The University of New South Wales

Engineering

1979 Faculty Handbook
How to use this Handbook

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

General Information (the blue 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 alphabetically.

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

Engineering

1979 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

The University of New South Wales Library has catalogued this work as follows:

UNIVERSITY OF NEW SOUTH WALES
Faculty of Engineering
Handbook.
Annual. Kensington.
1962 +

University of New South Wales —
Faculty of Engineering — Periodicals.
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 11 September 1978, but may be amended without notice by the University Council.

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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. The 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 the University and its activities you should consult the University Calendar.

Now, see the following pages for other general information which may be of value to 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 his Administrative Assistant, Mrs Anne Beaumont, are located on the first floor of the Chancellery. They will help students who need advice and who have problems and are not sure whom they should see. As well as dealing with general enquiries they are especially concerned with the problems of physically handicapped and disabled students and those in need of financial assistance. The latter students should see Mrs Beaumont. Enquire at room 148E, phone 2482 (general enquiries) or 3164 (financial assistance).

The Officer-in-Charge (Admissions and Higher Degrees Section), Mr Peter Wildblood, is located on the ground floor of the Chancellery. General enquiries should be directed to 3711.

The Officer-in-Charge (Examinations and Student Records Section) Mr Ross Woodham is located on the ground floor of the Chancellery. For particular inquiries regarding the Student Records Unit, including illness and other matters affecting performance in examinations, academic statements, graduation ceremonies, prizes, release of examination results and variations to enrolment programs, phone 3711. For information regarding examinations, including examination timetables and clash of examinations, phone 2143.

Some people who can help you

Note: All phone numbers below are University extension numbers. If you are outside the University, dial 6630351 and ask for the extension or dial 662— and then the extension number. This prefix should only be used when you are certain of the extension that you require. Callers using 662 cannot be transferred to any other number.
The Adviser for Prospective Students, Mrs Fay Lindsay, is located on the ground floor of the Chancellery and is available for personal interview. For an appointment phone 3453.

The Assistant Registrar (Student Employment and Scholarships), Mr Jack Foley, is located on the ground floor of the Chancellery. Enquiries should be directed to 2086 (undergraduate scholarships), 2525 (graduate scholarships), and 3259 (employment).

The Housing Officer, Mrs Judy Hay, is located in the Student Amenities and Recreation Unit in Hut B at the foot of Basser Steps. For assistance in obtaining suitable lodgings phone 3260.

The Student Health Unit is located in Hut E on College Road. The Director is Dr Max Napthali. For medical aid phone 2679 or 3275.

The Student Counselling and Research Unit is located at the foot of Basser Steps. The Head is Mr George Gray. For assistance with educational or vocational problems ring 3681, 3685 or 2696 for an appointment.

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

The Chaplaincy Centre is located in Hut F at the foot of Basser Steps. For spiritual aid phone Anglican—2684; Catholic—2379; Church of Christ—2683; The Uniting Church—2683; Seventh Day Adventist—2683; Jewish—3273; Baptist—398 4065.

The Students’ Union is located on the second floor of Stage III of the University Union, where the SU full-time President, Education Vice-President, Welfare-Research Officer, and Director of Overseas Students are available to discuss any problems you might have. In addition the SU offers a range of diverse services including legal advice (full-time solicitor available), clubs and societies services, second-hand bookshop (buy or sell), new records/tapes at discount, food shop (The Nuthouse), a professional nursery-kindergarten (House at Pooh Corner), a typesetting service, electronic calculators (bulk purchasing), AUS insurance (including health), an information referral centre (the Infakt Bus), a bail fund and publications such as Tharunka, Orientation Magazine, Concessions Book and counter-course handbooks. For information about these phone 2929.

