Level III unit from Table 2 offerings of School of Electrical Engineering and Computer Science.
9. Subjects may substitute any other appropriate Level II or III units from School of Metallurgy offering(s) in Table 1 or from Table 2 for course 3681.
10. In special circumstances with the permission of the Head of the School of Mechanical and Industrial Engineering, students may substitute 4.813 Mathematical Methods for 10.331.
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. Substitute 1 Level II or III unit from School of Mathematics or School of Physics offerings in Table 1 of 10.311B or 10.321B was taken in Year 2.
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%) over Years 1 and 2.

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.

<table>
<thead>
<tr>
<th>Year 3</th>
<th>Hours per week</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>S1</td>
</tr>
<tr>
<td>5.034</td>
<td>Engineering Experimentation</td>
</tr>
<tr>
<td>5.043</td>
<td>Industrial Training IA</td>
</tr>
<tr>
<td>5.073</td>
<td>Numerical Analysis/Mathematics†</td>
</tr>
<tr>
<td>5.303</td>
<td>Mechanical Vibrations</td>
</tr>
<tr>
<td>5.343</td>
<td>Linear Systems Analysis‡</td>
</tr>
<tr>
<td>5.423</td>
<td>Mechanics of Solids III</td>
</tr>
<tr>
<td>5.800</td>
<td>Aircraft Design I</td>
</tr>
<tr>
<td>5.811</td>
<td>Aerodynamics I</td>
</tr>
<tr>
<td>5.822</td>
<td>Analysis of Aerospace Structures I</td>
</tr>
<tr>
<td>6.854</td>
<td>Electrical Engineering</td>
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<tr>
<td>18.603</td>
<td>Management/Economics</td>
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<tr>
<td></td>
<td>General Studies elective</td>
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</tbody>
</table>

*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 18.803 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 18.803 a Technical Elective or a half Level II or Level III unit from Table 1 of the Sciences Faculty Handbook. Combined degree course students who have taken 10.211E Numerical Methods, 10.212A (or 10.222A) Numerical Analysis or 4.813 Mathematical Methods 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 Level III unit from Table 1 of the Combined Sciences Handbook.
### Year 4

<table>
<thead>
<tr>
<th>Course Title</th>
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<tr>
<td>5.051 Thesis</td>
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<tr>
<td>5.062 Communications</td>
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<td>2</td>
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<tr>
<td>5.801 Aircraft Design II</td>
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<td>3</td>
</tr>
<tr>
<td>5.812 Aerodynamics II</td>
<td>3</td>
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<td>5.823 Analysis of Aerospace</td>
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<tr>
<td>5.831 Aircraft Propulsion</td>
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<td>2</td>
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<tr>
<td>Technical Electives</td>
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<td><strong>Total</strong></td>
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</table>

**Note 1:** The Technical Electives may be taken from any Science Faculty Handbook, or from a suitably approved list of Technical Electives listed as being equivalent to the Technical Electives passed in a previous session. Students are advised to consult with their Head of School when choosing subjects for their Technical Electives.

**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.

*Tables refer to the Combined Sciences Handbook.*

---

### Year 3

<table>
<thead>
<tr>
<th>Course Title</th>
<th>Hours per week</th>
</tr>
</thead>
<tbody>
<tr>
<td>5.043 Engineering Experimentation</td>
<td>1½ 1½</td>
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<tr>
<td>5.044 Industrial Training II</td>
<td>0 0</td>
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<tr>
<td>5.073 Numerical Analysis/</td>
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</tr>
<tr>
<td>Mathematics</td>
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<td>5.303 Mechanical Vibrations</td>
<td>3 3</td>
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<tr>
<td>5.423 Mechanics of Solids II</td>
<td>2 2</td>
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<tr>
<td>5.901 Introduction to Mathematical</td>
<td>Modelling and Decision Making</td>
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<tr>
<td>5.902 Ship Management Economics</td>
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<td>5.911 Ship Hydrostatics</td>
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<tr>
<td>5.921 Ship Structures I</td>
<td>2 2</td>
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<tr>
<td>5.931 Principles of Ship Design I</td>
<td>0 3</td>
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<tr>
<td>5.953 Ship Hydrodynamics</td>
<td>3 2</td>
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<tr>
<td>6.854 Electrical Engineering</td>
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*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 10.011 Complex Analysis should substitute 18.603 Optimization for the Mathematics portion of this subject, if they have in addition taken 10.211 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 Sciences Faculty handbook. Combined degree course students who have taken 10.211E Numerical Methods, 10.212A (or 10.222A) Numerical Analysis or 4.813 Mathematical Methods 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.

---

### Year 4

<table>
<thead>
<tr>
<th>Course Title</th>
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<tr>
<td>5.044 Industrial Training II</td>
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<tr>
<td>5.051 Thesis</td>
<td>6 6</td>
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<tr>
<td>5.062 Communications</td>
<td>2 2</td>
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<td>5.922 Ship Structures II</td>
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<td>5.932 Principles of Ship Design II</td>
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<td>5.937 Ship Design Project</td>
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<td>General Studies elective</td>
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<tr>
<td><strong>Total</strong></td>
<td>23 22</td>
</tr>
</tbody>
</table>

### 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.

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### 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.

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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.
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 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 co-ordinate 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 men, machines, materials and money in industry, business, government and defence. 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.

Year 3

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Hours per week</th>
</tr>
</thead>
<tbody>
<tr>
<td>5.043</td>
<td>Industrial Training I†</td>
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</tr>
<tr>
<td>6.854</td>
<td>Electrical Engineering</td>
<td>0 4</td>
</tr>
<tr>
<td>14.001</td>
<td>Introduction to Accounting A</td>
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</tr>
<tr>
<td>14.002</td>
<td>Introduction to Accounting B</td>
<td>0 1½</td>
</tr>
<tr>
<td>18.003</td>
<td>Numerical Methods/Industrial Experimentation</td>
<td>1½ 2</td>
</tr>
<tr>
<td>18.303</td>
<td>Methods Engineering</td>
<td>2 2</td>
</tr>
<tr>
<td>18.403</td>
<td>Production Design and Technology</td>
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</tr>
<tr>
<td>18.413</td>
<td>Design for Industrial Engineers</td>
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</tr>
<tr>
<td>18.503</td>
<td>Operations Research A</td>
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</tr>
<tr>
<td>18.603</td>
<td>Management/Economics</td>
<td>4 0</td>
</tr>
<tr>
<td>18.803</td>
<td>Optimization</td>
<td>3 0</td>
</tr>
<tr>
<td></td>
<td>General Studies elective</td>
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</tr>
<tr>
<td></td>
<td><strong>Total</strong></td>
<td><strong>23 21½</strong></td>
</tr>
</tbody>
</table>

†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 Code</th>
<th>Course Title</th>
<th>Hours per week</th>
</tr>
</thead>
<tbody>
<tr>
<td>5.044</td>
<td>Industrial Training II</td>
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</tr>
<tr>
<td>5.051</td>
<td>Thesis</td>
<td>6 6</td>
</tr>
<tr>
<td>5.062</td>
<td>Communications</td>
<td>2 2</td>
</tr>
<tr>
<td>18.004</td>
<td>Manufacturing Management</td>
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<tr>
<td></td>
<td>Technical Electives</td>
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</tr>
<tr>
<td></td>
<td>General Studies elective</td>
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</tr>
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<td></td>
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<td><strong>22 22</strong></td>
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</tbody>
</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 counselling 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.

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.

School of Surveying

Head of School
Professor P.V. Angus-Leppan

Administrative Officer
Mr. J.V. Fonseka

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 broad range of career opportunities, including land boundary surveying, engineering surveying, photogrammetry, cartography, mining surveying, hydrographic surveying, geo-
dey and geodetic surveying, computing and systems development, management and development of land, land information systems, resource assessment systems and remote sensing. 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.

The course underwent a comprehensive revision in 1979. Features of the revision include: retention of the course on a session basis for all subjects lectured within the School; integration of the sandwich course with the full-time course as a result of the more flexible University policy towards leave of absence for students; elimination of the formally assessed professional training period in the earlier course; greater numbers of technical electives in the fourth year of study; further development of the Land Studies area: land development, inventory, law, tenure, and utilization, in continuing recognition of the growing importance of this area to surveyors; development of a formal strand to improve students' written and spoken communication skills.

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 several 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 18 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.

3. Resolution of class scheduling problems is the responsibility of the student.

Bachelor of Surveying students in their later years of study may elect to transfer to the new 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

Year 1

<table>
<thead>
<tr>
<th>Session</th>
<th>Hours per week</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td>1.971</td>
<td>Physics I</td>
</tr>
<tr>
<td>2</td>
<td></td>
</tr>
<tr>
<td>5.0102</td>
<td>Introduction to Engineering Design</td>
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<tr>
<td>2</td>
<td></td>
</tr>
<tr>
<td>10.001</td>
<td>Mathematics I</td>
</tr>
<tr>
<td>6</td>
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</tr>
<tr>
<td>29.001</td>
<td>Surveying I</td>
</tr>
<tr>
<td>4½</td>
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</tr>
<tr>
<td>29.800</td>
<td>Survey Draughting</td>
</tr>
<tr>
<td>3</td>
<td></td>
</tr>
<tr>
<td>29.700</td>
<td>Professional Orientation*</td>
</tr>
<tr>
<td>1½</td>
<td></td>
</tr>
<tr>
<td>29.191</td>
<td>Survey Camp †</td>
</tr>
<tr>
<td>1½</td>
<td></td>
</tr>
<tr>
<td></td>
<td>24½</td>
</tr>
</tbody>
</table>

*Three half-day excursions are an essential part of this subject.
†Students are required to attend a one-week survey camp equivalent to 1½ class contact hours per week in each session.

Session 2

<table>
<thead>
<tr>
<th>Hours per week</th>
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<tbody>
<tr>
<td>5.0302</td>
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<td>29.002</td>
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<td>29.191</td>
</tr>
<tr>
<td>1½</td>
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<tr>
<td></td>
</tr>
</tbody>
</table>

†Students are required to attend a one-week survey camp equivalent to 1½ class contact hours per week in each session.
Course Outlines

**Year 2**

<table>
<thead>
<tr>
<th>Session 1</th>
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</thead>
<tbody>
<tr>
<td>1.962 Physics of Measurement</td>
<td>3</td>
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<tr>
<td>10.022 Engineering Mathematics II (1st part)</td>
<td>4</td>
</tr>
<tr>
<td>10.341 Statistics SU</td>
<td>2</td>
</tr>
<tr>
<td>27.295 Physical Geography for Surveyors†</td>
<td>4</td>
</tr>
<tr>
<td>29.003 Surveying III</td>
<td>5</td>
</tr>
<tr>
<td>29.151 Survey Computations I</td>
<td>4</td>
</tr>
<tr>
<td>29.192 Survey Camp II*</td>
<td>1½</td>
</tr>
<tr>
<td></td>
<td>23½</td>
</tr>
</tbody>
</table>

*Students are required to attend a one-week survey camp, which is equivalent to 1½ class contact hours per week in each session.
†One-day field tutorial is an essential part of this subject.

**Year 4**

<table>
<thead>
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<tr>
<td>29.212 Geodesy II</td>
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<td>29.312 Astronomy II</td>
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<td>29.512 Photogrammetry II</td>
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</tr>
<tr>
<td>29.653 Land Development III†</td>
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</tr>
<tr>
<td>29.704 Management I</td>
<td>2</td>
</tr>
<tr>
<td>29.702 Seminar II</td>
<td>1</td>
</tr>
<tr>
<td>29.196 Survey Camp IV**</td>
<td>6</td>
</tr>
<tr>
<td></td>
<td>26</td>
</tr>
</tbody>
</table>

†One-day field tutorial is an essential part of this subject.
*See Year 4: Electives, below
**Two weeks of office computations equivalent to 6 class contact hours per week.

**Year 3**

<table>
<thead>
<tr>
<th>Session 1</th>
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</thead>
<tbody>
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<td>29.005 Surveying V</td>
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<tr>
<td>29.152 Survey Computations II</td>
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</tr>
<tr>
<td>29.631 Land Inventory I</td>
<td>2</td>
</tr>
<tr>
<td>29.651 Land Development I</td>
<td>3</td>
</tr>
<tr>
<td>29.661 Cadastral Surveying and Land Law I</td>
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</tr>
<tr>
<td>36.411 Town Planning</td>
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</tr>
<tr>
<td>General Studies elective</td>
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<table>
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<tr>
<td>8.712 Engineering for Surveyors II</td>
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<tr>
<td>29.006 Surveying VI</td>
<td>3</td>
</tr>
<tr>
<td>29.211 Geodesy I</td>
<td>4</td>
</tr>
<tr>
<td>29.311 Astronomy I</td>
<td>3</td>
</tr>
<tr>
<td>29.511 Photogrammetry I</td>
<td>4</td>
</tr>
<tr>
<td>29.652 Land Development II</td>
<td>3</td>
</tr>
<tr>
<td>29.662 Cadastral Surveying and Land Law II</td>
<td>3</td>
</tr>
<tr>
<td>29.195 Survey Camp III**</td>
<td>6</td>
</tr>
<tr>
<td></td>
<td>29</td>
</tr>
</tbody>
</table>

**Students are required to attend a two-week survey camp, which is equivalent to 6 class contact hours per week.

**Year 4 Electives**

Electives include both General Studies and Technical Electives. Students re-enrolling in 1984 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 five Technical Electives. Technical Electives (of three hours per week each, except 29.174) are chosen from:

<table>
<thead>
<tr>
<th>Hpw</th>
</tr>
</thead>
<tbody>
<tr>
<td>29.031 Electronic Distance Measurement</td>
</tr>
<tr>
<td>29.032 Precise Surveying in Industry and Engineering</td>
</tr>
<tr>
<td>29.033 Characteristics of Modern Theodolites and Levels</td>
</tr>
<tr>
<td>29.034 Mine Surveying*</td>
</tr>
<tr>
<td>29.035 History of Surveying</td>
</tr>
<tr>
<td>29.153 Adjustment of Control Surveys</td>
</tr>
<tr>
<td>29.161 Hydrographic Surveying I</td>
</tr>
<tr>
<td>29.162 Hydrographic Surveying II</td>
</tr>
<tr>
<td>28.173 Project</td>
</tr>
<tr>
<td>29.174 Major Project (6 hours per week)</td>
</tr>
<tr>
<td>29.213 Geodesy III</td>
</tr>
<tr>
<td>29.231 Geophysics for Surveyors</td>
</tr>
<tr>
<td>29.232 Atmospheric Effects on Geodetic Measurement</td>
</tr>
<tr>
<td>29.313 Astronomy III</td>
</tr>
<tr>
<td>29.513 Photogrammetry III</td>
</tr>
</tbody>
</table>
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.

*A one-day practical exercise is a compulsory part of this course.

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 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.
Graduate Study

Faculty of Engineering
Enrolment Procedures

All students re-enrolling in 1984 or enrolling in graduate courses should obtain a copy of the free booklet *Enrolment Procedures 1984* 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.

The administration of the various awards including admission, progress and assessment of all higher degree and diploma candidates is conducted by the Higher Degree Committee of the Faculty under the general supervision of the Faculty of Engineering.

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

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 Registrar on the prescribed form at least one calendar month before the commencement of the session in which registration is to begin.
Engineering

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.

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 four academic sessions (full-time) and six academic sessions (part-time) from the date of enrolment. In special cases the minimum period of registration may be reduced by up to two academic sessions. The maximum period of registration is eight 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:

<table>
<thead>
<tr>
<th>Degree</th>
<th>School/Course</th>
<th>Course Code</th>
</tr>
</thead>
<tbody>
<tr>
<td>PhD</td>
<td>Civil Engineering</td>
<td>1630</td>
</tr>
<tr>
<td></td>
<td>Electrical Engineering and Computer Science</td>
<td>1641</td>
</tr>
<tr>
<td></td>
<td>Mechanical and Industrial Engineering</td>
<td>1660</td>
</tr>
<tr>
<td></td>
<td>Nuclear Engineering</td>
<td>1670</td>
</tr>
<tr>
<td></td>
<td>Surveying</td>
<td>1680</td>
</tr>
<tr>
<td></td>
<td>Biomedical Engineering</td>
<td>1710</td>
</tr>
<tr>
<td>ME</td>
<td>Civil Engineering</td>
<td>2650</td>
</tr>
<tr>
<td></td>
<td>Electrical Engineering and 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

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 four academic sessions (full-time) and six academic sessions (part-time) from the date of enrolment. In special cases the minimum period of registration may be reduced by up to two academic sessions. The maximum period of registration is eight 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:

<table>
<thead>
<tr>
<th>Degree</th>
<th>School/Course</th>
<th>Course Code</th>
</tr>
</thead>
<tbody>
<tr>
<td>PhD</td>
<td>Civil Engineering</td>
<td>1630</td>
</tr>
<tr>
<td></td>
<td>Electrical Engineering and Computer Science</td>
<td>1641</td>
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<td></td>
<td>Mechanical and Industrial Engineering</td>
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<td>Nuclear Engineering</td>
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<td></td>
<td>Biomedical Engineering</td>
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<tr>
<td>ME</td>
<td>Civil Engineering</td>
<td>2650</td>
</tr>
<tr>
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<td>Electrical Engineering and Computer Science</td>
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<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 only. 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 a place being available.' When a firm offer is made, it is 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. 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 a place being available.' When a firm offer is made, it is subject to acceptance within one month.

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>
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</thead>
<tbody>
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<td></td>
<td>Industrial Engineering</td>
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<tr>
<td></td>
<td>Mechanical Engineering</td>
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<tr>
<td></td>
<td>Nuclear Engineering</td>
<td>8550</td>
</tr>
<tr>
<td></td>
<td>Civil Engineering</td>
<td>8610</td>
</tr>
<tr>
<td></td>
<td>Surveying</td>
<td>8640</td>
</tr>
<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>
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</tbody>
</table>

A 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.

A 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 at the end of this section. However, not all electives are offered in any particular year. Subject descriptions appear towards the end 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.

In 1984 all candidates must register in one of the following programs:

8501 Communications
Program Co-ordinator: Dr. C. J. E. Phillips

8502 Electric Power
Program Co-ordinator: Dr. T. R. Blackburn

8503 Electronics
Program Co-ordinator: Dr. H. S. Blanks

8504 Computer Science
Program Co-ordinator: A/Prof. A. Dunworth

8505 Systems and Control
Program Co-ordinator: Dr. R. F. Brown

In an all course work program of 36 credits (ie 12 subjects) up to 9 subjects from the program area may be chosen and at least 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.

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 I, II 3.3
5.716-7G Advanced Heat Transfer I, II 3.3
5.751-2G Refrigeration, Air Conditioning and Cryogenics I, II 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 I, II 2.2
5.806G Digital Logic Fundamentals for Mechanical Engineers 3
5.087G Microprocessor Fundamentals for Mechanical Engineers 3
5.328-9G Control and Modelling of Mechanical Systems I, II 3.3
5.345-6G Analogue, Non-Linear Control Systems I, II 3.3
5.653-4G Acoustic Noise I, II 2.2
5.655G Energy Conservation and System Design 3
5.722G Solar Thermal Energy Design 3
5.758G Refrigeration and Air Conditioning Applications 4
35.426G Building Services 3

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

2. Industrial Automation

18 credits of core subjects taken from:

5.068G Digital Logic Fundamentals for Mechanical Engineers 3
5.087G Microprocessor Fundamentals for Mechanical Engineers 3
5.089G Elements of Industrial Automation 3
5.328G Control and Modelling of Mechanical Systems 3
6.460G Real Time Computing and Simulation 3
Graduate Study: Graduate School of Engineering

and

18 credit Project Report

or

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

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

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

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 5.071 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 5.071 Computing as a co-requisite)

3. Industrial Management

3 credits of core subjects:

- 18.074G Industrial Management 3 credits
- 18.965G Industrial Management Seminar 0 credits

at least 11 credits selected from:

- 14.062G Accounting for Engineers 3 credits
- 18.380G Methods Engineering 4 credits
- 18.571G Operations Research I 6 credits
- 18.675G Economic Decisions in Industrial Management 3 credits
- 18.776G Production and Inventory Control and 2 credits
- 18.909G Project 9 credits
- 18.918G Project Report 18 credits

the remaining credits may be selected from:

- 14.042G Industrial Law 2 credits
- 15.565G Industrial Relations 3 credits
- 18.061G Industrial Experimentation I 3 credits
- 18.075G Decision Support Systems 2 credits
- 18.171G Inspection and Quality Control 3 credits
- 18.360G Ergonomics 3 credits
- 18.371G Factory Design and Layout 3 credits
- 18.464G Value Analysis/Engineering 3 credits
- 18.672G Decision Theory for Industrial Management 3 credits
- 18.764G Management of Distribution Systems 2 credits
- 18.772G Information Processing Systems in Organizations 2 credits
- 18.862G Linear Programming 2 credits
- 18.862G Nonlinear Programming 2 credits
- 18.870G Large Scale Optimization in Industry 3 credits
- 18.873G Large Scale Optimization in Industry 3 credits
- 18.874G Dynamic Programming 2 credits

or such other subjects as may be approved by the Head of School.
8610
Civil Engineering
Master of Engineering Science
MEngSc

The School of Civil Engineering offers a large number of graduate subjects which allow the flexibility of many combinations to provide relevant groupings both in an academic and professional sense. The main technical groupings are:

• civil engineering materials
• engineering construction and management
• structural engineering
• transport engineering
• water engineering

All candidates are expected to undertake at least a 9 credit project with the other credits being obtained from formal course work. Full details of preferred programs in the various specialist areas are available from the School.

Remote Sensing Program
Master of Engineering Science
MEngSc

Note: The course code for this program varies according to the School in which the candidate gains admission.

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

<table>
<thead>
<tr>
<th>Subject Code</th>
<th>Subject Name</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>6.580G</td>
<td>Image Analysis in Remote Sensing</td>
<td>3</td>
</tr>
<tr>
<td>6.587G</td>
<td>Computing Techniques in Remote Sensing Image</td>
<td>3</td>
</tr>
<tr>
<td>27.043G</td>
<td>Remote Sensing Applications</td>
<td>3</td>
</tr>
<tr>
<td>29.601G</td>
<td>Remote Sensing Principles and Procedures*</td>
<td>6</td>
</tr>
<tr>
<td>29.605G</td>
<td>Ground Investigations for Remote Sensing</td>
<td>3</td>
</tr>
</tbody>
</table>

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

Project

<table>
<thead>
<tr>
<th>Subject Code</th>
<th>Subject Name</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>Project in Remote Sensing† or</td>
<td></td>
<td>9</td>
</tr>
<tr>
<td>Research Project in Remote Sensing†</td>
<td></td>
<td>18</td>
</tr>
</tbody>
</table>

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

8650
Surveying
Master of Surveying Science
MSurvSc

Programs of study leading to the degree of MSurvSc are offered by the School of Surveying in a range of topics including:

• advanced surveying
• geodesy
• photogrammetry
• land development and management
• land information systems

Candidates are allowed a wide choice in selecting programs. Subjects can be selected to suit individual student needs and typical programs can be supplied by the School on request. The program of study must total at least 36 credits. One credit is normally equal to attendance for one hour per week for one session but some senior undergraduate subjects may be taken for partial credit towards the degree. The program normally includes a Project of 9 credits or a Project Report of 18 credits. Examples of suitable external subjects are electronic computing, statistics, oceanography and a range of others.
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)

Strand A

<table>
<thead>
<tr>
<th>Subject</th>
<th>Credits</th>
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</thead>
<tbody>
<tr>
<td>73.111 Physiology IA (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>
</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</td>
<td>HR 4</td>
</tr>
<tr>
<td>32.101G Mathematical Modelling 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>1.9222 Electronics and Instrumentation</td>
<td>3</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 IA</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</td>
<td>HR 2</td>
</tr>
</tbody>
</table>

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), 21 credits of compulsory subjects and 12 credits of Safety Science 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>Subject</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>3 or 4 credits selected from:</td>
<td></td>
</tr>
<tr>
<td>16.901G Health Services Statistics I</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>3</td>
</tr>
<tr>
<td>47.010G Basic Fortran</td>
<td>2</td>
</tr>
<tr>
<td>47.015G Programming in BASIC</td>
<td>2</td>
</tr>
</tbody>
</table>
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 of the University. 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.