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**Calendar of Dates**

- **Session 1** (14 weeks) 5 March to 13 May
  - May Recess: 14 May to 20 May
  - 21 May to 17 June
- Tuesday 19 June
- Midyear recess: 18 June to 22 July
- Wednesday 4 July
- Examinations begin
- **Session 2** (14 weeks) 23 July to 26 August
  - August Recess: 27 August to 2 September
  - 3 September to 4 November
  - Study Recess: 5 November to 11 November
- Monday 12 November
- Examinations begin
- Friday 1 December
- Examinations end

**January**
- Monday 1
  - New Year's Day — Public Holiday
- Friday 5
  - Last day for application for review of results of annual examinations
- Friday 12
  - Last day for acceptance of applications by Admissions Office for transfer to another course within the University
- Monday 29
  - Australia Day — Public Holiday

**February**
- Monday 5
  - Enrolment period begins for new students and students repeating first year
- Monday 19
  - Enrolment period begins for second and later year students
### March
- **Monday 5**
- **Tuesday 6**
  - **Session 1 commences**
  - List of graduands for April/May ceremonies published in daily press
- **Friday 30**
  - Last day for acceptance of enrolment by students re-enrolling in second and later years (late fee payable)
  - Last day for students other than those attending the University for the first time to discontinue without failure subjects which extend over Session 1 only

### April
- **Friday 6**
  - Confirmation of Enrolment forms despatched to all students
- **Friday 13 to Monday 16**
  - Easter
  - Last day for acceptance of corrected Confirmation of Enrolment forms
- **Friday 20**
  - Anzac Day — Public Holiday
  - Last day for students attending the University for the first time to discontinue without failure subjects which extend over Session 1 only

### May
- **Monday 7**
  - Last day for students completing requirements for degrees or diplomas at the end of Session 1 to submit Application for Admission to Degree
- **Monday 14**
  - **May Recess begins**
- **Thursday 17**
  - Publication of provisional timetable for June/July examinations
- **Friday 18**
  - Last day for students other than those attending the University for the first time, to discontinue without failure subjects which extend over the whole academic year
- **Sunday 20**
  - **May Recess ends**
  - Last day for students to advise of examination timetable clashes

### June
- **Tuesday 5**
  - Publication of timetable for June/July examinations
- **Sunday 17**
  - Queen's Birthday — Public Holiday
- **Monday 18**
  - Midyear Recess begins
- **Tuesday 19**
  - Examinations begin

### July
- **Wednesday 4**
  - Examinations end
- **Friday 13**
  - Examination results mailed to students
- **Monday 16**
  - Examination results displayed on University notice boards

### August
- **Thursday 2**
  - Foundation Day (No classes held)
- **Friday 3**
  - Last day for students attending the University for the first time to discontinue without failure subjects which extend over the whole academic year
- **Friday 17**
  - Last day for students, other than those attending University for the first time, to discontinue without failure subjects which extend over Session 2 only
- **Monday 27**
  - August Recess begins

### September
- **Sunday 2**
  - **August Recess ends**
- **Monday 10**
  - Last day for applications from students completing requirements for degrees and diplomas at the end of Session 2 to submit Applications for Admission to Degree
  - List of graduands for October graduation ceremony published in daily press
- **Wednesday 12**
  - Last day for students attending the University for the first time to discontinue without failure subjects which extend over Session 2 only
  - Confirmation of Enrolment forms forwarded to all students
- **Monday 17**
  - Last day to notify intention of attending October graduation ceremony

### October
- **Monday 1**
  - Last day to apply to MUAC for transfer to another University in New South Wales
  - Eight Hour Day — Public Holiday
- **Thursday 4**
  - Last day to return corrected Confirmation of Enrolment forms
  - Publication of provisional examination timetable
  - Graduation ceremony
- **Thursday 11**
  - Last day for students to advise of examination timetable clashes
- **Friday 12**
  - Tuesday 23
  - Publication of timetable for examinations

### November
- **Sunday 4**
  - **Session 2 ends**
- **Monday 5**
  - Study Recess begins
- **Sunday 11**
  - Study Recess ends
- **Monday 12**
  - Examinations begin
In 1978 the University had 18,562 students and over 4,000 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 coat of arms of the University is reproduced on the front cover of this handbook. The arms were granted by the College of Heralds in London, on 3 March 1952, and its 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 in 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 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 43 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, and the Deputy Chancellor is Dr F.M. Mathews.

The Professorial Board

The Professorial Board is one of the two chief academic units within the University and includes all the professors from the various faculties. 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 these and similar matters are presented to Council for its consideration and adoption.

Organization of the University

Rapid development has been characteristic of the University of New South Wales since it was first incorporated by an Act of Parliament in 1949, under the name of the New South Wales University of Technology.
The Faculties/Boards of Study

The Dean, who is also a professor, is the executive head of the Faculty or Board of Study. Members of each Faculty or Board meet regularly to consider matters pertaining to their own areas of study 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 together with the Australian Graduate School of Management. In addition, the Board of Studies in General Education fulfils 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 course.