**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 a place being available.' When a firm offer is made, it is 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). 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:

**School/Course**

- Engineering Developments
  - Civil
  - Biomedical
  - Electrical
  - Industrial
  - Mechanical
  - Nuclear
  - Surveying
  - Highway
  - Transport
  - Safety Science
  - Surveying
  - Remote Sensing*

*The Graduate Diploma 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.

Further details of programs of study may be obtained from the schools concerned.
Subjects available in the Faculty of Engineering are listed at the end of this section. However, not all electives are offered in any particular year. Subjects available by tape correspondence, as well as all subject descriptions, appear later in this handbook.

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 under the various schools. 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 course work, design, critical review or research in the different schools.

Safety Science

Graduate Study: Graduate School of Engineering

Graduate Subjects

Subjects offered by Tape Correspondence

<table>
<thead>
<tr>
<th>Credits</th>
<th>Subject</th>
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<tr>
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<td>6.378G</td>
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<td>47.010G</td>
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*Subject to approval.

Civil Engineering

Department of Transport Engineering

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<tbody>
<tr>
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Department of Engineering

Construction and Management

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<tr>
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71
<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Credits</th>
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<tbody>
<tr>
<td>8.710G</td>
<td>Advanced Topics in Optimization in Civil Engineering</td>
<td>3</td>
</tr>
<tr>
<td>8.714G</td>
<td>Advanced Topics in Systems Modelling</td>
<td>3</td>
</tr>
<tr>
<td>8.723G</td>
<td>Construction Design</td>
<td>3</td>
</tr>
<tr>
<td>8.724G</td>
<td>Construction Technology</td>
<td>3</td>
</tr>
<tr>
<td>8.725G</td>
<td>Construction Accounting and Control</td>
<td>3</td>
</tr>
<tr>
<td>8.726G</td>
<td>Construction Law and Professional Practice</td>
<td>3</td>
</tr>
<tr>
<td>8.727G</td>
<td>Construction Planning and Estimating</td>
<td>6</td>
</tr>
<tr>
<td>8.728G</td>
<td>Design of Construction Operations</td>
<td>6</td>
</tr>
<tr>
<td>8.731G</td>
<td>Project Management</td>
<td>3</td>
</tr>
<tr>
<td>8.732G</td>
<td>Advanced Project Management Theory</td>
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<tr>
<td><strong>Department of Civil Engineering</strong></td>
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<tr>
<td>8.748G</td>
<td>Pavement Materials I</td>
<td>3</td>
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<tr>
<td>8.749G</td>
<td>Pavement Materials II</td>
<td>3</td>
</tr>
<tr>
<td>8.750G</td>
<td>Pavement Design and Evaluation I</td>
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<tr>
<td>8.751G</td>
<td>Pavement Design and Evaluation II</td>
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<td>8.752G</td>
<td>Terrain Engineering</td>
<td>6</td>
</tr>
<tr>
<td>8.753G</td>
<td>Soil Engineering</td>
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<tr>
<td>8.754G</td>
<td>Applied Soil Mechanics</td>
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<td>8.755G</td>
<td>Materials of Construction (Concrete Technology) I</td>
<td>3</td>
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<tr>
<td>8.758G</td>
<td>Soil Mechanics</td>
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</tr>
<tr>
<td>8.760G</td>
<td>Materials of Construction (Concrete Technology) II</td>
<td>3</td>
</tr>
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<td>8.764G</td>
<td>Composites in Civil Engineering</td>
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<td>Welding in Structural Engineering</td>
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<td>8.771G</td>
<td>Foundation Engineering</td>
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<tr>
<td>8.773G</td>
<td>Materials of Construction (Metals) III</td>
<td>3</td>
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<tr>
<td>8.774G</td>
<td>Soil Dynamics</td>
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<tr>
<td>8.775G</td>
<td>Geotechnical Aspects of Natural Hazards</td>
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<tr>
<td>8.776G</td>
<td>Rock Mechanics</td>
<td>3</td>
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<tr>
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<td>Building Materials Technology in Third World Countries</td>
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<td>8.830G</td>
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<td>Pipe Networks and Transients</td>
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<td>Free Surface Flow</td>
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<td>Reservoir Design and Yield Determination</td>
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<td>Hydrometeorology</td>
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<td>Soil-Water Hydrology</td>
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<td>Urban Drainage Design</td>
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<td>Water Resources Policy</td>
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<td>8.850G</td>
<td>Drainage of Agricultural Lands</td>
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<td>Water Treatment**</td>
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<td>Sewage Treatment and Disposal**</td>
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<td>Water Quality Management**</td>
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<td>8.860G</td>
<td>Investigation of Groundwater Resources I</td>
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<td>8.862G</td>
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<td>8.864G</td>
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<td>8.901G</td>
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<td>Thesis*</td>
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*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**

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<tr>
<td>6.050G</td>
<td>Occasional Elective — Digital Signal Processing</td>
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<tr>
<td>6.150G</td>
<td>Communication Elective — Applied Optoelectronics</td>
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<tr>
<td>6.164G</td>
<td>Microwave Antenna Theory and Applications</td>
<td>3</td>
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<td>6.169G</td>
<td>Microwave Circuits: Theory and Techniques</td>
<td>3</td>
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<td>6.170G</td>
<td>Microwave Electronics</td>
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<tr>
<td>6.336G</td>
<td>Digital Communication Networks</td>
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<td>6.337G</td>
<td>Sound Broadcast Systems</td>
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<td>6.338G</td>
<td>Television Systems</td>
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<td>6.339G</td>
<td>Electroacoustics</td>
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<td>6.344G</td>
<td>Communication Theory</td>
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<tr>
<td>6.345G</td>
<td>Analogue and Digital Filters</td>
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<td>6.347G</td>
<td>Digital Communications</td>
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<td>6.348G</td>
<td>Optical Communications</td>
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<tr>
<td>6.349G</td>
<td>Radar and Navigation Aids</td>
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**Department of Electrical Power Engineering**

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<td>6.224G</td>
<td>Partial Discharges in Electrical Insulation</td>
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<td>6.227G</td>
<td>Insulation Performance in Electrical Plant</td>
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<td>6.228G</td>
<td>Power System Equipment</td>
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<td>6.229G</td>
<td>Fields and Materials</td>
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<td>6.234G</td>
<td>Power System Protection</td>
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<td>6.242G</td>
<td>Power System Analysis</td>
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<td>6.250G</td>
<td>Power Elective I</td>
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<td>6.251G</td>
<td>Power Elective II</td>
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<td>6.256G</td>
<td>Underground Systems</td>
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<td>6.257G</td>
<td>Electric Power Distribution Systems</td>
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**Department of Electronics**

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<td>6.550G</td>
<td>Solid State Electronics Elective</td>
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<td>6.573G</td>
<td>Advanced Semiconductor Devices</td>
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<td>6.575G</td>
<td>Integrated Circuit Technology</td>
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<td>6.576G</td>
<td>Reliability Engineering</td>
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<td>6.577G</td>
<td>Integrated Circuit Design</td>
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<td>6.578G</td>
<td>Solar Energy Conversion</td>
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<td>6.579G</td>
<td>Solar Cells — Operating Principles, Technology and System Applications</td>
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<td>6.580G</td>
<td>Image Analysis in Remote Sensing</td>
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**Department of Systems and Control**

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<tr>
<td>6.453G</td>
<td>Computer Methods of Optimization</td>
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<td>6.455G</td>
<td>System Identification and Modelling</td>
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<td>6.456G</td>
<td>General Concepts in Formal System Theories</td>
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<td>6.458G</td>
<td>Decision and Syntactic Systems for Digital Pattern Recognition</td>
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<td>6.459G</td>
<td>Control Computing</td>
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<td>6.460G</td>
<td>Real Time Computing and Simulation</td>
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<td>6.464G</td>
<td>Digital Estimation, Prediction and Control</td>
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<td>6.466G</td>
<td>Computer-Aided Design of Multivariable Control Systems</td>
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### Department of Computer Science

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<td>Digital Electronics</td>
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<td>Digital Systems</td>
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<td>6.655G</td>
<td>Computer Organization and Architecture</td>
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<td>6.656G</td>
<td>Software Systems A</td>
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<td>Precise Electrical Measurements</td>
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<td>6.074G</td>
<td>Superconductivity</td>
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<td>10.061G</td>
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<td>10.361G</td>
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### Project or Thesis

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<td>Project Report (not normally approved for part-time students)</td>
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### 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 I, II</td>
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<td>5.086G</td>
<td>Digital Logic Fundamentals for Mechanical Engineers‡</td>
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<td>5.087G</td>
<td>Microprocessor Fundamentals for Mechanical Engineers‡</td>
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<td>Industrial Applications of Microprocessors</td>
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<td>5.089G</td>
<td>Elements of Industrial Automation‡</td>
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<td>5.151-2G</td>
<td>Refrigeration and Air Conditioning Design I, II</td>
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<td>5.307-8G</td>
<td>Dynamics I, II</td>
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<td>Industrial Robotics</td>
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<td>Advanced Mechanism Analysis and Synthesis I, II</td>
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<td>Control and Modelling of Mechanical Systems ‡, II</td>
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A 36 credit Thesis is not normally approved in the School of Mechanical and Industrial Engineering.

Department of Industrial Engineering

18.061G Industrial Experimentation I 3
18.062G Industrial Experimentation II 3
18.074G Industrial Management 3
18.075G Decision Support Systems 2
18.171G Inspection and Quality Control 3
18.261G Computer Automation 3
18.360G Ergonomics 3
18.371G Factory Design and Layout 3
18.461G Design for Production 4
18.464G Value Analysis/Engineering 3
18.571G Operations Research I 6
18.574G Management Simulation 3
18.579G Case Studies in Operations Research 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
18.763G Variational Methods in Operations Research 2
18.764G Management of Distribution Systems 2
18.765G Optimization of Networks 2
18.770G Stochastic Control 2
18.772G Information Processing Systems in Organizations 2
18.774G Applied Stochastic Processes 2
18.775G Networks and Graphs 2

18.776G Production and Inventory Control 2
18.777G Time Series and Forecasting 2
18.778G Scheduling and Sequencing 2
18.779G Game Theory 2
18.862G Linear Programming 2
18.863G Non-Linear Programming 2
18.870G Large Scale Optimization in Industry 2
18.871G Mathematics for Operations Research 2
18.874G Dynamic Programming 2
18.875G Geometric Programming 2
18.876G Advanced Mathematics for Operations Research 2
18.878G Industrial Applications of Mathematical Programming 2
18.879G Mathematical Programming Analysis 3
18.965G Industrial Management Seminar 0
18.967G Advanced Topic in Production Engineering 2
18.968G Advanced Topic in Production Engineering 2
18.970G Operations Research Seminar 0
18.977G Advanced Topic in Operations Research 2
18.978G Advanced Topic in Operations Research 2
18.990G Project 9
18.918G Project Report 18
18.936G Thesis 36

Nuclear Engineering

Head of School
Professor J. J. Thompson

23.013G Neutron Transport and Diffusion 3
23.014G Fewgroup Reactor Theories 3
23.015G Multigroup Reactor Theories 3
23.016G Neutron Kinetics and Reactor Dynamics 3
23.023G Reactor Thermal Performance 3
23.024G Boiling and Two Phase Flow 3
23.025G Reactor Structural Mechanics 3
23.026G Reactor Systems Analysis 3
23.027G Boiling Reactor Dynamics 3
23.028G Reactor Accident and Safety Analysis 3
23.032G Mathematics Analysis and Computation 3
23.033G Matrix Theory and Computation 3
23.034G Random Processes and Reactor Noise 3
### Surveying

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<td>29.102G</td>
<td>Characteristics of Optical Surveying Instrumentation</td>
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<tr>
<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>Mathematical Methods II — Statistical Theory of Survey Observations</td>
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<td>Mathematical Methods III — Spherical Harmonics</td>
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<td>Mathematical Methods IV — Theory of Survey Adjustment</td>
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<td>29.207G</td>
<td>Doppler Positioning</td>
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<td>29.314G</td>
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<td>Stereophotogrammetry</td>
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<td>Analytical Photogrammetric Orientation</td>
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<td>Photogrammetric Instrumentation</td>
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<td>29.520G</td>
<td>Photogrammetric Production Processes</td>
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<td>29.601G</td>
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School of Electrical Engineering and Computer Science

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<td>Propagation and Transmission of Electromagnetic Waves</td>
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<td>Communication Electronics</td>
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<td>Signal Analysis</td>
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<td>6.343G</td>
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<td>6.452G</td>
<td>Feedback Control I</td>
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<td>6.457G</td>
<td>Cybernetic Engineering</td>
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<td>Feedback Control II</td>
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<td>Biology and Physiology for Engineers</td>
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<td>Dale Bases and Networks</td>
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<td>Design and Analysis of Algorithms</td>
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School of Mechanical and Industrial Engineering

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<td>18.380G</td>
<td>Methods Engineering</td>
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<td>18.580G</td>
<td>Operations Research</td>
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<td>18.681G</td>
<td>Engineering Economic Analysis</td>
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<td>18.780G</td>
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<td>14.002</td>
<td>Introduction to Accounting B</td>
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<td>14.062G</td>
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</table>

Division of Postgraduate Extension Studies*

Human Communication

There will be no student intake into this program in 1984.

The following subjects are offered by a combination of attendance at the Kensington campus for studio, laboratory and tutorial sessions and lectures by radio in the Sydney area and by audio tape elsewhere.

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<td>Basic Information Theory</td>
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<td>Human Transinformation</td>
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<td>97.004G</td>
<td>Psychology of Communication</td>
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<td>97.005G</td>
<td>Audio and Video Equipment — Capabilities and Applications</td>
<td>4</td>
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<td>97.007G</td>
<td>Audio and Visual Signals in Communication</td>
<td>3</td>
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<tr>
<td>97.008G</td>
<td>Body in Communication†</td>
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<tr>
<td>97.010G</td>
<td>Basic Fortran</td>
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<td>97.013G</td>
<td>Presentation of Information</td>
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<tr>
<td>97.015G</td>
<td>Programming in Basic</td>
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<tr>
<td>97.046G</td>
<td>Introduction to Microprocessor Systems</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.

*See the Calendar for further information on the Division of Postgraduate Extension Studies.

†Half-session only.
Hydraulics
Two-fluid systems with small density differences.
Sediment motion.
Air entrainment 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.
Engineering

Commercial software engineering.
Operating systems.
Microprocessor development systems.
VLSI Systems.

Electronics
Semiconductor device physics.
Integrated circuit design.
Integrated circuit technology.
Surface elastic wave devices.
Reliability engineering.
Photovoltaic solar energy conversion.
Ultrasonic holography.
Optoelectronic devices.
Periodically parametric systems.

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 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 low 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 — including 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.
Graduate Study: Graduate School of Engineering

**Surveying**

Deformation and settlement of structures.
Industrial applications of surveying.
Electronic distance measurements: high precision applications, calibrations.
Gyrotheodolite theory and applications.
Development of instrumentation.
Modern optical instrument testing.
Computation systems for desk top computers.

**Biomedical Engineering**

Modelling of respiratory function, cardiovascular function, nervous system, artificial kidney therapy, extracorporeal heart-lung support, endocrine system and other body systems.
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 wave forms from medical diagnostic equipment.
Implants for fracture support and joint replacement.
Improved drug administration.

**Remote Sensing**

**Surveying**

Deformation and settlement of structures.
Industrial applications of surveying.
Electronic distance measurements: high precision applications, calibrations.
Gyrotheodolite theory and applications.
Development of instrumentation.
Modern optical instrument testing.
Computation systems for desk top computers.

**Biomedical Engineering**

Modelling of respiratory function, cardiovascular function, nervous system, artificial kidney therapy, extracorporeal heart-lung support, endocrine system and other body systems.
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 wave forms 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.
Graduate Study

Conditions for the Award of Higher Degrees

First Degrees

Rules, regulations and conditions for the award of first degrees are set out in the appropriate Faculty Handbooks.

For the list of undergraduate courses and degrees offered see Disciplines of the University: Faculty Table (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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</table>
## Doctor of Philosophy (PhD)

### Qualifications

1. The degree of Doctor of Philosophy may be granted by the Council on the recommendation of the Professorial Board to a candidate who has made an original and significant contribution to knowledge and who has satisfied the following requirements:

2. A candidate for registration for the degree of Doctor of Philosophy shall:

   (1) hold an honours degree from the University of New South Wales; or
   (2) hold an honours degree or equivalent standing from another approved university; or
   (3) if the candidate holds a degree without honours from the University of New South Wales or other approved university, have achieved by subsequent work and study a standard recognised by the Higher Degree Committee of the appropriate faculty or board of studies (hereinafter referred to as the Committee) as equivalent to honours; or
   (4) in exceptional cases, submit such other evidence of general and professional qualifications as may be approved by the Professorial Board on the recommendation of the Committee.

3. When the Committee is not satisfied with the qualifications submitted by a candidate, the Committee may require the candidate, before being permitted to register, to undergo such examination or carry out such work as the Committee may prescribe.

### Registration

4. A candidate for registration for a course of study leading to the degree of Doctor of Philosophy shall apply to the Registrar on the prescribed form at least one calendar month before the commencement of the session in which registration is to begin.

5. Subsequent to registration the candidate shall pursue a program of advanced study and research for at least six academic sessions, save that:

   (1) a candidate fully engaged in advanced study and research for the degree, who before registration was engaged upon research to the satisfaction of the Committee, may be exempted from not more than two academic sessions;
(2) in special circumstances the Committee may grant permission for the candidate to spend not more than one calendar year of the program in advanced study and research at another institution provided that the work can be supervised in a manner satisfactory to the Committee;

(3) in exceptional cases, the Professional Board on the recommendation of the Committee may grant permission for a candidate to be exempted from not more than two academic sessions.

6. A candidate who is fully engaged in research for the degree shall present for examination not later than ten academic sessions from the date of registration. A candidate not fully engaged in research shall present for examination not later than twelve academic sessions from the date of registration. In special cases an extension of these times may be granted by the Committee.

7. The candidate shall be fully engaged in advanced study and research, save that:

   (1) the Committee may permit a candidate to undertake a limited amount of University teaching or outside work which in its judgment will not interfere with the continuous pursuit of the proposed course of advanced study and research;

   (2) a member of the full-time staff of the University may be accepted as a part-time candidate for the degree, in which case the Committee shall prescribe a minimum period for the duration of the program;

   (3) in special circumstances, the Committee may, with the concurrence of the Professorial Board, accept as a part-time candidate for the degree a person who is not a member of the full-time staff of the University and is engaged in an occupation which, in its opinion, leaves the candidate substantially free to pursue a program in a school of the University. In such a case the Committee shall prescribe for the duration of the program a minimum period which, in its opinion, having regard to the proportion of the time which the candidate is able to devote to the program in the appropriate University school is equivalent to the six sessions ordinarily required.

   (4) the Committee may permit a candidate to transfer to part-time enrolment where that candidate has completed the research work, is writing the thesis, and has been registered as a full-time candidate for at least six academic sessions.

8. Every candidate shall pursue a program under the direction of a supervisor appointed by the Committee from the full-time members of the University staff. The work other than field work shall be carried out in a school of the University save that in special cases the Committee may permit a candidate to conduct the work at other places where special facilities not possessed by the University may be available. Such permission will be granted only if the direction of the work remains wholly under the control of the supervisor.

9. Not later than two academic sessions after registration the candidate shall submit the topic of research for approval by the Committee. After the topic has been approved it may not be changed except with the permission of the Committee.

10. A candidate may be required by the Committee to attend a formal course of appropriate study.

11. On completing the course of study every candidate must submit a thesis which complies with the following requirements:

   (1) the greater proportion of the work described must have been completed subsequent to registration for the PhD degree;

   (2) it must be an original and significant contribution to the knowledge of the subject;

   (3) it must be written in English except that a candidate in the Faculty of Arts may be required by the Faculty on the recommendation of the supervisor to write the thesis in an appropriate foreign language;

   (4) it must reach a satisfactory standard of expression and presentation.

12. The thesis must present the candidate's own account of the research. In special cases work done conjointly with other persons may be accepted, provided the Committee is satisfied on the candidate's part in the joint research.

13. Every candidate shall be required to submit with the thesis a short abstract of the thesis comprising not more than 350 words.

*Or department where a department is not within a school.
The abstract shall indicate:
(1) the problem investigated;
(2) the procedures followed;
(3) the general results obtained;
(4) the major conclusions reached;
but shall not contain any illustrative matter, such as tables, graphs or charts.

14. A 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.

15. The candidate shall give in writing two months' notice of intention to submit the thesis.

16. 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 higher degree theses. The candidate may also submit any work previously published whether or not such work is related to the thesis.

17. It shall be understood that the University retains the four copies of the thesis submitted for examination, and is free to allow the thesis to be consulted or borrowed. Subject to the provisions of the Copyright Act, 1968, the University may issue the thesis in whole or in part, in photostat or microfilm or other copying medium.

18. There shall normally be 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.

19. 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:
(1) the candidate be awarded the degree without further examination; or
(2) 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
(3) 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
(4) 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
(5) the candidate be not awarded the degree and be not permitted to resubmit the thesis.

20. If the performance at the further examination recommended under Rule 19. (3) 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 them but not exceeding eighteen months.

21. 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 admitted to the degree.

22. A candidate shall be required to pay such fees as may be determined from time to time by the Council.

1. The degree of Master of Biomedical Engineering 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 satisfactorily completed an approved program of advanced study.

2. (1) An applicant for registration for the degree shall have been admitted to an appropriate Bachelor degree in the University of New South Wales or other university or tertiary institution at a standard acceptable to the Committee.
(2) In exceptional cases an applicant may be registered as a candidate for the degree by submitting evidence of such academic and professional attainments as may be approved by the Committee.

(3) Notwithstanding any other provisions of these conditions, the Committee may require an applicant to demonstrate fitness for registration by completing a qualifying program as determined by the Committee.

3. (1) An application to register as a candidate for the degree shall be made on the prescribed form which shall be lodged with the Registrar two months before commencement of the session in which the candidate desires to commence.

(2) An approved candidate shall register in one of the following categories:
(a) student in full-time attendance at the University;
(b) student in part-time attendance at the University.

(3) A candidate for the degree shall be required to undertake such formal courses of study and pass such examinations as may be prescribed by the Committee and shall undertake a specified project, the satisfactory completion of which shall be regarded as part of the examination.

(4) The progress of a candidate shall be reviewed at least once annually by the Committee and as a result of its review the Committee may terminate candidature or take such other action as it considers appropriate.

(5) Unless otherwise recommended by the Committee, no candidate shall be awarded the degree until the lapse of two full-time sessions after registration, or the equivalent in part-time study.

(6) The program of advanced study, including the preparation of a project report, shall normally total 60 credits. The number of credits allocated to each subject shall be determined by the Committee on the recommendation of the director of the Centre for Biomedical Engineering. Students with advanced standing may be given limited exemptions by the Committee on the recommendation of the Director of the Centre.

(7) The project report will normally carry 18 credits weighting except in special cases, approved by the Director of the Centre, where a more detailed project report may carry a weighting of 30 credits towards the award of the degree.

4. (1) The project forming the basis of the report shall be conducted under a supervisor(s) approved by the Committee on the recommendation of the Director of the Centre by Biomedical Engineering.

(2) Every candidate who submits a project report as provided in paragraph 3. (3) shall submit three copies in a form which complies with the requirements of the University for the preparation and submission of higher degree theses and project reports. The candidate may also submit any work the candidate has published whether or not such work is related to the project report.

(3) For each candidate who submits a project as provided in paragraph 3. (3) there shall be at least two examiners appointed by the Professorial Board on the recommendation of the Committee, one of whom shall, if possible, be an external examiner.

(4) It shall be understood that the University retains the three copies of the project report submitted for examination and is free to allow the 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 photostat or microfilm or other copying medium.

5. Having considered the examiners' reports and the candidate's other results in the prescribed course of study, the Committee shall recommend whether the candidate may be admitted to the degree.

6. An approved candidate shall pay such fees as may be determined from time to time by the Council.
Engineering

Master of Engineering (ME)

Qualifications

1. The degree of Master of Engineering may be awarded by the Council on the recommendation of the Higher Degree Committee to the appropriate Facility (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 investigation, or design or engineering development, which in each case is original.

2. (1) An applicant for registration for the degree shall have been admitted to the degree of Bachelor in the University of New South Wales, or other approved university or tertiary institution, in an appropriate school or department at a standard acceptable to the Committee.

   (2) In exceptional cases a person may be permitted to register as a candidate for the degree if the person submits evidence of such academic and professional attainment as may be approved by the appropriate Committee.

   (3) Notwithstanding any other provisions of these conditions, the Committee may require an applicant to demonstrate fitness for registration by carrying out such work and sitting for such examinations as the Committee may determine.

Registration

3. (1) An application to register as a candidate for the degree shall be made on the prescribed form which shall be lodged with the Registrar at least one full calendar month before the commencement of the session in which the candidate desires to register.

   (2) In every case, before permitting an applicant to register as a candidate, the Committee shall be satisfied that adequate supervision and facilities are available.

   (3) An approved applicant shall register in one of the following categories:

      (a) student in full-time attendance at the University

      (b) student in part-time attendance at the University

      (c) student working externally to the University

   (4) Every candidate for the degree shall be required to carry out a program of advanced study to take such examinations and perform such other work as may be prescribed by the Committee which shall include the preparation and submission of a thesis embodying the results of an original investigation. The work shall be carried out under the direction of a supervisor appointed by the Committee or under such conditions as the Committee may determine. At least once a year and at any other time that the Committee sees fit, the candidate's supervisor shall present to the head of the school in which the candidate is registered, a report on the progress of the candidate. The Committee shall review the report and may, if it decides as a result of its review that the progress of the candidate is unsatisfactory, cancel registration or take such other action as it considers appropriate.

   (5) No candidate shall be considered for the award of the degree until the lapse of four complete sessions from the date from which registration becomes effective save that, in the case of a candidate who obtained the degree of Bachelor with Honours or who has had previous research experience, this period may, with the approval of the Committee, be reduced by up to two sessions.

Thesis

4. (1) A candidate for the degree shall be required to submit three copies of the thesis referred to in paragraph 3. (4) which shall be presented in a form which complies with the requirements of the University for the preparation and submission of higher degree theses. The candidate may submit any work the candidate has published whether or not such work is related to the thesis.

   (2) For each candidate there shall be at least two examiners, appointed by the Professorial Board on the recommendation of the Committee one of whom shall, if possible, be an external examiner.

   (3) 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.

Recommendation for Admission to Degree

5. Having considered the examiners' reports the Committee shall recommend whether or not the candidate should be admitted to the degree.

Fees

6. An approved candidate shall pay such fees as may be determined from time to time by the Council.
1. The degrees of Master of Engineering Science and Master of Surveying Science 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 satisfactorily completed an approved program of advanced study.

2. (1) An applicant for registration for the degree shall have been admitted to the degree of Bachelor with Honours in the University of New South Wales or other approved university or tertiary education institution of acceptable standing in an appropriate school or department.

(2) The Committee may also admit a graduate with a pass degree of good standing from an appropriate degree course whose record is at a standard acceptable to the Committee.

(3) In special circumstances a person may be permitted to register as a candidate for the degree by submitting evidence of such academic and professional attainments as may be approved by the Committee.

(4) Notwithstanding any other provisions of these conditions the Committee may require an applicant to demonstrate fitness for registration by carrying out such work and sitting for such examinations as the Committee may determine.

3. (1) An application to register for the degree shall be made on the prescribed form which shall be lodged with the Registrar at least two full calendar months before the commencement of the course.

(2) An approved candidate shall register in one of the following categories:

(a) student in full-time attendance at the University

(b) student in part-time attendance at the University

(3) A candidate for the degree shall:

(a) complete a program of advanced study which may include the submission of a report on a project based upon a design or a critical review; or

(b) demonstrate ability to carry out research by the submission of a thesis embodying the results of an original investigation; or

(c) complete an approved combination of the above.

(4) An applicant for registration shall indicate the proposed project area or major field of study in order that the responsibility for the supervision of the program may be determined.

(5) The approval of the appropriate Head of School for the proposed program must be obtained by the candidate prior to enrolment. For the purpose of this regulation the Head of School shall normally be the Head of the School providing supervision of the project or research or if there is no project the major field of study. Should the appropriate school be the School of Surveying the degree awarded shall be Master of Surveying Science.

(6) The program of advanced study including the preparation of a thesis or report on a project to be completed by each candidate shall total a minimum of 36 credits, the number of credits allocated for each subject being determined by the Committee on the recommendation of Heads of Schools. Where the formal course work comprises no more than 50% of the total study, or where the formal work comprises 50% or more but less than 100% the candidate shall be required to submit a report on a project. With the approval of the Head of School, candidates may take subjects from other Schools of the Faculty, other Faculties of the University and other universities or institutions.

(7) The project forming the basis for the report or thesis shall be conducted under a supervisor appointed by the Committee or under such conditions as the Committee may determine, to the satisfaction of the Head of School.

(8) No full-time candidate shall be considered for the award of the degree until the lapse of two sessions from the date from which registration becomes effective. No part-time candidate shall be considered for the award of the degree until the lapse of four sessions from the date from which registration becomes effective.

4. (1) Every candidate who submits a thesis (36 credits) as provided in paragraph 3. (3) (b) shall submit three copies in a form which complies with the requirements of the University for the preparation and submission of higher degree theses. The candidate may also submit any published work whether or not such work is related to the thesis. The format of the report on a
Engineering Recommendation for Admission to Degree

project as provided in paragraph 3. (3) (a) shall comply with the requirements of the Faculty for the preparation and submission of project reports.

(2) For each candidate who submits a thesis or 18 credit project report there shall be at least two examiners appointed by the Professorial Board on the recommendation of the Committee, one of whom shall, if possible, be an external examiner.

(3) It shall be understood that the University retains the three copies of the thesis or 18 credit project report submitted for examination and is free to allow it to be consulted or borrowed. Subject to the provisions of the Copyright Act, 1968 the University may issue it in whole or in part, in photostat or microfilm or other copying medium.

(4) The report on the project (9 credits) provided in paragraph 3. (3) (a) shall be under the supervision of a member of the academic staff and shall be examined by two examiners. The satisfactory completion of the project shall be regarded as part of the annual examinations.

Recommendation for Admission to Degree

5. Having considered the examiners' reports and the candidate's other work in the prescribed course of study the Committee shall recommend whether or not the candidate should be admitted to the degree.

Fees

6. An approved candidate shall pay such fees as may be determined from time to time by the Council.

Master of Safety Science (MSafetySc)

1. The degree of Master of Safety Science 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 satisfactorily completed an approved program of advanced study.

Qualifications

2. (1) An applicant for registration for the degree shall have been admitted to an appropriate Bachelor degree in the University of New South Wales, or other university or tertiary institution at a standard acceptable to the Committee.

(2) In exceptional cases an applicant may be registered as a candidate for the degree if the applicant submits evidence of such academic and professional attainments as may be approved by the Committee.

(3) Notwithstanding any other provisions to these conditions the Committee may require an applicant to demonstrate fitness for registration by completing a qualifying program as determined by the Committee.

Registration

3. (1) An application to register as a candidate for the degree shall be made on the prescribed form which shall be lodged with the Registrar two months before the commencement of the session in which the candidate desires to commence.

(2) An approved applicant shall register in one of the following categories: (a) student in full-time attendance at the University (b) student in part-time attendance at the University

(3) A candidate for the degree shall be required to undertake such formal courses of study and pass such examinations as may be prescribed by the Committee including the submission of a report on a project based on a design or a critical review, the satisfactory completion of which shall be regarded as part of the examination.

(4) The progress of a candidate shall be reviewed at least once annually by the Committee and as a result of its review the Committee may terminate candidature or take such other action as it considers appropriate.

(5) Unless otherwise recommended by the Committee, no candidate shall be awarded the degree until the lapse of two full-time sessions after registration, or the equivalent in part-time study.

(6) The program of advanced study, including the preparation of a report on a project shall normally total 54 credits. The number of credits allocated to each subject shall be determined
by the Committee on the recommendation of the Course Director. Students with advanced standing may be given limited exemption by the Committee on the recommendation of the Course Director.

4. (1) The report on the project (9 credits) provided in paragraph 3. (3) shall be under the supervision of a member of the academic staff recommended by the Course Director and shall be examined by two examiners. The satisfactory completion of the project shall be regarded as part of the annual examinations.

5. Having considered the examiners' reports and the candidate's other results in the prescribed course of study, the Committee shall recommend whether the candidate should be admitted to the degree.

6. An approved candidate shall pay such fees as may be determined from time to time by the Council.

1. The degree of Master of Science may be awarded by the Council on the recommendation of the Higher Degree Committee of the appropriate Faculty or Board of Studies (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) An applicant for registration for the degree shall have been admitted to the degree of Bachelor in the University of New South Wales, or other approved university or tertiary institution in an appropriate school or department at a standard acceptable to the Committee.

(2) In exceptional cases a person may be permitted to register as a candidate for the degree if the person submits evidence of such academic and professional attainments as may be approved by the appropriate Committee.

(3) Notwithstanding any other provisions of these conditions the Committee may require an applicant to demonstrate fitness for registration by carrying out such work and sitting for such examinations as the Committee may determine.

3. (1) An application to register as a candidate for the degree of Master of Science shall be made on the prescribed form which shall be lodged with the Registrar at least one full calendar month before the commencement of the session in which the candidate desires to register.

(2) In every case before permitting an applicant to register as a candidate the Committee shall be satisfied that adequate supervision and facilities are available.

(3) An approved applicant shall register in one of the following categories:
(a) student in full-time attendance at the University
(b) student in part-time attendance at the University
(c) student working externally to the University

(4) Every candidate for the degree shall be required to submit three copies of a thesis embodying the results of an original investigation or design, to take such examinations and to perform such other work as may be prescribed by the Committee. This work shall be carried out under the direction of a supervisor appointed by the Committee or under such conditions as the Committee may determine.

(5) At least once a year and at any other time that the Committee sees fit, the candidate's supervisor shall present to the head of school or department in which the candidate is registered a report on the progress of the candidate. The Committee shall review the report and may, if it decides as a result of its review that the progress of a candidate is unsatisfactory, cancel registration or take such other action as it considers appropriate.

(6) Unless otherwise recommended by the Committee, no candidate shall be awarded the degree until the lapse of four complete sessions from the date of registration, save that the case of a candidate who obtained the degree of Bachelor with Honours or who has had previous research experience, this period may be reduced by up to two sessions with the
Engineering

approval of the Committee. A candidate who is fully engaged in research for the degree shall present for examination not later than six academic sessions from the date of registration. A candidate not fully engaged in research shall present for examination not later than twelve academic sessions from the date of registration. In special cases an extension of these times may be granted by the Committee.

Thesis

4. (1) A candidate for the degree shall be required to submit three copies of the thesis referred to in paragraph 3, (4) which shall be presented in a form which complies with the requirements of the University for the preparation and submission of higher degree theses. The candidate may submit also for examination any work the candidate has published whether or not such work is related to the thesis.

(2) For each candidate there shall be at least two examiners, appointed by the Professorial Board on the recommendation of the Committee, one of whom, if possible, shall be external to the University.

(3) 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.

Recommendation for Admission to Degree

5. Having considered the examiners' reports the Committee shall recommend whether or not the candidate should be admitted to the degree.

Fees

6. An approved candidate shall pay such fees as may be determined from time to time by the Council.

Master of Science (MSc)
Master of Engineering
(ME) Master of Surveying (MSurv) without supervision

Qualifications

1. Where it is not possible for candidates to register under the normal conditions for the degree of Master of Science, Master of Engineering or Master of Surveying by reason of their location at centres which are distant from University Schools or where effective supervision is not practicable registration may be granted in these categories under the following conditions:

2. An applicant for registration shall have been admitted to a degree of Bachelor in the University of New South Wales at a standard acceptable to the Higher Degree Committee of the appropriate Faculty (hereinafter referred to as the Committee).

Registration

3. (1) An application to register as an external candidate for the degree of Master of Science, Master of Engineering or Master of Surveying without supervision shall be lodged with the Registrar for recommendation by the Head of School 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 the candidate's own interest at an early stage, seek the advice of the appropriate School with regard to the adequacy of the subject matter for the degree. A synopsis of the work should be enclosed.

(2) A candidate shall not be considered for the award of the degree until the lapse of six sessions in the case of honours graduates and eight sessions in the case of pass graduates from the date of graduation.

Thesis

4. (1) (a) Every candidate for the degree shall be required to submit three copies of a thesis embodying the results of an investigation or design. 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. A candidate may submit also for examination any work the candidate has published, whether or not such work is related to the thesis.

(b) Every candidate shall submit with the thesis a statutory declaration that the material contained therein is the candidate's own work, except where otherwise stated in the thesis.

(2) For each candidate there shall be at least two examiners appointed by the Professorial Board on the recommendation of the Committee, one of whom shall be an internal examiner.
(3) If the thesis reaches the required standard, the candidate shall be required to attend for an oral examination at a time and place nominated by the Committee. The examiners may also arrange at their discretion for the examination of the candidate by written and/or practical examinations on the subject of the thesis and/or subjects related thereto.

(4) It shall be understood that the University retains the three copies of the thesis submitted for examination and is free to allow the thesis to be consulted or borrowed. Subject to the provisions of the Copyright Act, 1968, the University may issue the thesis in whole or in part, in photostat or microfilm or other copying medium.

5. Having considered the examiners' reports the Committee shall recommend whether or not the candidate should be admitted to the degree.

6. An approved applicant shall pay such fees as may be determined from time to time by the Council.

1. The degree of Master of Surveying 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 carry out research by the submission of a thesis embodying the results of an original investigation.

2. (1) An application for registration for the degree shall have been admitted to the degree of Bachelor with Honours in the University of New South Wales or other approved university or tertiary education institution of acceptable standing in an appropriate school or department.

(2) The Committee may also admit a graduate with a pass degree of good standing from an appropriate degree course whose record is at a standard acceptable to the Committee.

(3) In special circumstances a person may be permitted to register as a candidate for the degree if the person submits evidence of such academic and professional attainments as may be approved by the Committee.

(4) Notwithstanding any other provisions of these conditions the Committee may require an applicant to demonstrate fitness for registration by carrying out such work and sitting for such examinations as the Committee may determine.

3. (1) An application to register as a candidate for the degree shall be made on the prescribed form which shall be lodged with the Registrar at least one full calendar month before the commencement of the session in which the candidate desires to register.

(2) In every case before permitting an applicant to register as a candidate the Committee shall be satisfied that adequate supervision and facilities are available.

(3) An approved applicant shall register in one of the following categories:
(a) student in full-time attendance at the University;
(b) student in part-time attendance at the University;
(c) student working externally to the University.

(4) Every candidate for the degree shall be required to carry out a program of advanced study, to take such examinations and perform such other work as may be prescribed by the Committee, which shall include the preparation and submission of a thesis embodying the results of an original investigation. The work shall be carried out under the direction of a supervisor appointed by the Committee or under such conditions as the Committee may determine.

(5) No candidate shall be considered for the award of the degree until a lapse of four complete sessions from the date from which registration becomes effective save that, in the case of a candidate who obtained the degree of Bachelor with Honours or who has had previous research experience, this period may, with the approval of the Committee, be reduced by up to two sessions.
4. (1) A candidate for the degree shall be required to submit three copies of the thesis referred to in paragraph 3. (4) which shall be presented in a form which complies with the requirements of the University for the preparation and submission of higher degree theses. The candidate may submit any work the candidate has published whether or not such work is related to the thesis.

(2) For each candidate there shall be at least two examiners appointed by the Professorial Board, on the recommendation of the Committee, one of whom shall, if possible, be an external examiner.

(3) It shall be understood that the University retains the three copies of the thesis submitted for examination and is free to allow the thesis to be consulted or borrowed. Subject to the provisions of the Copyright Act, 1968 the University may issue the thesis in whole or in part, in photostat or microfilm or other copying medium.

5. Having considered the examiners' reports the Committee shall recommend whether or not the candidate should be admitted to the degree.

6. An approved candidate shall pay such fees as may be determined from time to time by the Council.

1. An application for admission to a graduate diploma course shall be made on the prescribed form which should be lodged with the Registrar at least two full calendar months before the commencement of the course.

2. An applicant for admission to a graduate diploma course shall be:

(1) a graduate of the University of New South Wales or other approved university.

(2) a person with other qualifications as may be approved by Faculty.

3. Notwithstanding clause 2. above, Faculty may require an applicant to take such other prerequisite or concurrent studies and/or examinations as it may prescribe.

4. Every candidate for a graduate diploma shall be required to undertake the appropriate course of study, to pass any prescribed examinations, and if so laid down in the course, to complete a project or assignment specified by the Head of the School. The format of the report on such project or assignment shall accord with the instructions laid down by the Head of the School.

5. An approved applicant shall be required to pay the fee for the course in which the applicant desires to register. Fees shall be paid in advance.
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 not been used for some time 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 and are published at the end of Undergraduate Study and Graduate Study of the relevant school. Their subject descriptions are also published in the handbook of the Faculty in which the subject is taught.

For General Studies subjects see the Board of Studies in General Education Handbook, which is available free of charge.

HSC Exam Prerequisites

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

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

Information Key

The following is the key to the information which may be supplied about each subject: S1 (Session 1); S2 (Session 2); F (Session 1 plus Session 2, i.e. full year); S1 or S2 (Session 1 or Session 2, i.e. choice of either session); SS (single session, i.e. which session taught is not known at time of publication); L (Lecture, followed by hours per week); T (Laboratory/Tutorial, followed by hours per week); Sem (Seminar, followed by hours per week); hpw (hours per week); C (Credit or Credit units); CR (Credit Level); DN (Distinction).
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<tr>
<td>School of Mechanical and Industrial Engineering (Industrial Engineering)</td>
<td>Engineering</td>
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<tr>
<td>Department of Industrial Arts</td>
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<td>School of Nuclear Engineering</td>
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<td>School of Geography*</td>
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<td>Centre for Biomedical Engineering</td>
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<td>School of Town Planning*</td>
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<td>School of Chemical Engineering and Industrial Chemistry*</td>
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<td>School of Physiology and Pharmacology*</td>
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<td>School of Paediatrics</td>
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<td>School of Psychiatry</td>
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<td>School of Community Medicine</td>
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<td>Australian Graduate School of Management</td>
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<td>Faculty of Law*</td>
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<tr>
<td>Division of Postgraduate Extension Studies</td>
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Physics

Undergraduate Study

The School of Physics has introduced the specialized units 1.951, 1.961, 1.971, 1.981, 1.962 and 1.982 for students in the Faculty of Engineering. The first-year units 1.951, 1.961, 1.971, 1.981 and 1.991 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 1.951, 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 I F L3T3

Prerequisites:

<table>
<thead>
<tr>
<th>Subject</th>
<th>HSC Exam Percentile Range</th>
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<tbody>
<tr>
<td>2 unit Mathematics or</td>
<td>71-100</td>
</tr>
<tr>
<td>3 unit Mathematics or</td>
<td>21-100</td>
</tr>
<tr>
<td>4 unit Mathematics</td>
<td>1-100 or (for 1.001 only) 10.021B</td>
</tr>
<tr>
<td>2 unit Science (Physics) or</td>
<td>31-100</td>
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<tr>
<td>2 unit Science (Chemistry) or</td>
<td>31-100</td>
</tr>
<tr>
<td>4 unit Science (Multistrand)</td>
<td>31 100</td>
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</table>

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.

1.011 Higher Physics I F L3T3

Prerequisites: As for 1.001; plus permission of the Head of the School of Physics. Co-requisite: 10.001 or 10.011.

For students of all Faculties except Medicine who have a good secondary school record and who wish to do a more challenging course.

Vector algebra, kinematics, uniform circular motion, conic sections, dynamics, energy, work and energy, gravitation, rotational motion of rigid bodies about fixed axis, rotational motion about a fixed point. Harmonic motions, waves in elastic media. Sound waves, physical optics, polarization and double refraction. Electric charges, electric intensity, electric flux. Gauss' law, electric potential, capacity, dielectric materials, electric current and resistance. DC circuits, magnetic field, field due to current, electromagnetic induction, inductance, magnetic materials, transients, AC circuits, electronics, diode, rectifier circuit, simple power supplies, electronic amplifier systems, single loop feedback systems, signal processing circuits using operational amplifiers.

1.951 Physics I (Mechanical Engineering) F L2T2

Prerequisites: As for 1.001 Physics I.

For students in the School of Mechanical Engineering.


1.961 Physics I (Electrical Engineering) F L3T3

Prerequisite: As for 1.001 Physics I.

For students in the School of Electrical Engineering.

Electrostatics in vacuum, electrostatics in dielectrics, steady state currents, magnetostatics in vacuum, ferromagnetism, electromagnetism, 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 I (Surveying) F L3T3

Prerequisite: As for 1.001 Physics I.

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 I (Civil Engineering) S1 L2T3 and S2 L2T1

Prerequisite: As for 1.001 Physics I.

For students in the School of Civil Engineering.

Physics Level II Units

1.962 Physics of Measurement (Surveying)  S1 L1T2
Prerequisite: 1.971.

For students in the School of Surveying:


1.972 Electromagnetism (Electrical Engineering)  S2 L2T2
Prerequisite: 1961 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)  S1 L2½T2
Prerequisite: 1961 or 1.001 or 1.011, 10.001. Co-requisites: 10.2111, 10.2112. Excluded: 1.012.

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)  F L1½T½

Particle mechanics, harmonic motion, central force problems, systems of particles, Lagrange's equations with applications, coupled oscillations, wave equation. Thermodynamic laws, entropy, kinetic theory, M-B distribution, microscopic processes, Maxwell's relations, chemical potential, phase diagrams, multicomponent systems, electrochemical potential, statistics of defects in solids.

Chemistry

Undergraduate Study

2.111 Introductory Chemistry  S1 L2T4
Prerequisite: None.

Note: Students who have passed 2.121 or 2.141 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 and salification. 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 IA  S1 or S2 L2T4
Prerequisites:

- Required: HSC Exam Percentile Range
- 2 unit Mathematics* or 71-100
- 3 unit Mathematics or 21-100
- 4 unit Mathematics and 1-100
- 2 unit Science (Physics) or 31-100
- 2 unit Science (Chemistry) or 31-100
- 4 unit Science (multistrand) or 31-100
- 2 unit Science (Geology) or 51-100
- 2 unit Science (Biology) or 51-100
- 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 2.141 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.
Mechanical and Industrial Engineering

Undergraduate Study

5.006 Engineering E

Prerequisite: as for 5.010. Excluded: 5.010, 5.020, 5.030.


5.010 Engineering A

Prerequisite:

<table>
<thead>
<tr>
<th>HSC Exam</th>
<th>Percentile Range</th>
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<tbody>
<tr>
<td>Required</td>
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</table>

Either

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

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

Statics: Composition and resolution of forces, laws of equilibrium. Friction. Statics of rigid bars, pin-jointed frames, and beams. Simple states of stress. Statics of fluids. Introduction to Engineering Design: Engineering method, problem identification, creative thinking, mathematical modelling, computer-aided design, materials and processes, communication of ideas, the place of engineering in society. Introduction to Materials Science: The structure and properties of the main types of engineering materials, with emphasis on the way in which properties may be controlled by controlling structure.
5.010 Statics
Prerequisites: as for 5.010.

5.020 Engineering B
Prerequisite: 5.010 or 8.170


5.030 Engineering C
Prerequisites: as for 5.010.


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

1. Production Technology
F 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. Machines. Analysis of the primary functions of the machine tool and an appraisal of their limitations. Principles of operation of common machines tools and illustrations of their use.

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

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

4. Introduction to Mining Engineering
(Mining Engineering students must take this option.) Mineral deposits; metallic, non-metallic and fuels. Elements of prospecting and exploration. Basic mining techniques. Mining phases, development, exploitation, 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
(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.

5.042 Industrial Experience
L0T0
A minimum of three years of satisfactory industrial experience must be obtained concurrently with attendance in all BSc(Eng) courses. Students are required to submit to the School evidence from their employers confirming completion of the prescribed period of industrial training.
5.043 Industrial Training I SS L0T0

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 II SS L0T0

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 F L0T6

Co-requisite: 5.062.

To be taken in year of completion of course.

For students in the full-time and part-time BE degree courses in the School of Mechanical and Industrial Engineering.

5.056 Mechanical Engineering S2 L/T4

Prerequisites: 1961 or equivalent, 10.2111, 10.2112.


5.061 Technical Orientation S1 L2T0

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 F L2T0

Co-requisite: 5.051.


5.0721 Computing S1 L1T1

Co-requisite: 10.001.


5.073 Numerical Analysis/Mathematics F L2T1

Prerequisites: 10.022, 5.072 (Computing Strand) or 5.0721.