The Schools

Once courses of study have been approved they come under the control of the individual Schools (eg the School of Chemistry, the School of Mathematics). 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 Rupert Myers, is charged with managing and supervising the administrative, financial and other activities of the University.

He is assisted in this task by three Pro-Vice-Chancellors, Professor John Thornton, Professor Rex Vowels and Professor Raymund Golding; 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 Keith Jennings, the Bursar, Mr Tom Daly, and the Business Manager (Property), Mr R.K. Fletcher.

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.

Student Representation on Council and Faculties/Boards

Three members of the University Council may be students elected by the 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/Board. Elections are for a one-year term of office.

Open Faculty/Board Meetings

If you wish you may attend a Faculty/Board meeting, you should seek advice at the office of the Faculty whose meeting you wish to attend, as different 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 on completion of their final year.

Identification of Subjects by Numbers

For information concerning the identifying number of each subject taught in this 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 no longer published in the Faculty handbooks. Separate lists are issued prior to the beginning of each session and are available at key points on the campus.

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

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.

There are also library services at other centres:

The Water Reference Library situated at Manly Vale (phone 9480261) which is closely associated with the Physical Sciences Library.

The library at the Broken Hill Division in the W.S. and L.B. Robinson University College building. Phone Broken Hill (060) 6022.

The library at the Royal Military College, Duntroon, ACT, serving the Faculty of Military Studies. Phone (062) 730427.

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 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.

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 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 students from Australia and up to twenty other countries. Preference is given to more senior undergraduates and graduate students. Apply in writing to the Warden, International House, PO Box 88, Kensington, NSW 2033.

New College

This Church of England College is open to all students without regard to race or religion. It has accommodation for approximately 220 students and is co-educational. Enquiries should be addressed to the Master, New College, Anzac Parade, Kensington, NSW 2033.

Shalom College

Shalom College 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. 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. A comprehensive tutorial program is offered along with a wide variety of activities and opportunities to meet informally with members of the University staff. Non-resident membership is available to male students who wish to participate in College activities and make use of its facilities. Warrane is directed by the International Catholic lay association Opus Dei. Apply in writing to the Master, Warrane College, PO Box 123, Kensington, NSW 2033.

Creston Residence

Creston, associated with Warrane College, offers accommodation for 25 full-time undergraduate and graduate women students of all nationalities and denominations. It is directed by the Women's Section of Opus Dei, a Catholic lay association. Further information: The Principal, 36 High Street, Randwick, NSW 2031.

Other Accommodation

Off-campus Accommodation

Students requiring other than College accommodation may contact the Housing Officer in the Student Amenities and Recreation Unit for assistance in obtaining suitable lodging in the way of full board, room 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.

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, list of estate agents and hints on house-hunting are available on request.
Student Employment and Scholarships

The Student Employment and Scholarships Unit offers assistance with career employment for final year students and graduates of the University. This service includes the mailing of regular job vacancy notices to registered students, and a Careers Library containing information on various careers and employers.

Careers advice and assistance are also available to undergraduates. Students undertaking courses in Applied Science or Engineering which require course-related industrial or professional training experience are assisted to find such employment over the long vacation. Information and advice regarding cadetships, undergraduate and graduate scholarships is also available.

The service is located in Room G19 of the Chancellery.

Phone extension 3259 for employment and careers advice, extension 2525 for details of graduate awards and grants, and extension 2086 for undergraduate scholarship, cadetship and industrial training information.

Student Health

A student health clinic and first aid centre is situated within the University. It is staffed by three qualified medical practitioners, assisted by two nursing sisters. The medical service, although therapeutic, is not intended to entirely 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 for specialist opinion and/or treatment. 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 as well as first aid service in the case of injury or illness on the campus are available.

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

Appointments may be made by calling at the centre or by telephoning extension 2879 or 3275 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. These clinics are open to staff and students and appointments may be made for the Student Health Unit clinic by telephoning 698.9499, or for The Prince of Wales Hospital clinics by telephoning 399.0111.
The Sports Association

The Sports Association caters for a variety of competitive sports for both men and women. Membership is compulsory at $6 per year for all registered students and is open to all members of staff and graduates of the University.