Numerical methods for solution of non-linear equations, linear and non-linear systems, ordinary and partial differential equations. Complex variable theory: differentiation, contour integrals, Laplace and Fourier transforms. Variational methods: optimality conditions; functionals; Euler-Lagrange equations; transversality and boundary conditions; one dimensional search; introduction to non-linear programming.

5.074 Computing Science for Mechanical Engineers S1 L2T1

Prerequisite: Computing Strand of 5.072 or 5.0721.


5.113 Mechanical Engineering Design III FL1½T4½

Prerequisite: 5.112 or 5.123.

Special analytical and experimental techniques of engineering design. Optimization; reliability analysis; Major and minor design projects.

5.121 Mechanical Engineering Design I S1 L4T4 S2L3

Prerequisites: as for 5.010.

Engineering Drawing: Graphic communication first and third angle orthographic projection and isometric projection. Descriptive geometry fundamentals and their application to engineering problems with special emphasis on visualization of problems and development of methods for their solution. Australian standard engineering drawing practice. Applications involving detail and assembly drawings, functional dimensioning and tolerancing. Introduction to Engineering Design: Engineering method, problem identification, creative thinking, mathematical modeling, computer aided design, materials and processes, communication of ideas. Design for Manufacture: The implementation of design and its interaction with manufacturing processes. Manufacturing capabilities and tolerancing. Selection of materials and processes. Approximately 63 hours of practical training, including casting, welding, fitting and machining. Project involving appraisal of an existing design and a report recommending design improvements, materials, equipment items and processes to be utilized. Introduction to Materials Science: The structure and properties of the main types of engineering materials, with emphasis on the way in which properties may be controlled by controlling structure.

5.122 Mechanical Engineering Design II F L1T2

Prerequisite: 5.030. Pre- or Co-requisites: 5.330 or 5.0201, 5.622, 5.422 or 8.112, 8.250.

Application of design strategy to creative design projects. Modelling, analysis and design of basic engineering elements and systems with further engineering drawing practice. Review of current available mechanical technology and use of standard equipment items, codes and trade literature.
5.123 Mechanical Engineering Design III
Prerequisite: 5.122. Co-requisite: 5.423 or 5.412.
Mathematical modeling and decision making in design with applications. More advanced design analyses, component design and drawing with individual and group projects of an interdisciplinary nature.

5.124 Mechanical Engineering Design IV
The combination of any four subjects in the sequence 5.1241 to 5.1245.

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: 5.123
Aspects of mechanical engineering technology which form the basis for machinery design. Includes hydraulic power systems, circuits, pumps, motors and other equipment: welding technology, vibration control and isolation: advanced tolerancing; composite materials; fracture mechanics. Laboratory deals with the evaluation of components for compliance with specification.

5.1243 Machinery Design Project
Prerequisite: 5.123.
Development of the final design for a solution to a specified problem. Requires attention to design analysis, component selection, decision making, specification and the preparation of engineering drawings.

5.1244 Design Management
Prerequisite: 5.123.
Aspects of design management which are necessary for the successful achievement of design objectives. Includes project scheduling and control, contracts, specifications, use of standards and codes, statutory controls, quality assurance, product liability, patent law, marketing. Laboratory deals with the evaluation of components for compliance with specification.

5.1245 Computer Based Engineering Design
Prerequisites: S1 of 5.123, 5.074, 5.423. Excluded: 18.803, 18.870G.

5.300 Engineering Dynamics IB
Prerequisites: 1.001 or 19.51, 5.0201, 10.001.
Kinematics and kinetics of rigid bodies in planar motion: absolute motion and motion relative to translating and rotating frames of reference; constraint and degree 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.

5.303 Mechanical Vibrations
Prerequisites: 5.300 or 5.330, 10.022.

5.324 Automatic Control Engineering
Prerequisite: 10.022

5.332 Dynamics of Machines II
Prerequisite: 5.331 or 5.333.

5.333 Dynamics of Machines
Prerequisites: 5.300 or 5.330, 10.022;

5.334 Engineering Dynamics II
Prerequisites: 5.333 or 5.331.
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. Gearing branched systems. Introduction to beam vibrations. Matrix methods.
5.343 Linear System Analysis  S1 L2T1
Prerequisites: 5.0201 or 5.330, 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.

5.351 Engineering Noise I  SS L2T1
Prerequisite: 5.073 (Mathematics Strand). Excluded: 5.654G.

5.352 Engineering Noise II  SS L2T1
Prerequisite: 5.073 (Mathematics Strand). Excluded: 5.653G.

5.413 Mechanics of Solids IV  F L2T1
Prerequisite: 5.412 or 5.423.

5.421 Mechanics of Solids I  S2 L2T2
Prerequisite: 5.010 or 5.0101.

5.422 Mechanics of Solids II/Materials  F L2T2½
Prerequisites: 5.421 or 5.040 or 5.020 or 8.171, 10.001.

5.4221 Mechanics of Solids II  F L1½T2
Prerequisites: 5.020 or 5.421 or 8.171, 10.001.

5.423 Mechanics of Solids III  F L1½T½
Prerequisites: 5.422 or 5.411 or 5.4221, 10.022.

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; crack propagation.

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: 5.412 or 5.423, 5.300 or 5.330, 5.611 or 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 18.143.
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
Prerequisite: 5.423.
Buckling of perfect and imperfect columns; bending and buckling of thin flat plates; local instability and crippling of thin-walled columns. Buckling of monocoque cylinders and curved panels. Stiffened panels. Tension field beams.

5.622 Fluid Mechanics/Thermodynamics
Prerequisites: 10.001 or 10.011, 1951 or 1.001 or 1.011, 5.010 or 5.0101. Co-requisite: 5.300 or 5.330 (for students in Faculty of Engineering only).
Comprises 5.6221, 5.6222, 5.6223.

5.6221 Introductory Thermo Fluids
Prerequisites: 5.611 or 5.622. Excluded: 5.621. Co-requisite: 5.653.

5.6222 Fluid Mechanics
Prerequisite: 5.611 or 5.622. Co-requisite: 5.653.

5.6223 Thermodynamics

5.623 Heat Transfer
Prerequisite: 5.611 or 5.622, 10.022

5.624 Refrigeration and Air Conditioning
Prerequisite: 5.611 or 5.622. Co-requisite: 5.623, 10.022.
Psychrometry and air conditioning calculations, heat load, estimates, vapor compression, absorption and air cycle refrigeration, refrigeration and air conditioning systems and components, cryogenic cycles.

5.633 Turbomachines
Prerequisites: 5.611 or 5.622, 10.022. Co-requisites: 5.073, 5.663.
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 a centrifugal machine.

5.6341 Viscous Flow Theory
Prerequisite: 5.611 or 5.622, 10.022.

5.6342 Lubrication
Prerequisite: 5.611 or 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 extremely pressurized bearings, squeeze films.

5.635 Convection Heat Transfer
Prerequisite: 5.623.
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, Fricion and heat transfer inside tubes: laminar and turbulent flow, relation between friction and heat transfer.

5.643 Thermodynamics and Combustion
Prerequisite: 5.611 or 5.622, 10.022. Co-requisite: 5.653.
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. Deflagration, detonation and diffusion flames, mixing controlled reactions.
5.644 Solar Energy
Prerequisite: 5.611 or 5.622, 10.022. Co-requisite: 5.623.

5.653 Compressible Flow
Prerequisite: 5.611 or 5.622; 10.022.
Part 1, below is compulsory for Aeronautical Engineers and forms a component of 5.811 — (7 weeks only).
1. One dimensional steady flow: isentropic channel flow, normal shock waves, supersonic wind tunnels and diffusers, flow visualization. 2. Two dimensional steady flow: oblique shock waves, Prandtl-Meyer expansions, nozzles, airfoils. 3. 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
Prerequisite: 5.611 or 5.622; 10.022.
Mass oscillations in surge systems with various types of surge tanks. Stability of surge systems, comparison with experiment. Alliev's theory of water hammer, fast and slow closures, water hammer in pumping systems, circle diagrams.

5.663 Potential Flow Theory
Prerequisite: 5.611 or 5.622; 10.022. Co-requisite: 5.073. Excluded: 5.811.

5.664 Multiphase Flow
Prerequisite: 5.611 or 5.622; 10.022.

5.800 Aircraft Design I
Prerequisites: 5.122 or 5.111, 5.300 or 5.330, 5.422 or 5.411. Co-requisites: 5.423 or equivalent.
Session 1: As for 5.123. Session 2: Aircraft types, materials, loads, load factors. The design process: Design of members in tension, compression, bending, torsion, riveted, welded and bolted joints. Wing lift distribution, stressig, design and drawing of components, fittings.

5.801 Aircraft Design II
Prerequisites: 5.303, 5.412 or 5.423; 5.800; 5.811; 5.822. Co- or prerequisite: 5.612, 5.823, 5.831.
A co-ordinated course of lectures in aerodynamics, structures and operations leading to detailed design, calculation and drawing of an original aircraft configuration.

5.811 Aerodynamics I
Prerequisites: 5.300 or 5.330, 5.611 or 5.622; 10.022. Excluded: 5.811.

5.812 Aerodynamics II
Prerequisites: 5.073, 5.612 or 5.811; 5.303 or 5.331 or 5.333 or 5.334; 5.343.

5.822 Analysis of Aerospace Structures I
Prerequisites: 5.300 or 5.330, 5.411 or 5.422, 8.259; 10.022. Co- or prerequisite: 5.412 or 5.432.
Equilibrium of forces: aerospace applications of plane frames and space structures. Beams; shear and bending stress distribution in thin-webbed beams, close-section thin-wall beams, tapered beams, beams with variable flange areas. Semi-monocoque structures; ribs and bulkheads. Deflection of structures: stresses due to torsion and shear in multi-cell tubes. Statically indeterminate structures; beams, trusses and frames. Flexibility method; elastic centre method; moment distribution method. Aircraft materials; dimensionless stress-strain data.

5.823 Analysis of Aerospace Structures II
Prerequisites: 5.412, 5.423, 5.822.
Structural instability; buckling of perfect and imperfect columns; bending and buckling of thin flat plates, local instability and crippling of thin-walled columns, buckling of monocoque cylinders and curved panels; tension field beams. Stress functions. Shear lag. Warming of thin-walled open and closed section tubes. Torsional buckling. Sandwich construction and analysis. Composite materials; elementary analysis.

5.831 Aircraft Propulsion
Prerequisites: 5.611 or 5.622; 5.653 or 5.811.
5.901 Introduction to Mathematical Modelling and Decision Making  
Prerequisite: 5.122 or 5.111.

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, inward rating comparisons, sensitivity; pitfalls; introduction to project control. Applications from the marine field.

5.902 Ship Management Economics  
Prerequisite: 10.022. Co- or prerequisites: 5.071 or 5.073.

1. Engineering Economy portion of 18.021. 2. 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.

5.911 Ship Hydrostatics  
Prerequisites: 5.010 or 5.0101.

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 I  
Prerequisites: 5.422 or 5.411; 10.022.


5.922 Ship Structures II  
Prerequisites: 5.423 or 5.412; 5.921.


5.933 Principles of Ship Design III  
Prerequisite: 5.932.


5.934 Ship Design Project  
Prerequisites: All subjects in Years 1, 2 and 3. Co- or prerequisites: 5.922, 5.933, 5.941.

Design of a vessel to provide characteristics of hull form, preliminary general arrangement, lines plan, hydrostatic curves, investigation of stability and trim, structural profile and midship section, capacity, freeboard, tonnage, floodable length (if applicable), power requirements, propeller design, investigation of vibration, rudder design and final general arrangements.

5.9311 Principles of Ship Design I  
Prerequisites: 5.933, 5.941.


5.9312 Principles of Ship Design II  
Prerequisite: 5.9311.


5.937 Ship Design Project  
Prerequisites: 5.901, 5.911, 5.953.

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, preliminary midship section. 4. Hydrostatics, floodable length 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.

Subject Descriptions

5.953 Ship Hydrodynamics

Prerequisites: 5.330 or 5.330; 5.611 or 5.622; 10.022. Co-requisite: 5.073.

1. 5.663 (Potential Flow Theory) in Session 1

Graduate Study

5.045G Advanced Topic in Mechanical Engineering

5.046G Advanced Topic in Mechanical Engineering

5.047G Advanced Topic in Mechanical Engineering

Subjects which may be offered by a Visiting Professor for graduate credit.

5.073G Ordinary Differential Equations in Mechanical Engineering

Excluded: 5.072G or equivalent.

Solutions and their meaning: integration constants, linearity; special methods of solution; integration factors; variation of parameters; Euler, higher order linear equations; physical origins of ordinary differential equations and linear systems; linearization of engineering problems; stability of engineering systems.

5.075G Computational Methods in Mechanical Engineering I

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


5.076G Computational Methods in Mechanical Engineering II

Prerequisites: 5.072 (Computing strand) or 5.072 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 or 6.631 or equivalent.

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

5.087G Microprocessor Fundamental for Mechanical Engineers

Prerequisite: 5.086G or equivalent. Excluded: 6.031, 6.432, 6.613, 6.060G, 6.433G, 6.651G or 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.

5.151G Refrigeration and Air Conditioning Design I

Prerequisite: 5.624 or equivalent.

5.152G Refrigeration and Air Conditioning Design II

Prerequisite: 5.151G or equivalent.


5.307G Dynamics I

Excluded: 5.304G and equivalent.

5.308G Dynamics II

Prerequisite: 5.307G or equivalent. Excluded: 5.305G and equivalent.

5.317G Industrial Robotics C3

Prerequisite: 5.086G or equivalent.


5.318G Advanced Mechanism Analysis and Synthesis I C3

Excluded: 5.315G and equivalent.

5.319G Advanced Mechanism Analysis and Synthesis II C3

Excluded: 5.316G and equivalent.

A selection of topics from Planar mechanisms: kinematic analysis of complex mechanisms; kinetic analysis; kinematic geometry; precision position synthesis. Cams: basic and common curves, equations of motion; development of profile; determination of system geometry and mechanical properties, noise, wear, backlash and manufacture. Spatial linkages: structural analysis; closure equations; screw system algebra; special configurations.

5.328G Control and Modelling of Mechanical Systems I C3

5.329G Control and Modelling of Mechanical Systems II C3

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 C2

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 C3

Prerequisite: 5.324 or 5.344 or equivalent. Excluded: 5.321G or equivalent.


5.346G Non-Linear Control Systems C3

Prerequisite: 5.324 or 5.344 or equivalent. Excluded: 5.322G or equivalent.


5.401G Experimental Stress Analysis C2

Grid technique; Moire fringe method; photoelasticity; crack detection techniques. Class project.

5.414G Finite Element Applications C3

Introduction to finite element and associated graphics packages. Principles of mesh design and validation. Specification of boundary conditions including use of symmetry. Estimation of the cost of solution. Interpretation of results. Assessment of the accuracy of the results. Convergence to the exact solution. Selection of applications from linear and non-linear elasticity — three dimensional solids, plates and shells, plasticity, buckling and post-buckling behaviour, thermal stresses, dynamics including natural and forced vibration.

5.415G Stress Analysis for Mechanical Engineering Design I C3

Prerequisite: 5.412 or 5.423 or equivalent. Excluded: 5.421G-5.424G or equivalent.

5.416G Stress Analysis for Mechanical Engineering Design II C3

Prerequisite: 5.412 or 5.423 or equivalent. Excluded: 5.421G-5.424G or equivalent.


5.417G Mechanics of Fracture and Fatigue C3

Excluded: 5.428G and 5.429G or equivalent. 5.424.

5.601G Computational Fluid Dynamics C3
Prerequisite: 5.076G or equivalent.

5.616G Internal Combustion Engines I C3
Prerequisite: 5.653 or equivalent. Co-requisite (for undergraduates): 5.643. Excluded: 5.615G or equivalent.

5.617G Internal Combustion Engines II C3
Prerequisite: 5.615G or 5.616G or equivalent.

5.621G Gasdynamics I C2
Prerequisite: 5.653 or equivalent.

5.622G Gasdynamics II C2
Prerequisite: 5.653 or 5.621G or equivalent.

5.631G Lubrication Theory and Design I C2
Excluded: 5.634 or 5.6342.
Hydrostatic lubrication, squeeze films, hydrodynamic lubrication, slider bearings, tilting pad thrust bearings, journal bearings, practical journal and thrust bearing design; air bearings, friction, wear; dry boundary lubrication; lubricant, bearing material selection; anti-friction bearings.

5.632G Lubrication Theory and Design II C2
Prerequisite: 5.634 or 5.6342 or 5.631G or equivalent.

5.653G Acoustic Noise I C2
Excluded: 5.3542.

5.654G Acoustic Noise II C2
Prerequisite: 5.3542 or 5.653G or equivalent. Excluded: 5.3541

5.655G Energy Conservation and System Design C3
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 I C3
Prerequisite: 5.623 or equivalent. Excluded: 5.718G, 5.719G, 5.721G or equivalent.

5.717G Advanced Heat Transfer II C3
Prerequisite: 5.523 or equivalent. Excluded: 5.712G, 5.713G or equivalent.

5.722G Solar Thermal Energy Design C3
Prerequisite: 5.721G or equivalent. Excluded: 5.720G or equivalent.
Engineering

5.751G Refrigeration, Air Conditioning and Cryogenics I
Prerequisite: 5.624 or equivalent.

5.752G Refrigeration, Air Conditioning and Cryogenics II
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; resorption 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.

5.758G Refrigeration and Air Conditioning Applications

5.909G Project

5.912G Naval Hydrodynamics I
Prerequisite: 5.663 or 10.411A or equivalent.

5.913G Naval Hydrodynamics II
Prerequisite: 5.912G or equivalent.

Advanced treatment of topics selected from: ship waves and ship resistance, ship manoeuvrability, 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

Undergraduate Study

6.010 Electrical Engineering I
Prerequisite: Electricity and magnetism section of 1961.

An orientation subject to acquaint students with the various areas and problems of Electrical Engineering. Some aspects of energy conversion and transmission: electronics; logic, number systems, computers and microprocessors; systems and circuit theory; probability, information and communication. Laboratory exercises and project work in these areas include instrumentation and device characteristics.

6.021A Circuit Theory I
Prerequisites: 1961 or equivalent, 6.010, 10.001.


6.021B Power
Prerequisite: 6.021A attempted at an acceptable level.

An introduction to the transmission, distribution and utilization of electrical energy including devices which use the interaction of electric, thermal and magnetic fields. Topics include a revision of three-phase circuit analysis, magnetic circuits, transformers, and basic electromechanical energy conversion.

6.021C Electronics I
Prerequisite: 1982, 6.021A (one of those 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

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  
Prerequisite: 10.001.
Combination circuits, Karnaugh maps, Sequential circuits, Register design, MOSFET circuits, Logic families, Memory elements, Computer magnetic storage devices. MSI/LSI functions, Computer operation, Numbers, codes, arithmetic, standards.

6.0311 Circuit Theory II  
Prerequisites: 6.021A, 10.111A (if attempted at an acceptable level may be taken as a co-requisite), 10.1113, 10.1114, 10.2111, 10.2112 (one 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 Chebbyshier filters. Transformation of low pass filter to high pass, bandpass and band stop filters.

6.0312 Utilization of Electric Energy  
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, the thermal behaviour and rating of machines, harmonics in three-phase transformers.

6.0313 Electronics II  

6.0314 Systems and Control I  
Prerequisite: 6.0311.

6.0315 Electrical Energy  
Prerequisite: 1.972; 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. Symmetrical fault calculations and protection for medium voltage systems — circuit breakers, fuses, relays, surge divertors and their application. Electrical methods of industrial heating: direct, induction, dielectric, arc furnace, etc. Light sources: their operation and efficacy, ac-dc conversion, power switching devices, their characteristics and uses.

6.0316 Electronics III  
Prerequisite: 6.0313. Co-requisites: 6.0311, 6.021E.
Extension of 6.0313 Electronics II to include oscillators, large-signal electronics of bipolar and field-effect transistors, charge-control switching analysis for bipolar and field-effect transistors, power amplifiers, waveform generators and shapers, monostables, astables, and an introduction to digital electronics, with an increasing emphasis on integrated circuit realizations.

6.0317 Communication Systems I  
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 communication.
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  
Basic computer organization, architecture of a modern microprocessor: memory chips, bus structures; instructions and addressing modes; translation from a higher level language to assembler code; program development — assemblers, debugging, subroutines and documentation; extending the system-address decoding; details of instruction fetching and execution; interfacing to parallel and serial external devices; interrupts and real time processing; timer chips.

6.041 Electrical Measurements  
Prerequisites: 6.0311, 6.0313.
A course of lectures and laboratory work of one session's duration treating basic electrical measurements using null or deflection techniques with analog or digital presentation in the range from DC to an upper frequency limit where lumped circuit techniques begin to be inadequate.

6.042 Digital and Analogue Signals  
Prerequisites: 6.0311, 10.033, 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) Hilbert 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  
**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 I  
**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.

6.203 Power Engineering — Systems II  
**Prerequisite:** 6.202.


6.212 Power Engineering — Utilization  
**Prerequisites:** 6.0312, 6.0315.

Topics include: machines and electrical drives, applications and control in particular using power rectifiers and thyristors, unified machine theory; application of symmetrical component theory to the operation of induction motors; frequency changing; electrical equipment for hazardous atmospheres. A program of experimental projects and design applications accompanies the lectures.

6.222 High Voltage and High Current Technology  
**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 to 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 High Frequency Circuits and Electronics I  
**Prerequisites:** 6.0311, 6.0316, 6.0317.

Fundamental aspects of high frequency and microwave circuits and electronics. TEM transmission lines, with emphasis on coaxial and microstrip lines and components. Introductory antenna theory: phased arrays and wide-band antennas. Two-port characterization, scattering parameters and noise theory, with application to high frequency bipolar and field effect transistors.

6.313 High Frequency Circuits and Electronics II  
**Prerequisite:** 6.303.

The material extends 6.303 High Frequency Circuits and Electronics I into further areas of high frequency and microwave circuits and electronics: Plane wave propagation and application to terrestrial communications. Waveguide theory and optical fibres. Microwave oscillators and amplifiers. Sources and detectors for optical communications.

6.322 Electronics IV  
**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 IC's using MOS logic, change-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 IIA  
**Prerequisite:** 6.0317 (Pass Conceded (PC) awarded prior to Session 2, 1983, is not acceptable for this subject), 10.033, 10.361.

Theory and practice of modern analogue and digital communication techniques. Topics include: Digital communication (representation of signals as vectors, matched filter, correlation receiver, spectrum bandwidth, line coding, adaptive equalization), Information Theory (mutual information and entropy, source encoding, rate distortion function, 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 IIB  
**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 Biology and Physiology for Engineers  
**Prerequisite:** 10.361.

Bringing the language barrier between biology and engineering. Some problems and techniques of biology and medicine encountered by the biomedical engineer. Cells, tissues and organs, with emphasis on their system, function and characteristics.
6.412 Systems and Control II
Prerequisites: 6.0311, 6.0314.

The design and analysis and identification of single and multivariable feedback control systems as encountered in industrial processes. Emphasis on the synthesis of a prescribed dynamic performance via both transient and frequency domain methods. Consideration of the effects of nonlinearities on the system performance. Simulation and computer-aided design.

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

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.

A course designed to introduce electrical engineering students to the practice of engineering techniques applied to the biological and medical fields. The lectures are supplemented by demonstrations and experimental work, and deal with medical instrumentation and measurement techniques and modelling of various types of biological systems.

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 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, STTL 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, transmission line behaviour of interconnections, gate arrays, structured chip design, system architecture, computer-aided design, layout considerations, timing estimates, design for testability.

6.606 Computing Science Honours

6.611 Computing I
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
Prerequisites: 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
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: 6.0316.

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 IIA
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 I. 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
S2 L3T2


6.631 Computing II B
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 IIC
S1 or S2 L3T2
Prerequisite: 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
S1 L3T2
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: 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 multiway 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
S2 L3T2
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
S1 L3T2
Prerequisite: 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, 45.1012 or equivalent. Excluded: 6.622.

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 queueing 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, debtors and creditors; 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 or 6.647.

Not offered in 1984.

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/I, 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  


6.652 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.

6.851R Electronics and Instrumentation  
Prerequisite: 1.001 or equivalent.

An applications-oriented introduction to electronics. Provides a basis of circuit theory and elementary electronics and then treats filters, frequency response, general amplifier characteristics, operational amplifiers and their use in instrumentation, power supplies, analog computers and their use in modeling non-electrical systems. Included is a project illustrating the application of electrical engineering to other disciplines.

6.852R Electrical Machinery and Supply  
Prerequisites: 6.851R.

A user-oriented introduction to the usage of electrical power in industry, covering the characteristics and selection of electrical machinery, its interface with the prime power supply, protection, electrical safety and compliance with Australian standards. Included in the subject is a project illustrating the application of electrical engineering to various aspects of industry.

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.

6.902 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. Students are required to submit to the School evidence from their employers confirming completion of the prescribed training. Experience claimed as an industrial elective would cover requirements for this subject.

6.911 Thesis  
This is done in the last two sessions of the BE degree course. For full-time students, two hours per week in the first session, and three days 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.

Subject Descriptions
Graduate Study

6.050G Occasional Elective — Digital Signal Processing
Prerequisite: 6.042 or 6.341G or similar Excluded: 6.150G (1980 version)

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 and possibly radar and sonar. Topics to be included are: interpolation and decimation of digital signals with applications in telecommunications (e.g. TDM/TFM transmultiplexers); linear prediction with autoregressive (AR) and moving average (MA) parameter estimation applied to spectrum estimation and speech analysis, least mean-square adaptive and predictive deconvolution (including Wiener and Kalman filtering), with applications in impulse response restoration and the removal of noise and echoes in communication systems, and seismic signals; short-time Fourier analysis and synthesis and homomorphic signal processing for speech and seismic signals; two dimensional digital signal processing with applications in image de-blurring and data compression. Practical work includes computer assignments and the use of special purpose programmable hardware signal processors.

6.060G Microprocessor Systems
Prerequisites: 6.021C and 6.021D, or 6.620 and 6.021E, or 6.631.
Excluded: 6.0318, 6.013, 5.007G, 5.086G.

LSI technologies and devices. Microprocessor integrated circuits. Outline of system configurations. Microprocessor busses, control signals and timing. Programming models and instruction sets. Programming including addressing modes, arithmetic and I/O. Memory devices including RAM, ROM, EPROM. Input/output devices and support chips. Parallel and serial I/O devices. Direct memory access. Interrupt systems. Microcomputer system devices including cassette tape, floppy disk, keyboards, LED and video displays. System development software including monitors, PROM programers, editors, assemblers and higher level languages. Development tools, logic state analyzers, emulators. The course will include laboratory involving both hardware and programming experience.

6.073G Precise Electrical Measurements
Prerequisites: 6.0311, 6.0313, 6.041 or equivalent.

An advanced course primarily devoted to the special problems of precision measurements at DC and audio frequencies. Establishment of electrical standards.

6.074G Superconductivity

The theory of superconductivity and its application. Includes loss mechanisms, ac losses, flux jumps, superconducting materials, applications to electrical apparatus.

6.150G Communications Elective — Applied Optoelectronics


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, including earthing, thermal rating, electric heating, contact effects, laser action, surface electron emission, etc; a brief outline of some measurement techniques applicable to the above.
6.164G Microwave Antenna Theory and Applications C3

Co-requisite: 6.167G or similar.


6.167G Propagation and Transmission of Electromagnetic Waves C3


The principles and applications of solid state and electron tube microwave devices. Includes: Gunn, IMPATT, TRAPATT and PIN diodes; mixers and detectors; space charge waves; travelling wave tubes, klystrons and crossed-field devices.

6.169G Microwave Circuits: Theory and Techniques C3

Co-requisite: 6.167G or similar.

Properties of microstrip transmission lines and the theory and design of microwave integrated circuit components and systems. Includes: microwave measurement techniques, waveguide components and applications.

6.170G Microwave Electronics C3


The principles and applications of solid state and electron tube microwave devices. Includes: Gunn, IMPATT, TRAPATT and PIN diodes; mixers and detectors; space charge waves; travelling wave tubes, klystrons and crossed-field devices.

6.221G High Voltage Technology C3

Prerequisite: 6.202 or equivalent. Not usable for the Power Electives.

Introduction to the technology involved in the design and testing of high voltage power system equipment.

6.224G Partial Discharges in Electrical Insulation C3

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 C3

Prerequisite: 6.202 or 6.222 or equivalent.

Selection from: design test requirements. Forms of high voltage work 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 C3

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 arresters and protection for lines and substations. Power and the line coupling capacitors, bus bars, connectors, cables and bushings. Line carrier systems.

6.234G Power System Protection C3

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 C3


6.250G Power Elective I C3

As for 6.350G Solid State Electronics Elective.

In 1984, taught by Professor B. Manhire, Ohio University, this subject is Power System Economics: Real rate of return and present worth analysis: marginal cost pricing and economic efficiency: production costing: expansion planning: tariffs.

6.251G Power Elective II C3

As for 6.350G Solid State Electronics Elective.

6.256G Underground Systems C3

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 system design criteria. Coordination 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 time-division multiple access, ALOHA systems, spread spectrum systems, direct sequence systems, interference rejection, jamming margin, error correction techniques using block and convolutional codes.

6.337G Sound Broadcast Systems  
Prerequisites: 6.167G, 6.341G or similar.

Theory and practice of sound broadcasting systems. 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. Includes: analogue and digital integrated circuits (including ADCs, DACs, PLLs, VCOs, multipliers, etc., and a survey of the main digital IC families); high-frequency and noise performance of active and passive circuits, particularly those using transistors; transistor ratings; microwave ICs; microstrip, thick film, and thin film circuits; COGs and SAW devices, and their use in signal processing; introduction to active and other filters; factors involved in the 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, including digital filtering. 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 6.348G 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 and digital filters. Includes: overview of modern filter methods, the approximation problems for analogue and digital filters, active filters and digital filters. In addition: classical LC filters, sensitivity and parasitics, equalizer design, adaptive and/or non-linear equalization, mechanical filters, other signal processing techniques.

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 ducibinary). 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, OAPSK, 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, optical detectors and receiver design, measurements on optical fibres, system performance, wide-band systems and future systems, applications to power and military systems.

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 I  
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.

6.453G Computer Methods of Optimization  
Use of digital, analog and hybrid computers for the solution of optimization problems in engineering. Includes: constrained and unconstrained minimization, review of search techniques, optimal control and the two point boundary value problem. Linear quadratic problems and minimum time schemes. All methods are implemented on the computer.

6.455G Systems Identification and Modelling  
Develops the basic techniques used in System Identification and Modelling. Topics include: representation of static and dynamic systems; parameter estimation; Maximum Likelihood Estimation methods; nonparametric methods; time series; spectral methods; pseudo random noise methods; recursive methods, least squares; analysis of residuals; accuracy, goodness of fit; adaptive systems (on-line estimation).

6.456G General Concepts in Formal System Theories  
Provides fundamental concepts common to many formal abstract system theories reflecting different aspects of the physical systems, which are their bases. Input-output, state transition, fuzzy, axiomatic-hierarchical and evolutionary representations will be reviewed with discussion based on differential and discrete models, and some form of pulsed automata. Basic concepts presented include the state properties and basis functions for linear systems; equivalence and reduction, structure, decomposition and interconnection; complexity; accessibility of states and stability considerations.

6.457G Cybernetic Engineering  
The fundamentals of cybernetic engineering, the genesis of cybernetics, machines modelled on life and the evolution to present day robots. Includes: biological information transmission (biochemical coding and control, genetic and neural), pattern recognition learning systems and perceptions, sub-systems of the human brain, and 'functional' descriptions for a Cybernetic Brain, an introduction to industrial manipulators and third generation robots; self-organizing control for manipulators and robots and the social consequences of flexible automation with industrial robots.

6.458G Decision and Syntactic Systems for Digital Pattern Recognition  
Concepts and techniques in decision-theoretic pattern recognition systems with an in-depth study of both non-parametric and parametric methods. Includes: pattern, feature and classification spaces, feature selection, linear discriminant functions and training algorithms; piecewise linear discriminant functions; decision rules; the Bayes framework, approximation of probability densities, clustering and dimensionality reduction. Structural pattern recognition, including such topics as formal linguistics, primitives, grammar and syntax analysis as a recognition procedure.
6.459G Control Computing
Prerequisites: 6.412 and 6.021D.
Review of fundamental principles of digital and analog computation with special reference to 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.

6.460G 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 systems. 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.

6.464G 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 Varian computer. Topics include: time domain methods, pole shifting, state decoupling, optimal control; frequency domain methods, inverse and direct Nyquist methods, characteristic locus.

The fundamentals of image processing including such topics as visual perception and the image model; uniform and non-uniform sampling and quantization; image transforms; image enhancement, sharpening and smoothing; image restoration and least squares filtering; image encoding mapping, quantizing and encoding; image segmentation and description, grammars, languages and similarity. Material oriented towards scene analysis and world models for industrial robots including scenes; labelling; shadows; shape information; structural descriptions and representing knowledge; computer vision for robots.

6.468G Computer Display Systems and Interactive Instrumentation
Prerequisite. 6.060G.
Man-machine-process communication and control, and associated microprocessor based instrumentation. Review of appropriate analog and digital technology. Microcomputer hardware and programming for interactive communication using both machine and high-level languages. Display devices, operating principles and performance limitations. Hardware and software techniques for computer-generation and processing of pictures. Colour and movement. Interactive design and graphics creation. The geometry of transformations and projections. Light pens and other input devices. Non-visual communications including speech input-output.

6.470G Advanced Topics in Control — Robotics, Automation and Productivity Technology
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 — Compartmental System Analysis
Compartmental system analysis, an important branch of system theory and design, serves to unify modelling and analysis in many diverse fields. It has wide application in pharmacokinetic, metabolic, ecosystem and chemical kinetic modelling, 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 identification and control.

6.472G Feedback Control II
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 Biology and Physiology for Engineers
Excluded: 6.402.
Bridging the language barrier between biology and engineering. Some problems and techniques of biology and medicine encountered by the biomedical engineer. Cells, tissues and organs, with emphasis on their system, function and characteristics.

6.484G Biological Signal Analysis
Excluded: 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  
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  
Theory and characteristics of semiconductor devices, notably bipolar transistors, field effect transistors, and thyristors. The course discards many of the simplifications and generalizations made in the undergraduate treatment of transistors.

6.575G Integrated Circuit Technology  
Prerequisite: 6.512 or 6.522 or equivalent.
Fabrication processes for MOS and bipolar integrated circuits. Maskmaking, photolithography, oxidation, diffusion, ion implantation, selective oxidation, plasma processing, silicon deposition, conductor systems and contacts. Advanced technologies. Packaging methods, including hybrid technology.

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, development 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: 6.575G (preferred) or 6.0316.
May be taken concurrently with 6.650G 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, multipliers, D/A and A/D converters. Digital circuits include gates, compound functions, RAM, ROM, speed and power analysis. Economics and yield analysis for MSI, VLSI and VLSI devices.

6.578G Solar Energy Conversion  

6.579G Solar Cells — Operating Principles, Technology, and System Applications  
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  
Prerequisites: 10.361 or similar.
Techniques for extracting information from remotely sensed data with particular emphasis on satellite imagery. Topics taken from: nature and characteristics of earth resources and related satellites; satellite sensors and data formats; image enhancement techniques, image classification methods, including clustering, classification and feature selection; image classification methodologies; new horizons in remote sensing image analysis.

6.587G Computer Techniques in Remote Sensing Image Analysis  
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, BICER, LASP; implementation of classification methodologies; introduction to image processing hardware and associated operating systems; interactive image processing.

6.550G Computer Science Elective — VLSI System Design  
Prerequisites: 6.021E, 6.0316, 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  
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  
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
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
Prerequisite: 6.641 (Pass Conceded (PC) awarded prior to Session 2, 1983, is not acceptable for this subject). Excluded: 6.643, 6.602D.
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
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
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
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 multiway trees; graph representations and algorithms; pattern matching algorithms. NP — complete problems. Design and specification of programs: modularization, interface design. Introduction to formal specification techniques.

6.661G Business Information Systems

6.662G Computing Practice

6.909G Project

6.918G Project Report

6.936G Thesis

Servicing Subject

6.680G Files and Database Systems
File structures, database management systems and file interrogation systems in a text processing or bibliographical environment. Topics include relations, their mapping and normalization; access methods; data organization; independence, integrity and security; CODASYL databases, relational databases and query languages.
Mining Engineering

Undergraduate Study

7.124 Coal Face Mechanization F L1T1

7.214R Mine Economics and Planning F L2T1
Prerequisite for 7.214: 7.113.

7.224R Operational Management F L1T½

Civil Engineering

Undergraduate Study

8.001 Industrial Training
Prerequisite: 8.670. Requirement for the Bachelor of Engineering Degree.
Students are required to complete a minimum of sixty working days of approved industrial training and submit a report on this training before the fourth week of Session 1.

8.012 Elements of Architecture SS L2T1
Introduction concerning the influence of structural technique in the past on architectural styles. Effect of modern structural engineering systems on architecture. Responsibilities of the structural engineer as a consultant.

8.014 Computer Applications in Civil Engineering SS L2T1
Prerequisites: 8.2733, 8.351 or 8.362, 8.360.
Advanced programming techniques such as the use of tapes, discs and plotter. Applications of advanced computational methods to structural analysis, geotechnology and flow problems.
8.018 Construction Engineering  
Prerequisites: 8.671, 8.312 or 8.301.

Advanced construction methods and techniques with special reference to major civil engineering projects under construction in Australia.

8.019 Railway Engineering  

8.020 Hydrology  
Prerequisite: 8.582.

Flood estimation with particular reference to design and flood forecasting. Outline of current practices and recent developments. Discussion of possible/likely implications of recent developments for the practising engineer.

8.021 Environmental Aspects of Civil Engineering  
Prerequisite: 8.301 or 8.312.

Examination of the professional issues arising from the environmental impact of civil engineering planning, design and construction. Methodologies for environmental impact evaluation and general project evaluation. Environmental legislation, institutional procedures and decision-making processes. Case studies and project work in the above context.

8.023 Hydrodynamics  
Prerequisite: 8.572.

Equations of continuity, motion and vorticity; stream function and velocity potential function; Laplace equation; standard flow patterns; practical applications.

8.024 Foundation and Dam Engineering  
Prerequisite: 8.2732.


8.025 Structural Failures  
Prerequisites: 8.174, 8.182.

Case studies of significant structural failures and distress during concept, construction, design and use. Modes, causes, consequences, responsibilities, corrective procedures.

8.026 Systems Methods in Civil Engineering  
Prerequisite: 8.672.

The development of models for the definition, design, and control of engineering problems in construction project management. Influence of decision level on systems model formulation. Case study approach coupled with field investigations and group projects. All students are required to visit a nominated field site as an integral part of the subject.

8.027 New Materials I  
Prerequisite: 8.2722.


8.028 New Materials II  
Prerequisite: 8.1822, 8.2722.


8.029 Continuum Mechanics  
Prerequisite: 8.172.

Concept of continua. Mathematical foundations, analysis of deformation, strain and stress, fundamental laws of continuum mechanics, constitutive equations, mechanical properties of solids and fluids, simple problems in elasticity.

8.030 Construction Management  
Co-requisite: 8.672.

Civil Engineering construction organization, management and control.

8.0301 Engineering Drawing  
As for 5.0301.

8.031 Construction Project Finance  
Co-requisite: 8.672.

Civil Engineering construction project feasibility, financial management, cash flow, cost control, insurance and company finance.
8.032 Construction Law

Prerequisite: 8.672.

The legal system, court procedures, sources of legal information, areas of liability for the professional engineer. The basic rules and concepts of the laws of tort and contract, with particular reference to their application to construction work. Case studies of significant litigation involving construction engineers and their actions. Arbitration as an alternative means of settling disputes.

8.033 Industrial Law and Arbitration

Prerequisites: 8.672, 8.032.


8.034 Engineering Economy

Prerequisite: 8.672.

Economic evaluation of civil engineering projects, including benefit-cost analysis and rate of return analysis.

8.038 Special Topics in Reinforced Concrete Design

Prerequisite: 8.1822.

General design process; limit states concepts. Design for bending and compression; ductility. Biaxial bending. Shear and torsion. Servicability design.

8.039 Computer Programming

Excluded: 8.360.

Introduction to the use of higher level programming languages such as PASCAL and FORTRAN and the principles of program design. Computing techniques. Development of software and its applications.

8.040 Advanced Engineering Geology

Prerequisite: 8.2721.


8.041 Geological Engineering

Prerequisite: 8.2721.


8.042 Water Resources

Resource systems approach to the problem of matching, by means of engineering works, the supply of water and the demand for water. The design and operation of water resource systems.

8.043 Public Health Engineering

Prerequisite: 8.581.


8.047 History of Civil Engineering

A study of the theoretical, practical and sociological aspects of the development of civil engineering, including its relationship to other disciplines.

8.051 Design Project — Materials

Final year design in the field of civil engineering materials.

8.052 Design Project — Structures

Prerequisite: 8.191 (students who have failed this subject may apply for permission to enrol simultaneously in this subject and the subsequent subject).

Final year design project in the field of structural engineering.

8.053 Design Project — Water

Prerequisite: 8.573 or 8.582 or 8.581.

Final year design project in the field of hydraulics and water resources.

8.054 Design Project — Engineering Construction

Prerequisite: 8.672.

Final year design project in the field of engineering construction and management.

8.055 Applied Structural Analysis

Prerequisite: 8.191. (Students who have failed this subject may apply for permission to enrol simultaneously in this subject and the subsequent subject).

Practical application of methods of structural analysis both for a small design office (with programmable calculator) and a design office of moderate or large size (with mini-computer, terminals and commercial programs.)

8.056 Practical Structural Design

Prerequisite: 8.191. (Students who have failed this subject may apply for permission to enrol simultaneously in this subject and the subsequent subject).

Choice of structural system, approximate methods of analysis, preliminary proportioning of members. Checks on design calculations and computer output. Domestic structures: home-unit building design; steel industrial buildings; design of stairs and lift shafts; design of floor systems.
8.057 Special Topics in Prestressed Concrete  
Prerequisite: 8.1621.

Historical development, methods of prestressing, general flexural theory, calculation of losses, anchorage zone design, partial prestressing.

8.058 Special Topics in Steel Design  
Prerequisites: 8.174, 8.1821.

Plastic analysis and design of steel members and frames. Elastic-plastic material behaviour, moment-rotation relations. Lower bound and upper bound theorems. Plastic design steel structures.

8.059 Structural Vibrations  
Prerequisite: 8.174.

Importance of structural dynamics in civil engineering; earthquake effects and design requirements in buildings and other structures; wind loads on structures. Review of basic methods in dynamic analysis, with structural applications.

8.060 Numerical Methods in Geotechnology  
Prerequisite: 8.2732, 8.2733.

Introduction to finite element methods; application of finite element and finite difference techniques to various soil mechanics and rock mechanics problems such as stability analysis of foundation, retaining walls, tunnel openings; prediction of settlement of footing, piles and raft foundations; seepage and consolidation analysis.

8.062 Construction Camp  
Prerequisite: 8.672. Co-requisite: 8.030.

A one week field camp involving several of the following: Falsework systems and field productivity measurement; Optimization of earth-moving equipment performance; Concrete pumping systems; Pile driving practice and the measurement of performance parameters; Bridge erection techniques; Rock drilling and blasting design and management; Formwork design and erection and concrete pressure measurements; Operation of earthmoving plant and demonstration of plant capabilities; Noise measurements on construction sites; Prestressing calculations and measurements on a full scale beam; Crane capacity and productivity measurements; Dewatering systems and measurement of well point performance; Site investigation; Compaction.

8.063 River and Coastal Engineering  
Prerequisite: 8.573.

Sediment transport in channels and rivers. Coastal processes, wave characteristics and longshore transport. Design and use of hydraulic models.

8.081 Probability and Statistics for Civil Engineers  
Prerequisite: 8.351 or 10.381.


8.082 Numerical Methods for Civil Engineers  
Prerequisite: 8.362.


8.113 Civil Engineering for Electrical Engineers  
Prerequisites:

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 movements, 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.

8.170 Statics  
Prerequisites:  

<table>
<thead>
<tr>
<th>HSC Exam Percentile Range Required</th>
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</thead>
<tbody>
<tr>
<td>Either 2 unit Science (Physics) or 4 unit Science (multistrand) or 2 unit Industrial Arts or 3 unit Industrial Arts</td>
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<tr>
<td>31-100</td>
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</tbody>
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Planar concurrent and non-current forces. Equilibrium equations and graphical techniques. Internal actions in rigid bars. Statically determine pin jointed plane trusses.

8.171 Mechanics of Solids I  
Prerequisite: 8.170. (Students who have failed 8.170 may apply for permission to enrol in 8.170 and 8.171 concurrently).

8.172 Mechanics of Solids II
Prerequisite: 8.171.
Structural statics. Bending moments, shear force and torsion. Stresses due to bending moment and shear in solid and thin-walled sections, shear centre. Torsion of circular, non-circular and thin-walled sections. Principal stresses and strains; yield criteria. Combined stresses. Concepts of instability.

8.173 Structural Analysis I
Prerequisite: 8.172.
The analysis of pin-jointed trusses. The principle of work applied to trusses; forces in, and deformation of, statically determinate trusses. Statically indeterminate trusses (force method); displacement method of analysis; variational theorems; non-linear analysis.

8.174 Structural Analysis II
Prerequisite: 8.173.
Force and displacement transformations. Rigid jointed frames and their components; the principle of work applied to frames; forces in, and deformation of, statically determinate frames; force and displacement methods of analysis; moment distribution, moving loads.

8.1811 Structural Design IA
Prerequisite: 8.170, 8.171. Co-requisite: 8.172.

8.1812 Structural Design IB
Prerequisite: 8.172, 8.1811.

8.1821 Structural Design IIA
Prerequisite: 8.1812.

8.1822 Structural Design IIB
Prerequisite: 8.1812.

8.191 Structural Engineering
Prerequisites: 8.174 (See Note), 8.1821, 8.1822 (See Note).

8.271 Introduction to Materials
Types of civil engineering materials: historical development, characteristics, response to environment; material selection; traditional and new materials. Nature of materials: structure, imperfections, relationships of properties to structure; phase equilibria, iron-carbon system.

8.2721 Civil Engineering Materials I
Prerequisite: 8.271.

8.2722 Civil Engineering Materials II
Prerequisite: 8.271.

8.2731 Geotechnical Engineering I
Prerequisite: 8.2721.
Basic soil properties and classification for engineering purposes; soil water, soil suction and the effective stress law; steady flow of water through soils; consolidation of soil masses; failure and shear strength of soils; stress strain characteristics of soils.
Note: Students who have failed this subject may apply for permission to enrol simultaneously in this subject and the subsequent subject.
8.2732 Geotechnical Engineering II

SS L1T1
Prerequisite: 8.2731.

Site investigation principles and practice; compaction and mechanical stabilization for soil masses; lateral earth pressures and retaining wall analysis; bearing capacity of isolated foundations; settlement analysis of isolated foundations; slope stability analysis for natural and man made slopes.

8.2733 Rock Engineering

SS L1T1


8.2741 Concrete Technology

SS L2T2
Prerequisite: 8.2721.


8.2742 Metals Engineering

SS L2
Prerequisite: 8.2722.

Application of metals in civil engineering structures; steels, aluminium alloys and other common metals. Design for avoidance of service failures. Corrosion, basic principles, causes and control. Fatigue and brittle fracture; relationships between material toughness, design stress, flaw size, stress concentrations and service conditions; effects of temperature, loading rate, restraint. Tradition and applied fracture mechanics approaches to fracture safe design. Welding, significance for the designer, quality requirements and control.

8.311 Systems Engineering I

SS L1T1
Prerequisites: 5.0102, 8.670, 10.001.

The systems approach to problem formulation and analysis by introduction to elements of systems theory and case studies relevant to engineering and project design.

8.312 Systems Engineering II

SS L1T1
Prerequisite: 8.311, 8.360. Co-requisite: 10.381.

Formulation of engineering resource problems for numerical analysis and decision-making, and study of a selected set of numerical evaluation techniques.

8.351 Engineering Mathematics

SS L2½T2½
Prerequisite: 10.022.


8.360 Computing

SS L1½T1½

An introduction to the use of higher level programming languages such as PASCAL and FORTRAN and the principles of program design. Computing techniques. Development of software and its applications.

8.362 Engineering Computations

SS L2T1
Prerequisite: 10.022.