The Sports Association office is situated in Hut G, near the bottom of Basser Steps, and the control of the Sports Association is vested in the General Committee. The Executive Officer of the Sports Association may be contacted on extension 2673.

Student Travel Concessions

The Student Amenities and Recreation Unit arranges distribution of bus, rail and ferry concessions. For the peak period during the week preceding and the first week of Semester 1 distribution is at a location to be decided. Students should watch for notices around the campus announcing the distribution centre.

For the rest of the year students seeking authorization for transit concessions, including planes, should enquire at SARU, Hut B, (extension 2617) or the Enquiry Desk, Chancellery, (extension 2251).

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 (Stage 2) and the Squarehouse (Stage 3). Membership of the Union is compulsory at $45 per year for all registered students and is open to all members of staff and graduates of the University.

The full range of facilities provided by the Union includes a cafeteria service and other dining facilities, a large shopping centre, cloak room, banking and hairdressing facilities, showers, a women's lounge, common, games, reading, meeting, music, practice, craft and dark rooms. 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. Exhibitions are held in the John Clark Gallery.

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.

The Students' Union

The Students' Union is run by students and represents them on and off campus. Presidential elections are by popular vote and all students who have completed two years at the University are eligible for election. The full-time President directs the entire administration of the Students' Union and its activities.

Other full-time officers include 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; Director of Overseas Students who deals with specific problems these students may encounter while in Australia.

Membership is compulsory at $14 per annum for full-time students and $11 for part-time students.

The activities of the Students' Union include:
1. Infakt: a student-run information referral service. If you want someone to talk to or need help of any kind see the people at Infakt located in the bus at the foot of Basser Steps.
2. A casual employment service.
3. Organization of Orientation Week.
4. Organization of Foundation Day.
6. Publication of the student paper Tharunka.
7. A free legal service run by a qualified lawyer employed by the Students' Union Council.
8. Students' Union Record Shop which sells discount records and tapes.
9. The Nuthouse which deals in bulk and health foods.
10. Secondhand Bookshop for cheap texts.
11. Clubs and societies which receive money from the Students' Union through CASOC (Clubs and Societies on Campus).
12. The sale of electronic calculators and accessories at discount rates.

* Subject to revision at time of publication.
General Information

The Students' Union is affiliated with the Australian Union of Students (AUS) which represents students on the national level. The Students' Union is located on the second floor, Stage 3, the Union.

Financial Assistance to Students

Tertiary Education Assistance Scheme

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

Students in the following types of university courses are eligible for assistance:
- Undergraduate and graduate bachelor degree courses
- Graduate diplomas
- Approved combined bachelor degree courses
- Master's qualifying courses (one year)

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

1978 Higher School Certificate candidates and tertiary students receiving an allowance are sent forms in December/January. Other students may obtain forms from the Admissions Section or Student Employment and Scholarships Unit, or from the Regional Director, Department of Education, 323 Castlereagh Street, Sydney, NSW 2000 (phone 218 8800).

Continuing students should submit application 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 1978, otherwise benefits will not be paid for the earlier months of the year.

Scholarships, Cadetships, Prizes

1. Undergraduate Scholarships In addition to finance provided under the Commonwealth Government's Tertiary Education Assistance Scheme there are a number of scholarships, cadetships, prizes and other forms of assistance available to undergraduate students. Details of procedures for application for these awards are contained in the Calendar.

There are also special scholarships not administered by the University, information about which may be obtained from the School office.

Further information and advice regarding scholarships is available from the Student Employment and Scholarships Unit in the Chancellery Building.
2. **Graduate Awards** An honours degree is generally an essential requirement for gaining one of the many graduate scholarships which are available at the University. Therefore gifted students should not neglect the opportunity to qualify for honours and thus become eligible for an award.

Details of graduate awards are contained in the University Calendar.

**Other Financial Assistance**

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

1. **Deferral of Payment of Fees** Deferrals may be granted for a short period, usually one month, without the imposition of a late fee penalty, provided the deferral is requested prior to the due date for fee payments.

2. **Short Term Cash Loans** Donations from the Students' Union, the University Union and other 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 the University. Repayment usually commences after graduation or upon withdrawal from the course. 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.

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 Australian Government's Aboriginal Study Grant Scheme. Furthermore, the University may assist Aboriginal students with loans to meet some essential living expenses.
students seeking admission with advanced standing, or from students who have a record of failure at another university, are referred by the Admissions Office to the Admissions Committee of the Professorial Board.

Students seeking to register as higher degree candidates should first consult the Head of the School in which they wish to register. An application is then lodged on a standard form and the Admissions Office, 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 Admissions Office or the Metropolitan Universities Admissions Centre.

**How do I qualify for admission?**

In order to enter an undergraduate course you must qualify for matriculation to the University, and be selected for admission to the faculty or course you wish to enter. Full details of matriculation and admission requirements are contained in a pamphlet obtainable at the Admissions Office and in the Calendar.

**Enrolment**

**How do I enrol?**

All students, except those enrolling in graduate research degrees (see below), must lodge an authorized enrolment form with the Cashier on the day the enrolling officer signs the form or on the day their General Studies electives are approved if their course requires this.

All students, except those enrolling in graduate research degrees and those exempted (see below), should on that day also either pay the required fees or lodge an enrolment voucher or other appropriate authority.

**What happens if I am unable to pay fees at the time of enrolment?**

If you are unable to pay fees by the due date you may apply in writing to the Deputy Registrar (Student Services) for an extension of time, which may be granted in extenuating circumstances.

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 that time (see Fees below). Payment may be made through the mail in which case it is important that the student registration number be given accurately.

**New Undergraduate Enrolments**

Persons who are applying for entry in 1979 must lodge an application for selection with the Metropolitan Universities Admissions Centre, PO Box 7049, GPO, Sydney 2001, by 3 October 1978.

Those who are selected will be required to complete enrolment at a specified appointment time before the start of Session 1. Compulsory fees must be paid on the day of the appointment. In special circumstances, however, and provided class places are still available, students may be allowed to complete enrolment after the prescribed week, subject to the payment of a penalty (see page 15).

Application forms and details of the application procedures may be obtained from the Admissions Office.

**Re-enrolment**

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 Admissions Office 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 Metropolitan Universities Admissions Centre, PO Box 7049, GPO, Sydney 2001, by 3 October 1978.

**Restrictions Upon Re-enrolling**

Students enrolled in the first year of any undergraduate course in the University who failed more than half their program in 1978; students who have failed more than once a subject prescribed as part of their course; and students required by the Re-enrolment Committee to show cause should not attempt to re-enrol but should follow the written instructions they will receive from the Registrar.

For the purpose of calculating a student's program, all subjects taken during the year, including repeat subjects, are counted.

**Miscellaneous Subject Enrolments**

Students may be permitted to enrol for miscellaneous subjects (i.e. as students not proceeding to a degree or diploma) provided the Head of the School offering the subject considers it will be of benefit and there is accommodation available. Only in exceptional cases will subjects taken in this way count towards a degree or diploma. Students who are under exclusion may not be enrolled in miscellaneous subjects which may be counted towards courses from which they have been excluded.

Students seeking to enrol in miscellaneous subjects should obtain a letter of approval from the Head of the appropriate School or his representative permitting them to enrol in the subject concerned. The letter should be given to the enrolling officer at the time of enrolment.

For details of the locations and hours for enrolment see Enrolment Procedures 1979, a free booklet obtainable from your School or Faculty Office or from the Admissions Office.
Final Dates for Completion of Enrolments

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 1979) 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 1979) except with the express approval of the Deputy Registrar (Student Services) and the Heads of 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 1979) except with the express approval of the Deputy Registrar (Student Services) and the Heads of Schools concerned.

Can I change my course program?

If you wish to seek approval to substitute one subject for another, or add one or more subjects to your program or discontinue part or all of your program, you must make application to the Registrar through the Head of the School responsible for the course on forms available from School offices or at the Enquiry Desk in the main entrance of the Chancellery. The Registrar will inform you of the decision. Application to enrol in additional subjects must be submitted by 30 March 1979 for Session 1 only and Whole Year subjects and by 17 August 1979 for Session 2 only subjects.

It is emphasized that failure to attend for any assessment procedure, or to lodge any material stipulated as part of an assessment procedure, in any subject in which a student is enrolled will be regarded as failure in that assessment procedure unless written approval to withdraw from the subject without failure has been obtained from the Registrar.