Solution of equations encountered in stress analysis. Eigenvalue algorithms for buckling and vibration problems. Finite difference solution to deflection of beams and plates, heat conduction, flow of fluids and wave propagation.

8.400 Transport Engineering I

SS L2T1


8.401 Transport Engineering II

SS L2T1

The land use/transport system — urban, regional and local systems. Definitive concepts and ideas — land use potential, transport impedance accessibility, traffic generation. Equations of state of a land use/transport system, feedback equilibrium. Land use transport planning process; land use, traffic generation, distribution, assignment and evaluation models. Strategic planning issues; optimization, sensitivity analysis, constraints and resources. Operational planning.

8.571 Hydraulics I

SS L1½T1½
Prerequisites: 5.0201, 10.001.


8.572 Hydraulics II

SS L1½T1½
Prerequisite: 8.571.


8.573 Hydraulics III

SS L1½T1½
Prerequisite: 8.572.

8.581 Water Resources I
A prior knowledge of elementary hydraulics is assumed.

8.582 Water Resources II
A prior knowledge of elementary hydraulics is assumed.
The hydrologic cycle, water and energy balances, climatology, atmospheric moisture, precipitation, run off cycle, infiltration, stream gauging, hydrograph analysis, storm runoff and loss rates, design storms, flood estimation, yield and storage determination.

8.583 Water Resources III
Prerequisites: 8.572, 8.582.
Hydraulics of groundwater systems, application to regional problems. Water resources planning, systems approach, applied aspects of water engineering.

8.670 Introduction to Engineering Construction
Introduction to construction engineering, projects and decision agents, construction equipment and methods. A report required involving site visits on a construction operation.

8.671 Engineering Construction
Prerequisite: 8.670.
Role of professional construction engineer. Project breakdown into construction activities and operations. Engineering construction characteristics of equipment, materials and methods with emphasis on earth-moving, rockworks, compressed air and concrete placement and formwork.

8.672 Planning and Management I
Prerequisite: 8.671.
Project definition, documents, estimating, planning and scheduling models. Project finance and cost control methods. Field project management and reporting systems.

8.673 Planning and Management II
Prerequisite: 8.672.
Fundamentals of Engineering Economy developed within a micro-economic systems framework for application by the following decision-makers: plant engineer, contractor, developer, local government engineer, and State/National engineering project managers.

8.674 Planning and Management III
Prerequisite: 8.672.
Project implementation, organization and control, field management techniques, industrial relations, field documentation and information flow, field change orders, risks, and delays, legal aspects, the relationship and duties between professional agents involved in projects.

8.711 Engineering for Surveyors I

8.712 Engineering for Surveyors II
Municipal Engineering. Soil Mechanics: Soil forming processes; pedological classification; engineering classification of soils; pavement design based on engineering classification; effective stress concept for saturated and unsaturated soils, shear strength, flow of water through soils, consolidation; slope stability and earth pressures. Public Utilities: Relationship between urban development and each of water supply, wastewater and stormwater drainage, transport.

Servicing Subjects
These are subjects taught within courses offered by other schools or departments in a different faculty.

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

8.112 Structures

8.250 Properties of Materials

Graduate Study

8.401G Human Factors in Transport
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


8.403G Theory of Land Use/Transport Interaction


8.404G Local Area Transport Planning

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

Analytical techniques for urban land use, transport planning practice. Planning methodology: traffic generation, trip distribution, modal choice, traffic assignment, evaluation. Land use forecasting; calibration and verification of behavioural models, application of mathematical programming models, case studies, public transport problems.

8.406G Regional Transport Planning

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)

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)

Types of urban transport facilities. Distributors, streets, bicycle routes, walk-oriented areas, bus lanes and rapid transit lanes, stops and change terminals, noise control. Minimum geometric form: speed range controls, provision for surface water on urban roads, landscape. Design of intersections and parking areas.

8.409G Interchange Design

Central projection theory and application to alignment design; perspective drawing methods, introduction to aerial 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.

8.410G Highway Engineering Practice Part I


8.411G Highway Engineering Practice Part II


8.412G Economics for Transportation Studies


8.413G Transport Economics

Cost and price analysis to each of the transport modes (road, rail, air and sea). Welfare analysis and taxation theory with respect to transport. Economics of location, economics of land use models; regional trade model.

8.414G Transport Systems Part I


8.415G Transport Systems Part II

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

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

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 queueing theory. Simulation techniques. Signalized and unsignalized intersections.

8.418G Statistics for Transport Studies

Part I


Part II


8.420G Transport Engineering Elective

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

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

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

Search, linear programming, non-linear programming, geometric programming, calculus of variations, maximum principle, applications.

8.704G Stochastic Methods in Civil Engineering

Queueing, Markov processes, theory of storage, reliability, renewal, application, transportation and allocation.

8.705G System Modelling

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

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


8.710G Advanced Topics in Optimization in Civil Engineering

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

Special studies in system modelling to be offered from time to time by appropriate specialists.

8.723G Construction Design

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

A selection of topics from: drilling, blasting techniques, tunnelling, rock-boring 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


8.726G Construction Law and Professional Practice

8.727G Construction Planning and Estimating 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 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 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 C3
A theoretical and formative approach to Project and Mission Management; management strategies and project success evaluation techniques; organizational and behavioural 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 I 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 II C3

8.750G Pavement Design and Evaluation I 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 II C3

8.752G Terrain Engineering C6
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 C3

8.754G Applied Soil Mechanics C3
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) I C3
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 Soil Mechanics C3
A critical review of the theories of real soil behaviour and their implications for the selection of soil parameters for use in engineering design. Examination of the actual stress-strain and shear strength behaviour of saturated and unsaturated soils under static and dynamic conditions; survey of modern soil mechanics testing techniques; influence of real soil behaviour on the performance of scale models.

8.760G Materials of Construction (Concrete Technology) II C3
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.
8.764G Composites In Civil Engineering C3
History, relationship between structure and mechanical and physical properties. Elastomers, adhesives, reinforced plastics natural composites. Applications and case studies.

8.766G Welding In Structural Engineering C3
Terminology, welding processes, metallurgy, weldability of ferrous and non-ferrous metals, pre-heat and post-heating treatments, residual stresses and distortion, weld quality levels, destructive and non-destructive testing, economic welded design, quality assurance.

8.771G Foundation Engineering C6
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-art with particular emphasis on the application of recent theoretical developments to foundation engineering, including piles, raft, raft-piles, laterally loaded piles, retaining structures and techniques of strengthening soils.

8.773G Materials of Construction (Metals) III C3
Previously 8.756G.
Use of metals as structural materials, specification; structural aluminium alloys; modern steels; philosophy of materials selection; properties, applications, limitations; behaviour under mechanical loading; effects of environment, corrosion, and corrosion protection.

8.774G Soil Dynamics C3
Fundamentals of vibrations: wave propagation in elastic homogeneous medium; wave propagation in layered medium, vertical, sliding, torsional and rocking motion on elastic half-space; behaviour of dynamically loaded soils; design procedures for dynamically loaded foundations.

8.775G Geotechnical Aspects of Natural Hazards C3
Basic principles involved in earthquake engineering; treating on 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.

8.776G Rock Mechanics C3
Strength and deformation characteristics of rock mass and joints; flow through joints and porous rock; failure criteria; stresses and deformations around underground openings; tunneling and rock anchors; stability of rock slopes; stabilization of rock slopes; stability of underground excavations related to mining; foundations of dams in fissured and layered rocks.

8.777G Numerical Methods in Geomechanics C3
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, seepage and consolidation; soil-structure interaction problems; earth pressures, retaining walls and buried pipes; thermal stress analysis.

8.778G Geotechnical Processes for Energy Resources 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 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 C3

8.802G Elastic Stability I 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 II 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 I 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 II C3

8.806G Prestressed Concrete I C3
Historical development. Methods of prestressing. Elastic analysis and design. Flexural capacity and shear capacity of prestressed elements.

8.807G Prestressed Concrete II C3
8.808G Prestressed Concrete III
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.

Prestressed slabs; two-way slabs; flat slabs; load balancing approach to design, effect of tendon distribution; design procedures: flexural and shear strength; deflections.

8.809G Reinforced Concrete I
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 II

8.811G Reinforced Concrete III

8.812G Plastic Analysis and Design of Steel Structures I
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 II
Estimation of deflections, factors affecting plastic moment, shakedown, three-dimensional plastic behaviour; minimum weight design.

8.814G Analysis of Plates and Shells

8.817G Experimental Structural Analysis I
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 I

8.819G Bridge Design II

8.820G Structural Analysis and Finite Elements I

8.821G Structural Analysis and Finite Elements II

8.822G Structural Analysis and Finite Elements III
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
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
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

8.833G Free Surface Flow
Theory of waterflow 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 I
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 II
Wave forces on structures, shore processes and beach erosion. Estuarine hydraulics, wave and tide models.
8.837G Hydrological Processes 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 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 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 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 C3
Water and energy balances, atmospheric moisture, precipitation, evaporation and transpiration, snow and snowmelt, extreme precipitation.

8.842G Groundwater Hydrology 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 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 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 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 C3
Resource economics, water supply, water demand, multiple objective planning, multiple purpose projects, water law, water administration, case studies.

8.848G Water Resource System Design C3
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.

8.849G Irrigation C3
Soils, soil-water relationships, plants, climate, crop requirements; water budgets, sources, quality, measurement; irrigation efficiency. Design of irrigation systems, appurtenant works, distribution.

8.850G Drainage of Agricultural Land C3
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.

8.851G Unit Operations in Public Health Engineering C3
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.

8.852G Water Distribution and Sewage Collection C3
Water collection, transmission and distribution systems — layout design and analysis, reservoirs, pumping. Sewage collection design and analysis — capacities, corrosion, pumping.

8.854G Solid and Liquid Waste Management C3
Sources and nature of refuse-collection and transportation-disposal: sanitary landfill, incineration, pyrolysis, resource recovery, composting. Collection, treatment and disposal of strong liquid wastes.

8.855G Water and Wastewater Analysis and Quality Requirements C3
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.

8.856G Water Treatment C3
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.

8.857G Sewage Treatment and Disposal C3
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.
8.858G Water Quality Management C3
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.

8.860G Investigation of Groundwater Resources I C3
Occurrence and extraction of groundwater; investigation and drilling methods; systems approach; optimization techniques; conjunctive use studies; quality of groundwater.

8.861G Investigation of Groundwater Resources II C3
Geophysical methods, remote sensing, photo-interpretation, environment studies, analog models, case studies.

8.862G Fluvial Hydraulics C3
Unsteady and varied flow in non-uniform channels, secondary currents, sediment transport, channel morphology, scour and shoaling, river control works, modelling of fluvial processes.

8.863G Estuarine Hydraulics C3

8.864G Arid Zone Hydrology S1 L1\frac{1}{2} T1\frac{1}{2} C3
Co-requisite: 8.837G, 8.838G.
Arid zone rainfall characteristics, data collection and instrumentation, runoff processes, infiltration, transmission loss, recharge processes, flood characteristics and design, water yield, storage of water; evaporation and evaporation suppression; sediment transport and measurements.

8.865G Arid Zone Water Resources Management S1 or S2 L1\frac{1}{2} T1\frac{1}{2} C3
Water as a resource demand for and supply of water; works and management to match demand with supply. Special features of the arid zone climate, water uses, quantification of demand quantities and qualities; measurement of flow rate, volume, quality. Engineering works: design, construction, operation and maintenance of works, including excavation tanks, dams, pipelines, pumps, windmills, engines and motors, storage; costs; reliability; energy sources for pumping. Special practices: water spreading, irrigation including trickle irrigation; evaporation reduction; desalination.

8.901G Civil Engineering Elective I C3
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 II C3
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 C9
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 C18
As for 8.909G but involving more substantial investigation.

8.936G Thesis C36

Mathematics

Undergraduate Study

10.001 Mathematics I FL4T2
Prerequisite:

HSC Exam
Percentile Range Required
71-100

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

Excluded: 10.001, 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 I FL4T2
Prerequisite:

HSC Exam
Percentile Range Required
71-100

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 II  
Prequisite: 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  
Prequisite: 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.

10.033 Electrical Engineering Mathematics III  
Prequisite: 10.111A, 10.1113, 10.1114, 10.2111, 10.2112.
Optimization.

10.111A Pure Mathematics II — Linear Algebra  
Prequisite: 10.001 or 10.011. Excluded: 10.121A.

10.1113 Pure Mathematics II — Multivariable Calculus  
Multiple integrals, partial differentiation. Analysis of real valued functions of one and several variables.

10.1114 Pure Mathematics II — Complex Analysis  
Prequisite: 10.001 or 10.011. Excluded: 10.1214.
Analytic functions, Taylor and Laurent series, integrals. Cauchy's Theorem, residues, evaluation of certain real integrals.

10.2111 Applied Mathematics II — Vector Calculus  
Vector fields, divergence, gradient, curl of a vector, line, surface, and volume integrals. Gauss' and Stokes' theorems. Curvilinear co-ordinates.

10.2112 Applied Mathematics II — Mathematical Methods for Differential Equations  
Series solution or ordinary differential equations; numerical methods. Partial differential equations: separation of variables. Fourier series, Bessel functions.

10.341 Statistics SU  
Prequisite: 10.001 or 10.011.
Introduction to probability theory, random variables and distribution functions, Sampling distributions, including those of \( t \), \( x^2 \) 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  
Prequisite: 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: \( t \), \( x^2 \) 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  
Prequisite: 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.
Engineering

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  

Graduate Study

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 modelling, analysis of modified data (censored, truncated and missing observations), general statistical inference (decision theory), acceptance testing, and reliability analysis (hazard functions).

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.

Graduate Study

14.042G Industrial Law  
The elements of the law of contract and tort as applied to industrial law; the New South Wales and Commonwealth industrial arbitration systems, including award making and interpretation, and industrial disputes; workers' compensation.

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.

Economics

Industrial Relations

Accountancy

Undergraduate Study

14.001 Introduction to Accounting A  
Architecture: 2 credit points; compulsory for BBuild degree course students.

Prerequisite: Nil.


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

Graduate Study

16.901G Health Services Statistics I  S1 L2

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.

18.020 Industrial Orientation  S2 L1T0

A series of lectures and discussions designed to prepare students for Industrial Training. Topics include: Forms and structure of private and public organizations; line and staff; authority and responsibility; company objectives; functions of staff departments, eg personnel, purchasing, quality control, industrial engineering, accounting, new forms of organization. Industrial legislation, industrial relations, safe practices. Employer expectations of the trainee engineer, requirements for the Industrial Training Report. Introduction to the specialist streams of the Years 3 and 4.

18.091 Industrial Management  S1 LT5

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, queueing 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 S1 or S2 L2T1

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  F L1T1

Prerequisites: 5.072, 18.020.


18.403 Production Design and Technology  F L2T2

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.

Industrial Engineering

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

Undergraduate Study

18.003 Numerical Methods/Industrial Experimentation  S1 L1T½ S2 L1½T½

Prerequisites: 5.072, 10.001, 10.022.


18.004 Manufacturing Management  F L1T1

Prerequisites: 18.503, 18.603, 14.001, 14.002.

Servicing Subjects

These are subjects taught within courses offered by other schools or departments in a different faculty.

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, eg mathematical programming, queueing 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, eg mathematical programming, queueing theory, inventory models, simulation.

Graduate Study

18.061G Industrial Experimentation I

C3

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 II

C3

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

C3

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 man-
agential 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 C2
Descriptive analysis of the decision-making process: alternative perspectives on organizational decision-making; rational, satisficing, organizational output, political process and individual differences perspectives; structured, semi-structured and unstructured decisions. Levels of decision support; conversion of data into information by simple algorithms; models, integrative structures; use of decision analysis (single and multi-attribute) cognitive mapping, cross impact analysis, fuzzy sets. Overall system design implementation and maintenance with particular reference to the man-machine interface: practical examples of decision support systems.

18.171G Inspection and Quality Control C3
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.

Overview of N.C. systems and manual programming. Requirements of a high level language designed specifically for programming N.C. machine tools. Computer Assisted Programming dealing with specific and generalized part programming. Detailed study of the structure and use of Automatic Programmed Tools (APT) language including overview of language, basic APT grammar; part program structure, geometry statements, motion statements, macro commands, post-processors, diagnostics.

18.261G Computer Automation C3
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 C3
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, physiological and psychological effects, preventive measures; heat and ventilation, thermal regulation in man, 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.

18.371G Factory Design and Layout C3
Prerequisite: 18.303 or 18.380G or equivalent.

Production Requirements: Processes, machines and storage; optimum factory size, multiple factories. Plant Location: Single and multiple factories and warehouses; location models and economic analysis.


A project forms a substantial proportion of the assessment for this subject.

18.380G Methods Engineering C4

18.461G Design Production C4
Influence of manufacturing processes on design; design simplification and standardization; value engineering; economics of process selection; case studies.

18.464G Value Analysis/Engineering C3
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.

18.471G Design Communication C2
Communication systems in design; aids to design communication; engineering drawing practice; standardization; interpretation of design information.

18.571G Operations Research I C6
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, queuing 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 C3


18.579G Case Studies in Operations Research C3

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 C6

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, queuing theory, inventory models, replacement and reliability models: simulation. These techniques applied to situations drawn from industrial fields, e.g., production planning and inventory control. Practical problems of data collection, problem formulation and analysis.

18.671G Decision Theory C2

Excluded: 18.672G.

Theories of choice, value, risk, uncertainty for the individual and for multi-person situations. Statistical decision theory, Bayes and minimax rules.

18.672G Decision Theory for Industrial Management C3

Excluded: 18.671G.


18.673G 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.


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, e.g., replacement, capital rationing. Measures of profitability.

18.761G Simulation in Operations Research C3


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
Basic inventory replenishment models, continuous stock review, periodic re-ordering and base stock models, with deterministic, probabilistic, and dynamic demands. Variations of the basic models to include additional features (eg demand dependent on delivery time). Costs of the complete system in practice. Production smoothing models. Forecasting techniques. Optimum stock locations in multistage systems. Practical inventory surveys and control systems.

18.777G Time Series Forecasting C2

18.778G Scheduling and Sequencing C2

18.779G Game Theory C2

18.780G Production Control C2
Corporate objectives and organization. The production environment. The detailed mechanics of control of jobbing production and its extension to repetition batch and continuous production. Manufacturing organization and controls, functions, inter-relationship and information flow. Relevance to computerized control. Introduction to inventory control and the analysis of some typical engineering planning decisions.

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.

18.870G Large Scale Optimization in Industry C3
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 problems. The theory is applied to polynomial and posynomial programming. As projects actual polynomial and posynomial programs will be solved.

18.780G Production Control C2
Corporate objectives and organization. The production environment. The detailed mechanics of control of jobbing production and its extension to repetition batch and continuous production. Manufacturing organization and controls, functions, inter-relationship and information flow. Relevance to computerized control. Introduction to inventory control and the analysis of some typical engineering planning decisions.

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.

18.870G Large Scale Optimization in Industry C3
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 problems. The theory is applied to polynomial and posynomial programming. As projects actual polynomial and posynomial programs will be solved.

18.780G Production Control C2
Corporate objectives and organization. The production environment. The detailed mechanics of control of jobbing production and its extension to repetition batch and continuous production. Manufacturing organization and controls, functions, inter-relationship and information flow. Relevance to computerized control. Introduction to inventory control and the analysis of some typical engineering planning decisions.

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.

18.870G Large Scale Optimization in Industry C3
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 problems. The theory is applied to polynomial and posynomial programming. As projects actual polynomial and posynomial programs will be solved.
Engineering

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.

18.878G Industrial Applications of Mathematical Programming C2

Problem formulation: profitability criteria, operating constraints. Conventions for large-scale matrix construction; list and table-processing, error-checking. Use of commercial systems: data organization, interpretation of output, ranging procedures. Examples from actual industrial studies.

18.879G Mathematical Programming Analysis C3

Co-requisites: 18.871G, Linear Programming section of 19.571G.

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.

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

Allows the presentation of special topics, particularly by visiting academics.

18.970G Seminar (Operations Research) C0

18.977G Advanced Topic in Operations Research C2

18.978G Advanced Topic in Operations Research C2

18.979G Advanced Topic in Operations Research C2

Allows the presentation of special topics, particularly by visiting academics.

Nuclear Engineering

Undergraduate Study

23.051 Nuclear Power Technology F L2½T½

Atomic nuclei, radioactivity, neutron reactions, fissile and fertile materials, nuclear conversion and breeding cycles, plutonium. Criticality requirements, heat removal, control and safety of nuclear reactors. The thermal, hydraulic and structural aspects of gas and liquid cooled thermal reactors and liquid metal cooled fast breeder reactors. 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.

Graduate Study

Not all subjects are available in any one year.

23.013G Neutron Transport and Diffusion S2 L2½T½ C3

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.

23.014G Fewgroup Reactor Theories S2 L2½T½ C3

The derivation and use of fewgroup 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

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
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
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
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
The special problems associated with the dynamics and stability of fluid cooled reactors under boiling conditions.

23.028G Reactor Accident and Safety Analysis
The mathematical modelling 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
Mathematical methods, partial differential equations, special functions, and numerical methods for digital computation, relevant to Nuclear Engineering.

23.033G Matrix Theory and Computation
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
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
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
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
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
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.

23.909G Project

23.918G Project Report

23.936G Thesis

Geography

Undergraduate Study

27.1711 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 aerial photography and 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.
27.1712 Remote Sensing Applications  S2 L2T1

Prerequisite: 27.1711.

Spectral characteristics of natural phenomena and image formation. Ground truthing, collection and calibration. Introduction to computer classification procedures. Multitemporal sampling procedures, image to image registration and map to image registration. Major applications of remote sensing in the investigation of renewable and non-renewable resources to include: soils, geology, hydrology, vegetation, agriculture, rangelands, urban analysis, regional planning, transportation and route location and hazard monitoring.

27.295 Physical Geography for Surveyors  S1 L2T2

Fundamentals of physical geography. Landscapes of Australasia. Techniques of landscape appraisal. Laboratory classes to support the above, including map analysis, air photo interpretation and examination of soil properties. There is a compulsory one-day excursion.

Graduate Study

27.171G Directed Problems in Remote Sensing  S2 L1½T1½C3

A detailed investigation of a particular aspect of remote sensing technology or an area of applications relevant to candidate 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.

27.901G Geomorphology for Hydrologists  S2 L1½T1½ C3

Offered subject to availability of staff.


Surveying

Undergraduate Study

29.001 Surveying I  S1 L3T1½

Introduction to computations; principles, use of calculation aids, solutions of triangles, areas of plane figures, co-ordinate systems, units of measurement. Introduction to surveying; principles, types of errors, computation of mean and standard deviation. Minor instruments: prismatic compass, clinometers, plane table alidades. Methods of distance measurement; tape measurement, correction to tape measurements. Angular measurements: construction of theodolite, observation methods for direction and zenith distance measurement.

29.002 Surveying II  S2 L2T3

Traversing: fieldwork, computation and adjustment. Principles of levelling, levels and associated equipment, field and reduction procedures, testing and adjustment of levels. Vertical staff theodolometry: principles, field and reduction procedures for stadia, self-reducing theodolites. Survey methods for detail and contour surveys.

29.003 Surveying III  S1 L2½T2½


29.004 Surveying IV  S2 L2T2½

Co-requisites: 29.003, 29.151.

Setting out surveys. Calculation and setting out of horizontal circular curves and transition curves. Principles and calculation of vertical curves, sight distance. Determination of areas of irregular figures, trapezoidal and Simpson's rules. Volume determination from spot heights, contours and cross-sections, mass haul diagrams. Route surveys for roads, railways, waterways, pipe and transmission lines. Adjustments of theodolite and level.

29.005 Surveying V  S1 L3T2

Prerequisite: 29.003.

Electronic distance measurement principles, applications and instruments, propagation of electromagnetic waves. Geometrical and geometric corrections, field procedures, instrumental errors and their calibration. Calibration of linear scales. Precise angle measurement, observations and reduction procedures, sources of error and their testing.
29.006 Surveying VI

Prerequisite: 29.003.

Error theory, expression of uncertainty, testing of observations, application to design and analysis of surveys. Precise levelling, equipment, field procedures. Project surveys, integrated surveys, surveys for large structures,精密 surveys for deformation, measurement and setting out machinery, mining and tunnel surveys, hydrographic surveys.

29.031 Electronic Distance Measurement

Prerequisite: 29.005.