Withdrawal from courses and subjects

Courses
1. Students withdrawing from courses (see also Subjects, below) are required to notify the Registrar in writing.

For details see the Calendar.

Subjects
2. Students are permitted to withdraw from subjects without being regarded as having failed, provided they apply by the dates indicated.

Students enrolled in the University for the first time (in any undergraduate course):
1. for one session subjects, the end of the eighth week of that session (27 April or 14 September)
2. for whole year subjects the end of the second week of Session 2 (3 August)

Students who have been enrolled in the University prior to 1979:
1. for one session subjects, the end of the fourth week of that session (30 March or 17 August)
2. for whole year subjects, the end of the eleventh week of Session 1 (18 May)

How do assisted students (eg scholarship holders) enrol?

Scholarship holders or sponsored students who have an enrolment voucher or letter of authority from their sponsor should present it at the time of enrolment. 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 must pay the 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.

What special rules apply if I wish to be considered for admission with advanced standing?

If you make application to register as a candidate for any degree or other award granted by the University you may be admitted to the course of study with such standing on the basis of previous attainments as may be determined by the Professorial Board. For complete details regarding ‘Admission with Advanced Standing’ consult the University Calendar.

Can I transfer from one course to another?

To transfer from one course to another you must apply on an application form obtainable from the Admissions Office by 17 January. If your application is successful you are required to comply with the enrolment procedures for the year/stage of the new course and, unless otherwise instructed, you should present the letter granting transfer to the enrolling officer. If you intend to transfer, you should also inform the enrolling officer of the school in which you were enrolled in 1978.

How do I enrol after an absence of twelve months or more?

If you have had an approved leave of absence for twelve months or more and wish to resume your course you should follow the instructions about re-enrolling given in the letter granting your leave of absence. If you do not fully understand or have lost these instructions, then you should contact the Admissions Office before November in the year preceding the one in which you wish to resume your course.
If you have not obtained a leave of absence from your course and have not been enrolled in the course over the past twelve months or more, then you should apply for admission to the course through the Metropolitan Universities Admission Centre before October in the year preceding that in which you wish to resume studies.

Are there any restrictions upon students 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-enroll and retain valuable class places.

First-year Rule

1. A student enrolled in the first year of any undergraduate course of study in the University as set out in the relevant faculty handbook shall be required to show cause why he/she should be allowed to continue the course if he/she fails more than half the program in which he/she is enrolled. In order that students may calculate half their program, the weighting of subjects in each course is defined in Schedule A,* which may be varied from time to time by the Professorial Board.

Repeated-failure Rule

2. A student shall be required to show cause why he/she should be allowed to repeat a subject which that student has failed more than once. Where the subject is prescribed as part of the student’s course he/she shall also be required to show cause why he/she should be allowed to continue that course.

General Rule

3. A student shall be required to show cause if, in the opinion of the faculty or board of studies his/her academic record is such as to demonstrate the student’s lack of fitness to pursue a subject or subjects and/or course or courses.

The Session-unit System

4. (1) A student who infringes the provision of Rules 1. or 2. at the end of Session 1 of any year will not be required to show cause at that time but 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 that course.

(2) Such a student will be required to show cause at the end of the year, except that a student who has infringed Rule 2. at the end of Session 1, repeats the subject(s) in question in Session 2, and passes it/them, will not be required to show cause on account of any such subject.

Exemption from Rules by Faculties

5. (1) A faculty or board of studies examination committee may, in special circumstances, exempt a student from some or all of the provisions of Rules 1. and 2.

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

'Showing Cause'

6. (1) A student wishing to show cause must apply for special permission to re-enrol. Application should be made on the form available from the Examinations and Student Records Section 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 Re-enrolment Committee which shall determine whether the cause shown is adequate to justify the granting of permission to re-enrol.

Appeal

7. (1) Any student who is excluded by the Re-enrolment Committee from a course and/or subject(s) under the provisions of the Rules may appeal to an Appeal Committee constituted by Council for this purpose with the following membership:

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

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

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

The decision of the Committee shall be final.

(2) The notification to any student of a decision by the Re-enrolment Committee to exclude him/her from re-enrolling in a course and/or subject(s) shall indicate that the student may appeal against that decision to the Appeal Committee. In lodging such an appeal with the Registrar the student should provide a complete statement of all grounds on which the appeal is based.

*For details of Schedule A see Restrictions upon Re-enrolling in the University Calendar.
Exclusion

8. (1) A student who is required to show cause under the provisions of Rules 1, or 3, and either does not attempt to show cause or does not receive special permission to re-enrol from the Re-enrolment Committee (or the Appeal Committee on appeal) shall be excluded from re-enrolling in the subject(s) and course(s) on account of which he was required to show cause. Where the subjects failed are prescribed as part of any other course (or courses) he/she shall not be allowed to enrol in any such course.

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.

How do I apply for admission to degree or diploma?

If your current program will enable you to complete all requirements for a degree or diploma, including industrial training where necessary, you should complete the form Application for Admission to a Degree by the dates shown in the Calendar of Dates and on the Notification of Examination Results. The forms are available from the Enquiry Counter at the Chancellery and will be mailed to all potential graduates.

The completion and submission of the form ensures that:

1. The correct spelling and sequence of names is recorded on the degree certificate. Any previous academic qualifications are shown in the graduation ceremony program. 3. All correspondence relating to the ceremony is forwarded to the correct address. Note: If notifying change of address after the form has been submitted an additional form Final Year Students' Graduation: Change of Address should be submitted.

If you meet all the requirements, the degree or diploma will be conferred without the necessity for further action by you. Students should advise the Registrar, in writing, if they do not wish to have the degree or diploma conferred for any reason, including the decision to proceed to an honours degree. To ensure that the degree is not conferred advice should reach the Registrar no later than 24 July for students completing at the end of Session 1, and 24 February for those completing at the end of Session 2.

Fees

Fees and penalties quoted are current at the time of publication but may be amended by the University Council without notice.
Do I have to pay fees for tuition?
No tuition fees are charged.

What other fees and charges are payable?
There are other fees and charges which include those charges raised to finance the expenses incurred in operating student activities such as the University Union, the Students' Union, the Sports Association and the Physical Education and Recreation Centre. Penalties 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 which are lent to students for personal use during attendance in certain subjects. Accommodation charges, costs of subsistence on excursions, field work etc., and for hospital residence (medical students) are payable in appropriate circumstances.

How much is my contribution to student activities and services on campus?
All students (with the exceptions noted below) will be required to pay the following fees if enrolling for a program involving two sessions. Those enrolling for only one session will pay one-half of the Student Activities Fees, and the full University Union entrance fee, if applicable.

University Union Entrance Fee, payable on first enrolment $25

Student Activities Fees
University Union, annual subscription $45
Sport Association, annual subscription $5
Students' Union $5
Students enrolling in full-time courses, annual subscription $14
Students enrolling in part-time courses and miscellaneous subjects, annual subscription $11
Miscellaneous annual fee $25

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

Are fees charged for examinations?
Generally, there are no charges associated with examinations; however two special examination fees are applied:
Examinations conducted under special circumstances—for each subject $11
Review of examination result—for each subject $11

What penalties exist for late payment of fees?
The following additional charges will be made in 1979 when fees are paid late:
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.

Locations and Hours of Cashier
Cashier's Offices are open during the enrolment periods. Details of locations and hours are listed in Enrolment Procedures 1979, a free booklet obtainable from your School or Faculty Office or from the Admissions Office.

Who is exempt from payment of fees?
1. Life members of University Union, Sports Association, and Students' Union are exempt from the relevant fee or fees.
2. Students enrolled in courses classified as External are exempt from all Student Activities Fees and the University Union entrance fee.
3. 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.

4. 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 in a miscellaneous subject or subjects to be credited towards the degrees or diplomas for which they are enrolled elsewhere are exempt from all Student Activities Fees and the University Union entrance fee.

5. 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.

6. 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.
7. Graduate students resubmitting a thesis or project only are exempt from all Student Activities Fees.

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

Is exemption from membership possible?

The Registrar is empowered to grant exemption from membership of the Students' Union and the Sports Association to students who have a genuine religious objection to such membership, subject to payment of the prescribed fees to the University.

How much will textbooks and special equipment (if any) cost?

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

Will I receive any refund if I withdraw from a course?