Short range instruments: sources of error, field and computational methods of calibration, baseline design. Long range instruments: laser and microwave distance meters, sources of error, calibration, precise measurement techniques, geometric and atmospheric corrections. Properties of reflectors. Power sources.

29.032 Precise Surveys in Industry and Engineering

Prerequisite: 29.006.

Review of survey problems in industry and engineering. Setting-out of large structures: network design, measurements, methods of height transfer, optical plumbing, examples and accuracy requirements. Surveys for measurement of deformation and settlement: design of control network and stations, observation and adjustment techniques, detection of movement, electric measurement of small changes in length, height and inclination. Close-range indoor surveys: optical tooling, special equipment and techniques, auto-collimation, laser interferometry.

29.033 Characteristics of Modern Theodolites and Levels

Prerequisites: 29.006.

Construction features, sources of error and methods of testing modern optical surveying instruments. Topics selected from: circle and micrometer graduation errors, coded circles, calibration and behaviour of bubbles, automatic compensator systems, axis wobble, temperature effects.

29.034 Mine Surveying

Prerequisite: 29.006.


29.035 History of Surveying

Prerequisite: 29.006.

Historical development of geodesy, astronomy, cartography, photogrammetry, and geophysics. History of general surveying: mathematical aids, optics, instruments, electronic aids for surveyors. Selected topics from history of surveying and land law in Australia.

29.121 Electronics for Surveyors

Prerequisite: 1971.


29.150 Introduction to Computer Programming

Prerequisite: 29.150.

Computer components and functions. Program design and flow charting. Algorithm development and coding using a high level language. Computer output diagnostics, program documentation.

29.151 Survey Computations I

Prerequisite: 29.150.


29.152 Survey Computations II

Prerequisite: 29.151.


29.153 Adjustment of Control Surveys

Prerequisite: 29.212.


29.161 Hydrographic Surveying I

Prerequisite: 29.006.

Introduction, theory of echo sounder, sounding techniques, visual fixing, electronic position fixing, tides, tidal streams, tidal datums, ocean currents, acoustic and wire sweeps.

29.162 Hydrographic Surveying II

Prerequisite: 29.161.

Practical training: undertake 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. Static display of other equipment. Lectures on nature of seabed, wind waves, the survey report. Discussions on practical surveying tasks or topics of current interest. A harmonic analysis of 12 days of tidal data.
29.173 Project

Prerequisite: 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 experiences.

29.174 Major Project

Prerequisite: High standard in the chosen topic area normally required; permission of project supervisor.

An elective subject involving a detailed investigation of a selected or assigned 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 experiences.

29.191 Survey Camp I

Co-requisites: 29.001, 29.002.

A one-week field camp equivalent to 42 contact hours. A series of field surveying tasks designed to consolidate the current year's work and serve as an introduction to the following year's work. Tasks include traversing, levelling, stadia and detail survey measurements for the production of a large-scale plan. Calculations, preparation of plans and reports.

29.192 Survey Camp II

Prerequisite: 29.191. Co-requisites: 29.003, 29.004.

A one-week field camp equivalent to 42 contact hours. A series of field surveying tasks designed to consolidate the current year's work and serve as an introduction to the following year's work. Surveys for the design of a road alignment, determination of dam capacity and methods of point fixation. Calculations, preparation of plans and reports.

29.195 Survey Camp III


A two-week field camp equivalent to 84 contact hours. Survey projects designed to consolidate course work. Field astronomy, triangulation, trigonometric levelling, photogrammetric control and cadastral survey.

29.196 Survey Camp IV

Co-requisite: 29.195.

Two weeks of office computations equivalent to 84 contact hours. Preparation of comprehensive individual reports based on field survey tasks completed in Survey Camp III.

29.211 Geodesy I

S2 L3T1


29.212 Geodesy II

S1 L2T1

Co-requisites: 29.151, 29.211.


29.213 Geodesy III

SS L3

Prerequisite: 29.212.

Topics from: advanced geodetic techniques and instrumentation—principles and applications; variations in geodetic position with time; earth satellite orbits; geoid solutions from gravimetry; earth's gravity field from satellite orbits; extension of gravity into unsurveyed regions.

29.231 Geophysics for Surveyors

SS L2T1


29.232 Atmospheric Effects on Geodetic Measurements

SS L3


29.311 Astronomy I

S2 L2T1

Uses of field astronomy. The solar system, the celestial sphere and the astronomical triangle. Time systems and time keeping. Latitude by circum-meridian and longitude by extra meridian methods. Prediction of observation programs. Evaluation of precision of results. Introduction to the determination of azimuth.

29.312 Astronomy II

S1 L1½T½

Prerequisite: 29.311.

Determination of azimuth from circum polar, circum-elongation and sun observations. Simultaneous determination of latitude and longitude by the position line method. Prediction of observation programs. Evaluation of precision of results.

29.313 Astronomy III

SS L2T1

Prerequisite: 29.312.

Topics selected from: geodetic astronomical methods, daylight star observations, meridian and equal altitude methods, variation in star co-ordinates, sun dials, celestial methods in navigation.
29.441 Surveying for Engineers  
S1 or S2 L2T4


29.491 Survey Camp

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

29.511 Photogrammetry I  
S2 L2\frac{1}{2}T1\frac{1}{2}

Prerequisite: 29.151.


29.512 Photogrammetry II  
S1 L2T1

Prerequisite: 29.511.


29.513 Photogrammetry III  
SS L2\frac{1}{2}T1\frac{1}{2}

Prerequisite: 29.512.


29.514 Principles of Remote Sensing  
SS L2T1


29.631 Land Inventory I  
S1 L1T1


29.632 Land Inventory II  
SS L2T1

Prerequisite: 29.512.


29.651 Land Development I  
S1 L2T1


29.652 Land Development II  
S2 L2T1


29.653 Land Development III  
S1 L1T2

Design and studio project for a neighbourhood development. Constraint and site analysis: preparation of maps for land use and vegetation, surface and soils, drainage and terrain, slopes, climate and aspect, composite maps. Structure plan: residential precincts, schools, commercial areas, industrial areas, active and passive recreation, pedestrian ways and road hierarchy. Plan of detailed lot layout: consideration of access, grades, drainage reserves, parks, and pedestrian ways. Engineering design and plans: capture details, longitudinal and cross-sections, drainage layout and longitudinal sections, flow schedule with calculations, longitudinal sections of kerb profiles.

29.654 Land Development IV  
SS L2T1

Prerequisite: 29.653.


29.661 Cadastral Surveying and Land Law I  
S1 L1\frac{1}{2}T1\frac{1}{2}

The legal system in NSW as it affects the land surveyor. Forms of titles: Old System titles, Torrens titles and Crown lands titles. Land law: legislation, real and personal property, interests and estates in land, riparian rights and conveyancing. The status of roads in NSW. Maritime law. The operation of the cadastral system: an historical introduction, the role of the boundary surveyor and boundary control.
29.662 Cadastral Surveying and Land Law II
Prerequisite: 29.661.

Practical and legal aspects of cadastral surveying in NSW including: survey and title searching; survey investigation; re-determination of artificial and natural boundaries; related statutes, regulations and case law; the preparation of plans for title surveys; and subdivisions under the Strata Titles Act, 1973 as amended.

29.663 Cadastral Surveying and Land Law III
Prerequisite: 29.662.

The relationship between land information systems, title and deed registration, cadastral surveying and the cadastre. Forms and components of land tenure and cadastral systems. Aspects related to the definition of the cadastre: cadastral mapping, integrated surveys and methods of defining land parcels.

29.664 Modern Title Concepts
Prerequisite: 29.662.


29.700 Professional Orientation
Introduction to the total field surveying activities and their relationship to associated disciplines. Introduction to geodesy and position fixing from celestial bodies. Map projections and co-ordinates. Introduction to the use of aerial photographs. Maps and aerial photographs and their application to resource surveys. Role of consulting surveyor. Brief introduction to cadastral, engineering and land development surveys. Mining and hydrographic surveys. Includes a visit to several surveying establishments.

29.701 Seminar I
Basic writing and speaking, introduction to the literature of the profession. Oral presentation by individual students on assigned topics in selected areas of surveying.

29.702 Seminar II
Effective writing and speaking, increased emphasis on research of literature. Oral presentation by individual students on assigned topics in selected areas of surveying.

29.703 Seminar III
Effective communication. Technical writing for comprehension. Additional speaking experiences. Invited speakers on current areas of interest in surveying. Student critique of course.

29.704 Management I

29.705 Management II
Prerequisite: 29.661.


29.800 Survey Draughting

29.801 Cartography I
Co-prerequisite: 29.512.


29.802 Cartography II
Cartographic technology: characteristics of base materials, drawing techniques, scribing techniques, symbol and type preparation, photomechanical methods, screens and masks, colour registration, proofing methods, principles of lithography. Planning, costing and organizing cartographic work.

29.803 Mapping Technology
Prerequisite: 29.512.

Production of base maps from aerial photographs, rectification theory, photogrammetric methods, differential rectification and orthophotomaps, cartographic completion of photomaps. Automation of cartographic processes, data collection and processing, plotting software and hardware, digital terrain models.

Servicing Subjects
These are subjects taught within courses offered by other schools or departments in a different faculty.

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

29.411 Surveying for Architects and Builders
A compulsory subject. Prerequisite: nil.

Graduate Study

29.101G Aspects of Electromagnetic Distance Measurement SS L2T1 C3


29.102G Characteristics of Optical Surveying Instrumentation SS L2T1 C3

Sources of error in modern optical surveying instruments. Methods of testing and calibration. Observational techniques for reducing effects of errors. Development of circle reading and level sensing systems. Design of instrument testing facilities.

29.103G Precise Engineering Surveys SS L2T1 C3

Techniques and instrumentation for precise surveys. Applications in industry and engineering: deformation and settlement surveys, surveys for large constructions: optical tooling, special measurement problems.

29.105G Special Topic in Surveying A C3

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 C3

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 Observations SS L2T1 C3


29.171G Mathematical Methods I — Numerical Analysis SS L2T1 C3

Topics from real analysis, computational error theory, curve fitting by orthogonal polynomials, trigonometrical and exponential series, time series and quadrature.

29.172G Mathematical Methods II — Statistical Theory of Survey Observations SS L2T1 C3

Advanced application to survey observations of frequency distributions, moments, minimum variance, unbiased estimation, central limit theorem, analysis of variance and statistical testing. Outlying observations.

29.173G Mathematical Methods III — Spherical Harmonics SS L2T1 C3

Two dimensional Fourier Series. Theorems of vector field theory. The solution of Laplace's equation in spherical co-ordinates. Spherical harmonics.

29.174G Mathematical Methods IV — Theory of Survey Adjustment SS L2T1 C3

Matrices, multivariate normal, distribution of quadratic forms, five standard problems of Tienstra, geometrical interpretation of least squares adjustment, free net adjustment and generalised matrix algebra. Solution of large sets of equations. Confidence ellipses.

29.175G Mathematical Methods V — Collocation SS L2T1 C3


29.201G Geodetic Methods SS L2T1 C3


29.202G Earth and Ocean Dynamics SS L2T1 C3


29.203G Gravimetric Geodesy SS L2T1 C3


29.204G Geodetic Refraction SS L2T1 C3

29.205G Satellite Geodesy

29.206G Advanced Geodetic Instrumentation
Developments in: distance measuring instruments; Strainmeters; Tiltmeters. Optical-angle measurement instruments; Gravity measurements; Gravity gradiometers; Inertial navigation systems; Gravity measurements at sea; Tide gauges; Ocean pressure measurement; Bathymetry; Positioning on deep-ocean floor; Radio Doppler; Satellite laser ranging; global positioning system; Drag-free satellite technology; long baseline microwave interferometry and Satellite altimetry.

29.207G Doppler Positioning
Introduction to Doppler positioning using the NNSS satellite system. The use of point positioning, translocation and short arc techniques. Review of available hardware. Majority voting; general and specialized reduction techniques. Computing techniques associated with the integration of Doppler positions into terrestrial network. Introduction to the Global Positioning System (GPS).

29.314G Geodetic Astronomy

29.516G Mathematical Model of the Imaging Process

29.517G Stereophotogrammetry

29.518G Analytical Photogrammetric Orientation
Prerequisite: Prior knowledge of FORTRAN computer programming is assumed.

29.519G Photogrammetric Instrumentation

29.520G Photogrammetric Production Processes

29.521G Control Extension A
Prerequisite: 29.517G or consent of the instructor.

29.522G Control Extension B
Prerequisite: 29.518G.

29.600G Principles of Remote Sensing

29.601G Remote Sensing Principles and Procedures

29.602G Mass Appraisal Methods
29.603G Statutory Controls of Land Development

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

Land information as maps and records. Methods of data collection. Integrated surveys and coordinate systems. Legal boundaries. Land tenure. Identifiers. Computerisation 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

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.

29.706G Survey Management


29.707G Quantitative Management Methods

Detailed analysis of operations research methods and discounted cash flow techniques as they apply to mapping, surveying and development projects. Various case studies and their solutions will be examined.

29.909G Project

29.918G Project Report

29.936G Thesis

Organizational Behaviour

Graduate Study

30.935G Organization Behaviour A

Graduate Study

30.009G Project

30.010G Biomedical Engineering Practice

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.

30.012G 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.

30.018G Project Report

30.020G Radiation Physics

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. Clinical applications are stressed.

30.030G Thesis
32.050G Microprocessors and Circuit Design for Biomedical Engineers
S2 L2T2 C4
Prerequisite: 32.510G or equivalent.
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.

32.111G 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 and artificial livers.

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
Program design and documentation, printer plotting, computer graphics editing (XEDIT/MODIFY), KCL and procedure files. Overview of computers in biomedical engineering. Microprocessors and their capabilities. Assessment of hospital computing requirements and evaluation of computer packages.

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.

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: 32.510G 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
S1 L2T1 C3
Structure of the heart; organization of the mammalian vasculature; mechanical, electrical and metabolic aspects of cardiac pumping; the fluid mechanics of blood vessels.

Town Planning

Undergraduate Study

36.411 Town Planning
S1 L2T1
Architecture prerequisite: 11.4309.
Graduate School of the Built Environment

Graduate Study

39.908G Community Noise Control S1 LT1C2

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.

Biotechnology

Graduate Study

42.211G Principles of Biology SS L3

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 SS L3

A condensed treatment of biochemistry comprising the following aspects: the elemental and molecular composition of living organisms; the chemistry and roles of the biological elements and molecules; the thermodynamics and enzymatic catalysis of metabolism; catabolic, anabolic, amphibolic and anaplerotic processes, with emphasis on hydrolysis and synthesis of polymers, glycolysis and gluconeogenesis of glucose, β-oxidation and synthesis of fatty acids, deamination and decarboxylation of amino acids, the tricarboxylic acid cycle, electron transport and oxidative phosphorylation; metabolic regulation and integration.

42.214G Biotechnology SS L2T1

The selection, maintenance and genetics of industrial organisms; metabolic control of microbial synthesis; fermentation kinetics and models of growth; batch and continuous culture; problems of scale-up and fermenter design; control of the microbial environment; computer/fermentor interactions. Industrial examples will be selected from: antibiotic and enzyme production, alcoholic beverages, single cell protein (SCP), microbial waste disposal and bacterial leaching. Tutorial/practical sessions include: problem solving, instrumentation, continuous culture techniques, and mathematical modelling and simulation of industrial processes.

Safety Science

Graduate Study

47.010G Basic Fortran FL C2

Introduction to computer programming using FORTRAN for people with no computer experience and no mathematical training beyond High School mathematics. Practice at programming and debugging, with problems taken from both data processing and scientific applications. Input and Output FORMAT statements; Nested DO loops; Arithmetic statement functions; Matrix arrays; Implied DO loops; Function subprograms and subroutine programs; Sorting and merging techniques; Common Storage; Communicating with peripherals of microcomputer; program planning and debugging.

47.015G Programming in BASIC S1 LT2 C2

A brief introduction to programming, programming in BASIC on common microcomputers and Cyber 171, definition of programming problems using flowcharts, error diagnosis and debugging techniques, lab function, nested subroutines and FOR NEXT loops, sorting and comparison of strings and arrays, operations on 2-dimensional arrays, plotting, memory limitations.

47.031G Linguistics and Written and Spoken Communication C1

The lectures in linguistics aim to display the present state of linguistic theory in its aspects that relate most directly to human communication in the English-speaking world. Includes the structure of English sentences in terms of pragmatics, semantics, syntax, and phonology. The orientation is eclectic, and encompasses at least the traditional, the structural and the transformational-generative approaches. Stress on applications of linguistics, especially in language teaching, in technological developments for speech transmission, and in speech and language disorders. Students are expected to develop their own special interests.
47.032G Basic Information Theory

47.034G The Psychology of Communication
The basic communication process analysed in terms of Source, Medium/Message, Respondent and Effects. A social context theory of communication relating the influence of groups, roles, social class, power, status etc on communication. Attitude change through communication. Statistics and statistical analyses in the experimental study of communication.

47.038G The Body in Communication

47.043G Presentation of Information
Styles, terms and models in communication. Channels of communication, audio and video. Characteristics of the various media of communication. Production and presentation of information by audio and video displays. Radio, films and TV for education. The actor in communication.

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.

47.052G Introduction to Safety Engineering
Management of dangerous materials; fire and explosion; ventilation; occupational toxicology; noise control; radiation protection; electrical safety; microbiological safety; failure of structures and machines.

47.054G Machines and Structures Safety
Machinery contact dangers; machine guarding. 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.

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.

47.345G Active and Adaptive Circuits

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 C3

47.900G Introductory Law C2
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.

47.909G Project C9

47.918G Research Project C18

Anatomy

Undergraduate Study

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 I S1 L2T4
Prerequisites: 70.011A, 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.

Chemical Engineering and Industrial Chemistry

Undergraduate Study

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.

48.412 Polymer Materials

Pathology

Graduate Study

72.402G Principles of Disease Processes S1 L3 C3
Prerequisite: 73.111 or equivalent, 70.011C 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

Undergraduate Study

73.001 Elements of Human Physiology  F L2
Lectures only from 73.111 Physiology IA.

73.111 Physiology IA  F L2T4
Prerequisites: 17.021 (or 17.041); 2.121 & 2.131, or 2.141; 10.001 or 10.011 or 10.021 B & C. Excluded: 73.121, 73.011 A. 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 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

Undergraduate Study

90.502 Industrial Safety and Health Law  SS Hpw4 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.

Medicine

Undergraduate Study

80.701 Occupational Disease  S2L3 C3
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.
Financial Assistance to Students

The scholarships and prizes listed below are available to students whose courses are listed in this handbook. Each faculty handbook contains in its Financial Assistance to Students 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

As well as the assistance mentioned, there are a number of scholarships available to students. What follows is an outline only. 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>$180 pa</td>
<td>Minimum period of</td>
<td>Merit in HSC and total family income not exceeding $6000</td>
</tr>
<tr>
<td></td>
<td></td>
<td>approved degree/combined</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>degree course</td>
<td></td>
</tr>
<tr>
<td>Sam Cracknell Memorial</td>
<td>Up to $3000 pa</td>
<td>1 year</td>
<td>Prior completion of at least 2 years of a degree or diploma course and</td>
</tr>
<tr>
<td></td>
<td>payable in</td>
<td></td>
<td>enrolment in a full-time course during the year of application; academic</td>
</tr>
<tr>
<td></td>
<td>fortnightly</td>
<td></td>
<td>merit; participation in sport both directly and administratively; and</td>
</tr>
<tr>
<td></td>
<td>instalments</td>
<td></td>
<td>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>General (continued)</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Girls Realm Guild</td>
<td>Up to $1500 pa</td>
<td>1 year</td>
<td>Available only to female students under 35 years of age enrolling in any year of a full-time undergraduate course on the basis of academic merit and financial need</td>
</tr>
<tr>
<td>Universities Credit Union</td>
<td>$500 pa</td>
<td>1 year</td>
<td>Prior completion of at least 1 year of any undergraduate degree course. Eligibility limited to members of the Universities Credit Union Ltd or members of the family of such members.</td>
</tr>
<tr>
<td><strong>Electrical Engineering</strong></td>
<td></td>
<td></td>
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</tr>
<tr>
<td>The Tyree Electrical Company Pty Ltd</td>
<td>Up to $6720 over 4 years</td>
<td>1 year</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</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 $400 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 $800 pa</td>
<td>1 year</td>
<td>Eligibility for admission to Year 2 of the full-time degree course in Mechanical Engineering</td>
</tr>
<tr>
<td><strong>Surveying</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>The Institution of Surveyors, NSW Division</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 Surveying</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 26, Parkville, Victoria 3052;
2. *Study Abroad*, published by UNESCO;

Where possible, the scholarships are listed in order of faculty.

<table>
<thead>
<tr>
<th>Donor</th>
<th>Value</th>
<th>Years of Tenure</th>
<th>Conditions</th>
</tr>
</thead>
<tbody>
<tr>
<td>University of New South Wales Postgraduate Scholarships</td>
<td>Living allowance of $5750 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. Applicants must be honours graduates (or equivalent) or scholars who will graduate with honours in current academic year, and who are domiciled in Australia. Applications to Registrar by 31 October. Preference is given to applicants with employment experience. Applicants must be graduates or scholars who will graduate in current academic year, and who have not previously held a Commonwealth Postgraduate Award. Applications to Registrar by 30 September.</td>
</tr>
<tr>
<td>Commonwealth Postgraduate Research Awards</td>
<td>Living allowance of $6850 pa. Other allowances may also be paid.</td>
<td>1-2 years; minimum duration of course</td>
<td>Applicants must be honours graduates (or equivalent). Applications to Dean of relevant Faculty. Applicants must be honours graduates (or equivalent) or scholars who will graduate with honours in current academic year, and who are domiciled in Australia. Applications to Registrar by 31 October. Preference is given to applicants with employment experience. Applicants must be graduates or scholars who will graduate in current academic year, and who have not previously held a Commonwealth Postgraduate Award. Applications to Registrar by 30 September.</td>
</tr>
<tr>
<td>Commonwealth Postgraduate Course Awards</td>
<td>Amount varies, depending on award</td>
<td>Up to 1 year</td>
<td>Applicants must be graduates, senior scholars or post-doctoral Fellows. Applications close 30 September. Applicants must be female graduates who are members of the Australian Federation of University Women.</td>
</tr>
<tr>
<td>Australian American Educational Foundation Travel Grant (Fulbright)**</td>
<td>$16000 over 2 years for further studies in USA, UK, Northern Europe or in special cases Australia. There are no special allowances for travel or accommodation for married graduates.</td>
<td>2 years</td>
<td>Applicants must be female graduates who will have completed a University degree or diploma this year and who are Australian citizens or have resided in Australia for at least seven years. Selection is based on scholastic and literary achievements, demonstrable qualities of character and accomplishments in cultural and/or sporting/recreational activities. Applications close 30 September.</td>
</tr>
</tbody>
</table>

*Available for reference in the University Library.

**Application forms are available from The Secretary, Department of Education, AAEF Travel Grants, PO Box 826, Woden, ACT 2606.
### 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>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 Commonwealth citizens or British Protected Persons, and who are not older than 35 years of age. Applications close with Registrar by 15 September.</td>
</tr>
<tr>
<td><strong>Sam Cracknell Memorial</strong></td>
<td>Up to $3000 pa</td>
<td></td>
<td>See above under Undergraduate Scholarships, General</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.</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 15 November.</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 early August.</td>
</tr>
<tr>
<td><strong>Frank Knox Memorial Fellowships at Harvard University</strong></td>
<td>Stipend of $5600 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</td>
</tr>
<tr>
<td><strong>The Rhodes Scholarship</strong>*</td>
<td>Approximately £3000 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 early September each year.</td>
</tr>
<tr>
<td><strong>Rothmans Fellowships Award</strong></td>
<td>$16500 pa</td>
<td>1 year, renewable up to 3 years</td>
<td>The field of study is unrestricted. Applicants must have at least 3 years graduate experience in research. Applications close in July.</td>
</tr>
</tbody>
</table>

†Application forms must be obtained from the Australian representative of the Fund, Mr. L. T. Hinde, Reserve Bank of Australia, GPO Box 3947, Sydney NSW 2001. These must be submitted to the Registrar by early August.

*Applications to Mr. H. McCredie, Secretary of the NSW Committee, University of Sydney, NSW 2006.

**Applications to the Secretary, Rothmans University Endowment Fund, University of Sydney, NSW 2006.
Graduate Scholarships (continued)

<table>
<thead>
<tr>
<th>Donor</th>
<th>Value</th>
<th>Years of Tenure</th>
<th>Conditions</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Engineering</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Harold G. Conde Memorial Fellowship</td>
<td>$7350 pa plus allowances</td>
<td>1 year, Renewable up to 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, including management.</td>
</tr>
<tr>
<td>Australian Institute of Nuclear Science and Engineering Studentships</td>
<td>Single students $8563 pa. Dependent spouse allowance $2220 pa, $520 for each dependent child, plus some University expenses.</td>
<td>1-3 years</td>
<td>Applicants must be graduates in Nuclear 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>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, Master of Public Administration or Doctor of Philosophy at the University. Applications close 30 November.</td>
</tr>
</tbody>
</table>

Shell Scholarship in Science or Engineering See below under Science

Prizes

Undergraduate University Prizes

The following table summarizes the undergraduate prizes awarded by the University. Prizes which are not specific to any School are listed under General. All other prizes are listed under the Faculty or Schools in which they are awarded. 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><strong>General</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sydney Technical College Union Award</td>
<td>150.00 and medal</td>
<td>Leadership in the development of student affairs, and academic proficiency throughout the course</td>
</tr>
<tr>
<td>University of New South Wales Alumni Association</td>
<td>Statuette</td>
<td>Achievement for community benefit – students in their final or graduating year</td>
</tr>
</tbody>
</table>
### Undergraduate University Prizes (continued)

<table>
<thead>
<tr>
<th>Donor/Name of Prize</th>
<th>Value $</th>
<th>Awarded for</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Faculties of Engineering and Applied Science</strong></td>
<td></td>
<td></td>
</tr>
<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: Civil Engineering, Electrical Engineering and Computer Science, Mechanical and Industrial Engineering, Chemical Engineering and Industrial Chemistry, Mining Engineering, Textile Technology (Engineering option only)</td>
</tr>
<tr>
<td>The John Fraser Memorial Award</td>
<td>130.00</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>

<table>
<thead>
<tr>
<th><strong>School of Civil Engineering</strong></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Association of Consulting Structural Engineers of New South Wales</td>
<td>100.00</td>
<td>General proficiency – Structures in full-time final year of the Bachelor of Engineering degree course in Civil Engineering</td>
</tr>
<tr>
<td>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>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>50.00</td>
<td>Subject selected by Head of School</td>
</tr>
<tr>
<td>Department of Civil Engineering Materials Staff</td>
<td>50.00</td>
<td>Best aggregate mark in the subjects 8.273 Civil Engineering Materials II and 8.274 Civil Engineering Materials III</td>
</tr>
<tr>
<td>James Hardie Co Pty Ltd</td>
<td>100.00</td>
<td>Highest proficiency in 8.571 Hydraulics I</td>
</tr>
<tr>
<td>Hornibrook</td>
<td>200.00</td>
<td>Proficiency in Engineering Construction and Management</td>
</tr>
<tr>
<td>Crawford Munro Memorial</td>
<td>150.00</td>
<td>Highest proficiency in 8.582 Water Resources II</td>
</tr>
<tr>
<td>Water Board Gold Medal</td>
<td>Medal</td>
<td>Public Health Engineering</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th><strong>School of Electrical Engineering and Computer Science</strong></th>
<th></th>
<th></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>
</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>Chamber of Manufactures of New South Wales</td>
<td>50.00</td>
<td>Subject selected by Head of School</td>
</tr>
<tr>
<td>Electricity Supply Engineers Association of New South Wales</td>
<td>40.00</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>J. Douglas Maclurcan</td>
<td>40.00</td>
<td>Book order</td>
</tr>
<tr>
<td>The Wilfred Holmes Memorial Award</td>
<td>120.00</td>
<td>Control Systems</td>
</tr>
<tr>
<td>The Wilfred Holmes Memorial Award</td>
<td>40.00</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 Mechanical and Industrial Engineering

<table>
<thead>
<tr>
<th>Donor/Name of Prize</th>
<th>Value $</th>
<th>Awarded for</th>
</tr>
</thead>
<tbody>
<tr>
<td>Atlas Copco</td>
<td>125.00</td>
<td>General proficiency in Bachelor of Engineering degree course in Mechanical Engineering</td>
</tr>
<tr>
<td>Austral Crane</td>
<td>75.00</td>
<td>Full-time Year 3 Mechanical Engineering</td>
</tr>
<tr>
<td>Babcock Aust Ltd</td>
<td>40.00</td>
<td>Subject selected by Head of School</td>
</tr>
<tr>
<td>David Carment Memorial</td>
<td>350.00</td>
<td>Highest proficiency in Final Year of Naval Architecture degree course</td>
</tr>
<tr>
<td>Chamber of Manufactures of New South Wales</td>
<td>50.00</td>
<td>Subject selected by Head of School</td>
</tr>
<tr>
<td>Computer-Based Engineering Design</td>
<td>75.00</td>
<td>Best undergraduate or graduate thesis making a contribution to Computer-Based Engineering Design in the School of Mechanical and Industrial Engineering</td>
</tr>
<tr>
<td>CSR Limited</td>
<td>60.00</td>
<td>Subject selected by Head of School</td>
</tr>
<tr>
<td>Ford Motor Co of Aust Ltd</td>
<td>75.00</td>
<td>Subject selected by Head of School</td>
</tr>
<tr>
<td>Harbin Polytechnical Alumni Association</td>
<td>100.00</td>
<td>Theory of Machines</td>
</tr>
<tr>
<td>Jeremy Hirschhorn</td>
<td>20.00</td>
<td></td>
</tr>
<tr>
<td>Royal Institution of Naval Architects</td>
<td>50.00</td>
<td>Best ship design in the final year</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>The Australian Institute of Refrigeration, Air Conditioning and Heating</td>
<td>60.00</td>
<td>Refrigeration and Air Conditioning</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>Department of Industrial Engineering</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>50.00</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</td>
</tr>
<tr>
<td>TRW Australia Ltd</td>
<td>20.00</td>
<td>Bachelor of Science (Engineering) degree course in Industrial Engineering</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>School of Surveying</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Association of Consulting Surveyors NSW</td>
<td>100.00</td>
<td>Most outstanding student in the field of land studies</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 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>School of Civil Engineering</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Institute of Advanced Motorists</td>
<td>20.00</td>
<td>Traffic Planning and Control</td>
</tr>
<tr>
<td>Wabco Aust Pty Ltd</td>
<td>400.00</td>
<td>Most distinguished graduate in the Master of Engineering Science degree course in Highway Engineering</td>
</tr>
</tbody>
</table>
Staff

Comprises Schools of Civil Engineering, Electrical Engineering and Computer Science, Mechanical and Industrial Engineering, Nuclear Engineering, and Surveying; and Centre for Biomedical Engineering.

Dean
Professor N. L. Svensson

Chairman
Associate Professor D. T. Howell

Executive Assistant to Dean
H. Harrison

Administrative Assistant
Patricia M. Rooney

School of Civil Engineering

Professor of Civil Engineering and Head of Department of Civil Engineering Materials
Ian Kenneth Lee, BCE MEngSc PhD Melb., FIEAust, MASCE

Professor of Civil Engineering and Head of Department of Structural Engineering
Hilary Max Irvine, ME Cant., CE Caltech., PhD Auck., MNZIE

Professor of Civil Engineering and Head of Department of Water Engineering
Thomas Grandin Chapman, BSc Leeds, PhD S'ton., FIEAust, MACS

Executive Assistant to Head of School
Dr D. K. Robinson

Senior Administrative Officer
Robert William Prior

Honorary Visiting Professor
James Macquarie Antill, BE Syd., ME N.S.W., FIEAust, FIArb, FIArbA, AMAusIMM

Honorary Associate
Alexander Wargon. MSc Harv., CE, FIEAust, FASCE, MNZIE
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 Calg., MIEAust
Owen Graeme Ingles, BA MSc Tas., CEng, CChem, FRIC, FRPSL, MIEAust, MInstF, MAIE
Somasundaram Valliappan, BE Annam., MS Northeastern, PhD DSc Wales, FIEAust, MInstF, MAIE

Senior Lecturers
William Henry Cogill, MSc(Eng) CapeT., MSc Camb., PhD N.S.W., FIEAust, MIE
Bruce John Francis Patten, BE Syd., PhD N.S.W., DIC Lond.
Brian Shackle, BE Sheff., MEngSc PhD N.S.W., MIEAust
John Maurice Wheatley, MA PhD Camb., CEng, FIM, FAusWI, MWeld(Lond)
William Otho Yandell, ME PhD N.S.W., MIEAust
Stephen Ross Yeomans, BSc PhD N.S.W., CEng, MIM

Professional Officers
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Fredrick Adrian John Stein, ED, BE N.S.W., GradIEAust, AMASCE

Programmer
Jane Nerida Louis, MSc DipEd W'gong.

Department of Structural Engineering


Associate Professors
Aigis Peter Kabaila, MEngSc PhD N.S.W., FRMTC, MIEAust
Victor Andrade Pulmano, BSCE Philippines, MEng A.I.T. PhD Northwestern
B. Vijaya Rangan, BE Madr., PhD I.I.S'B'lore., MASCE, MIEAust, MIEIndia

Senior Lecturers
Peter Stephen Balint, DiplEng Bud., BE N.S.W., MIEAust
Donald John Fraser, MEngSc PhD N.S.W., ASTC
Alexander Cuthbert Heaney, BE MEngSc Melb., PhD War., MIEAust, MASCE, AMICE
Peter Walder Kneen, BE Melb., PhD War., MIEAust, IASS
Ian James Somervaille, BE PhD N.S.W., ASTC

Lecturers
Raymond Ian Gilbert, BE PhD N.S.W., MIEAust
Raymond Eric Lawther, BE PhD N.S.W.
Francis Shay Khiet Tin Loi, BE PhD Monash, MIEAust
Neil Colin Micklesborough, MEng Car., PhD Tas., DipCE Hobart TC., MIEAust, MASCE

Tutor
Mario Maria Paul Attard, BE N.S.W.

Professional Officer
John Wesley Carrick, BE N.S.W.

Department of Transport Engineering

Senior Lecturer and Head of Department
John Andrew Black, BA Manc., PhD Brad., MTCP Syd., MCIT

Senior Lecturers
Alec James Fisher, BSc Lond., PhD N.S.W., FIESAust
Ross Donald Munro, BSc W.Aust., BA Melb., FSS
Theo ten Brumbelaar, BE MEngSc N.S.W., MIEAust
John Irwin Tindall, BE Qld., BCom ME N.S.W., MIEAust
Lecturer
Michael Clarence Dunne, BSc PhD Adel.

Professional Officers
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Andrzej Waldemar Raczkowski, Mgrinz T.U. Warsaw, MIEAust
Colin John Wingrove, BSc MEngSc N.S.W.

Professor of Computer Science
Murray William Allen, BE Adel., PhD Syd., CEgn, FTS, FACS, FIREE, MIEE, SMIEEE

Professor of Electrical Engineering — Electric Power Engineering
Frederic John Evans, BSc BE Syd., Hon. DSc Liège, CEng, SMIEEE, FIEE, FIEAust

Professor of Electrical Engineering — Electronics
Graham Austin Rigby, MSc Syd., PhD Calif., CEng, FTS, SMIEEE, FinstP, FIEEE, FIEEE, FAAA

Department of Water Engineering

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Ian Cordy, ME PhD N.S.W., MIEAust
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Bernard William Gould, BE Tas., ME N.S.W., MIEAust
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David Herbert Pilgrim, BE PhD N.S.W., FIEAust
Keith Kingsford Watson, BE Syd., ME PhD DSc N.S.W., FIEAust

Senior Lecturers
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Colin Raymond Dudgenon, ME N.S.W., MIEAust, MASCE
Trevor Regis Fietz, ME N.S.W.
Brian Selby Jenkins, BE PhD N.S.W., ASTC, MIEAust, LGE
John Robert Learmonth, BE Syd., ME N.S.W.
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School of Electrical Engineering and Computer Science

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The Bao Vu, BE PhD Adel., SMIEEE
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Hugh Ronald Outhred, BSc BE PhD Syd., AMIEEE, MIEEE

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Ronald Arthur Dennis, MSc Nott., CEng, MIMechE

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Eric Joseph Hahn, BE BSc PhD N.S.W., MIE Aust
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Chakravarti Varadachar Madhusudana, BE Mys., ME II.Sc., PhD Monash, MIE Aust, MASME, MAIAA
Engineering

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Hugh Lithgow Stark, BSc PhD Strath., CEng, FI MechE, MIEAust
Jae Lin Woo, BSc Seoul., SM M.I.T., PhD N.S.W.

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John Michael Challen, Be MEngSc Syd., PhD N.S.W., MIEAust
George Crawford, BE BSc N.S.W., ASTC, CEng, FIEAust, MAIE, ARACI
Llewellyn Ramsay Jones, BSc N.Z., DipAm MEng Shoff., PhD Wales, MIEAust, MIMechE
Knut Kjorrefjord, BSc Durh., ME N.S.W., CEng

Department of Fluid Mechanics and Thermodynamics
Includes Aeronautical Engineering and Naval Architecture.

Associate Professors
Richard Douglas Archer, BSc Melb., BE Syd., MS PhD Minn., FBIS, FRAeS, MIEAust, MAIAA
Michael Richard Davis, BSc(Eng) Phd S'ton., CEng, MRAeS, MIEAust, MAAS
Owen Francis Hughes, SB SM(NavArch). M.I.T., PhD N.S.W., MIEAust, MRINA, MSNAME

Senior Lecturers
Lawrence Julian Doctors, BE MEngSc Syd., PhD Mich., MRINA, AMSNAME
Brian Edward Milton, BE PhD N.S.W., MSc Birm., CEng, MIEAust, MRAeS
Graham Lindsay Morrison, BE PhD Melb.
Prabhat Kumar Pal, BME N.C.E., Bengal, BTech PhD Kharagpur, MlINA, MSTG(Hamburg)
John Arthur Reizes, ME PhD N.S.W., MIEAust

Lecturers
Donald Wainwright Kelly, BE Syd., PhD Lond.
Eleonora Maria Kopalinsky, BE PhD N.S.W.
Eddie Leonardi, BSc(Eng) N.S.W., MIEAust, MAIRAH, AMASHRAE
Ian Lachlan Macaline-Cross, BE Melb., PhD Monash, MIEAust

School of Nuclear Engineering

Professor of Nuclear Engineering and Head of School
James Joseph Thompson, BE PhD Syd., FIEAust

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Zdenek Josef Holy, Dipling Prague, MSc Birm., MEngSc PhD N.S.W., MIEAust

Senior Lecturer
Leslie George Kemery, BE Syd., MIEAust

Professional Officer
Peter Yo Pin Chen, BSc MEngSc ME PhD N.S.W., ASTC

Honorary Visiting Fellow
John Gannon Clouston, MSc Syd., PhD Dic Lond., ASTC, FAIP

School of Surveying

Professor of Surveying and Head of School
Peter Vincent Angus-Leppan, BSc(Eng) Rand., PhD DipTP Natal, FISAust, MILS(Natal), MAIC

Associate Professors
John Stuart Allman, BSurv PhD N.S.W., MAIC
George Gordon Bennett, MSurv Melb., PhD N.S.W., RegSurv(NSW), FISAust, MIN
John Charles Trinder, BSurv PhD N.S.W., MSc I.T.C. Delft, RegSurv(NSW), FISAust

Department of Industrial Engineering
Includes Operations Research and Production Engineering.

Associate Professors
Bruce Albert Murtagh, ME Cant., PhD Lond., DIC, CEng, MChemE, MIEAust
Michael Geoffrey Stevenson, BSc(Tech) PhD N.S.W., ASTC, CEng, FIEAust, MIPrOdE
Senior Lecturers
Bruce Crosby Forster, MSurv Melb., MSc R'dg., PhD N.S.W., MISAust, LS(Vic), MASPNG
Arthur Harry William Kearsley, BSurv MSurvSc PhD N.S.W., MISAust
Anthony John Robinson, BSurv MBA PhD N.S.W., RegSurv(NSW), MISAust, MAIC
Jean Marc Rueger, Dipling E.T.H. Zurich, SIA, LS(Switz), MISAust
Artur Stolz, BSurv PhD N S.W., RegSurv(NSW)
Ian Philip Williamson, BSurv MSurvSc N.S.W., RegSurv(NSW), MISAust

Lecturers
Pratap Shiwabhai Amin, BSc T.H. Delft, MSc Lond., MISK, CLSEA, ARICS
Leonard Berlin, Bsc(LS) CapeT, BSc T.H. Delft
Sabapathy Ganeshan, BSc Ceyl.,
Lynn Charles Holstein, MIS N.Z., DipPhotogram U.C.L., RegSurv(NSW), ARICS
John Richard Pollard, BSc Old., BTech S.A.I.T.

Administrative Officer
Joseph Valentine Fonseka, BA Lond.

Professional Officers
Tat Ming Lau, BE N'cle.(N.S.W)
Alex Pui Yin Wong, BSc Leic.

Analyst/Programmer
Mohammad Hadi Aghakhani, BSc Sh.UT.Tehran,
MSc Colorado State

Programmer
Bernd Hirsch

Centre for Biomedical Engineering

Director
Associate Professor Peter Craig Farrell, BE Syd., SM M.I.T, PhD
Wash., DSc N.S.W., MASAIO, MISAO

Senior Lecturer
*Edward Maxwell Nicholls, MD BS Adel.

Lecturers
Christopher David Bertram, MA DPhil Oxf.
Klaus Schindheim, BE PhD N.S.W., MIEAust, MASAIO

*Joint appointment with Faculty of Medicine.
The University of New South Wales Kensington Campus 1984

### Theatres
- Biomedical Theatres E27
- Central Lecture Block E19
- Classroom Block (Western Grounds) H3
- Rex Vowels Theatre F17
- Keith Burrows Theatre J14
- Main Building Theatrette K14
- Mathews Theatres D23
- Parade Theatre E3
- Science Theatre F13
- Sir John Clancy Auditorium C24

### Buildings
- Affiliated Residential Colleges
  - New (Anglican) L6
  - Shalom (Jewish) N9
  - Warrane M7
- Applied Science F10
- Architecture H14
- Arts (Morven Brown) C20
- Banks F22
- Barker Street Gatehouse N11
- Basser College C18
- Biological Sciences D26
- Central Store B13
- Chancellery C22
- Chemistry Dalton F12
- Robert Heffron E12
- Civil Engineering H20
- Commerce (John Goodsell) F20
- Dalton (Chemistry) F12
- Electrical Engineering G17
- Geography and Surveying K17
- Goldstein College D16
- Golf House A27
- Gymnasium B5
- House at Pooh Corner N8
- International House C6
- Io Myers Studio D9
- John Goodsell (Commerce) F20
- Kangas House O14
- Kensington Colleges C17
- Bass C18
- Goldstein D16
- Philip Baxter D14
- Main Building K15
- Maintenance Workshop B13
- Mathews F23
- Mechanical and Industrial Engineering J17
- Medicine (Administration) B27
- Menzies Library E21
- Metallurgy E6
- Morven Brown (Arts) C20
- New College (Anglican) L6
- Newton J12
- Parking Station H25
- Philip Baxter College D14
- Robert Heffron (Chemistry) E12
- Sam Cracknell Pavilion H8
- Shalom College (Jewish) N9
- Sir Robert Webster (Textile Technology) G14
- Squash Courts B7
- Swimming Pool B4
- Unisearch House L5
- University Regiment J2
- University Union (Blockhouse) G6
- University Union (Roundhouse) — Stage I E6
- University Union (Blockhouse) — Stage II G6
- University Union (Squarehouse) — Stage III E4
- Wallace Wurth School of Medicine C27
- Warrane College M7
- Wool and Pastoral Sciences B8
- Building H14
- Careers and Employment C22
- Cashier's Office C22
- Centre for Biomedical Engineering A28
- Centre for Medical Education Research and Development C27
- Centre for Remote Sensing K17
- Chaplains E15a
- Chemical Engineering and Industrial Chemistry F10
- Chemistry E12
- Child Care Centres N8, O14
- Civil Engineering H20
- Closed Circuit Television Centre F20
- Commerce (Faculty Office) F20
- Committee in Postgraduate Medical Education B27
- Community Medicine D26
- Computing Services Unit E21
- Drama B10
- Economics F20
- Education G2
- Electrical Engineering and Computer Science G17
- Energy Research, Development and Information Centre B8b
- Engineering (Faculty Office) K17
- English C20
- Examinations C22
- Fees Office C22
- Food Technology F10
- French C20
- General Staff Office C22
- Accountancy F20
- Admissions C22
- Adviser for Prospective Students C22
- Alumni and Ceremonials C22
- Anatomy C27
- Applied Geology F10
- Applied Science (Faculty Office) F10
- Architecture (Including Faculty Office) H14
- Arts (Faculty Office) C20
- Australian Graduate School of Management G27
- Biochemistry D26
- Biological Sciences (Faculty Office) D26
- Biomedical Library F23
- Biotechnology D26
- Bookshop G17
- Botany D26
- Building H14
- Careers and Employment C22
- Cashier's Office C22
- Centre for Biomedical Engineering A28
- Centre for Medical Education Research and Development C27
- Centre for Remote Sensing K17
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- French C20
- General Staff Office C22
- Accountancy F20
- Admissions C22
- Adviser for Prospective Students C22
- Alumni and Ceremonials C22
- Anatomy C27
- Applied Geology F10
- Applied Science (Faculty Office) F10
- Architecture (Including Faculty Office) H14
- Arts (Faculty Office) C20
- Australian Graduate School of Management G27
- Biochemistry D26
- Biological Sciences (Faculty Office) D26
- Biomedical Library F23
- Biotechnology D26
- Bookshop G17
- Botany D26
- Library E21
- Lost Property F20
- Marketing F20
- Mathematics F23
- Mechanical Engineering J17
- Medicine (Faculty Office) B27
- Metallurgy E8
- Microbiology D26
- Mining Engineering K15
- Music B11b
- National Institute of Dramatic Art C15
- Nuclear Engineering J17
- Off-campus Housing C22
- Optometry J12
- Organizational Behaviour F20
- Pathology C27
- Patrol and Cleaning Services F20
- Philosophy C20
- Physics K15
- Physical Education and Recreation Centre (PERC) B5
- Physiology and Pharmacology C27
- Political Science C20
- Postgraduate Extension Studies (Closed Circuit Television) F20
- Postgraduate Extension Studies (Radio Station and Administration) F23
- Psychology F23
- Public Affairs Unit C22
- Regional Teacher Training Centre C27
- Russian C20
- Science and Mathematics Course Office F23
- Social Work G2
- Sociology C20
- Spanish and Latin American Studies C20
- Sport and Recreation E4
- Student Counselling and Research E15c
- Student Health E15b
- Student Records C22
- Students Union E4
- Surveying K17
- Teachers' College Liaison Office F15b
- Tertiary Education Research Centre E15d
- Textile Technology G14
- Town Planning K15
- University Archives C22
- University Press A26
- University Union (Blockhouse) G6
- Wool and Pastoral Sciences B8a
- Zoology D26
This Handbook has been specially designed as a source of reference for you and will prove useful for consultation throughout the year.

For fuller details about the University — its organization, staff membership, description of disciplines, scholarships, prizes, and so on, you should consult the Calendar.

The Calendar and Handbooks also contain a summary list of higher degrees as well as the conditions for their award applicable to each volume.

For detailed information about courses, subjects and requirements of a particular faculty you should consult the relevant Faculty Handbook.

Separate Handbooks are published for the Faculties of Applied Science, Architecture, Arts, Commerce, Engineering, Law, Medicine, Professional Studies, Science (including Biological Sciences and the Board of Studies in Science and Mathematics), the Australian Graduate School of Management (AGSM) and the Board of Studies in General Education.

The Calendar and Handbooks are available from the Cashier's Office.

The Calendar costs $5.00 (plus postage $1.00, interstate $1.20).

The Handbooks vary in cost: Applied Science, Architecture, Arts, Commerce, Engineering, Professional Studies, and Sciences are $3.00. Postage is $1.00 in each case ($1.20 interstate). Law, Medicine and AGSM are $2.00. Postage is 60 cents in each case (70 cents interstate).

A set of books is $32.00. Postage is $2.00 ($4.50 interstate).

The General Studies Handbook is free. Postage is 60 cents (70 cents interstate).