Yes. The following rules apply:

1. If you withdraw from courses you are required to notify the Registrar in writing.
2. Where notice of withdrawal from a course is received by the Registrar before the first day of Session 1 a refund of all fees paid will be made. After that time only a partial refund will be made. See the Calendar for details.

What happens if I fail to pay the prescribed fees or charges?

If you fail to pay prescribed fees or charges or become otherwise indebted to the University and you fail to make a satisfactory settlement of your indebtedness upon receipt of due notice then you cease to be entitled to the use of University facilities. You will not be permitted to register for a further session, to attend classes or examinations, or be granted any official credentials. In the case of a student enrolled for Session 1 only or for Sessions 1 and 2 this disbarment applies if any portion of fees is outstanding at the end of the eighth week of Session 1 (27 April 1979). In the case of a student 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 1979).

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

Can I get an extension of time to pay?

If you apply before the due date and extenuating circumstances exist, an extension of time may be granted. Apply to the Deputy Registrar (Student Services).

Examinations

When are examinations held?

Examinations for Session 2 and for Full Year subjects are held in November/December. Examinations for Session 1 subjects are held during the Midyear Recess. Provisional timetables indicating the dates and times of examinations and notices of the location of examinations are posted on the University notice boards on the campus, including the Western Grounds Area. Final timetables indicating the dates, times, locations and authorized aids are available for students two weeks before the end of each session. You must advise the Examinations Unit (the Chancellery) of any clash in examinations. Details of dates are published in the Calendar of Dates (see pages 2-4 for May/June and October/November).

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

In the assessment of your progress in University courses, 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.

How are examination passes graded?

Passes are graded: High Distinction, Distinction, Credit and Pass. Satisfactory indicates the satisfactory completion of a subject for which graded passes are not available. A Pass Conceded may be granted to a student whose mark in a subject is slightly below the standard required for a pass but whose overall satisfactory performance warrants this concession.

A Terminating Pass may be granted where the mark for the subject is below the required standard. A Terminating Pass will not permit a student to progress further in the subject or to enrol in any other subject for which a pass in the subject is a co-requisite or prerequisite. A student given a Terminating Pass may attempt a deferred examination, if available, to improve his performance but should he fail in such attempt, the Terminating Pass shall stand.
When are examination results available?

Final examination results will be posted to your term address (which can be altered up to 30 November) or to your vacation address (fill in a form obtainable at the Information Desk, Chancellery, also by 30 November). Results are also posted on School notice boards and in the foyer of the Sir John Clancy Auditorium. No examination results are given by telephone.

Can examinations results be reviewed?

Examination results may be reviewed for a fee of $11 a subject, which is refundable in the event of an error being discovered. This review consists mainly of ensuring that all questions attempted have been marked and of checking the total of the marks awarded. Applications for review must be submitted on the appropriate form to the Examinations and Student Records Section together with the necessary fee by the dates printed on the reverse side of Notification of Results.

Are allowances made if students are sick before or during an examination?

A student who through serious illness or other cause outside his control is unable to attend an examination is required to bring the circumstances (supported by a medical certificate or other evidence) to the notice of the Registrar not later than seven days after the date of the examination.

A student who believes that his performance in a subject has been affected by serious illness during the year or by other cause outside his control, and who desires these circumstances to be taken into consideration in determining his standing, is required to bring the circumstances (supported by a medical certificate or other evidence) to the notice of the Registrar as soon as the circumstances are known but not later than seven days after the date of the examination.

A student who attempts an examination, yet claims that his performance is prejudiced by sickness on the day of the examination must notify the Registrar or Examination Supervisor before, during, or immediately after the examination, and may be required to submit to medical examination.

When submitting a request for consideration candidates are required to give details of their registration number, address, course, specialization, year or stage, full or part-time and subject number, title and date of the examination affected.

A student suffering from a physical disability which puts him at a disadvantage in written examinations should apply to the Assistant Registrar, Examinations and Student Records Section (Ground Floor, the Chancellery) immediately the disability is known. If necessary, special arrangements will be made to meet the student’s requirements.

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.

Compulsory Industrial Training

Examinations including deferred 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 Unit, immediately the location of the industrial training is known. Special forms for this purpose are available at the Enquiry Desk, the Chancellery.

Arrival at Examinations

Examination rooms will be open to students 25 minutes before the commencement of the examination. Candidates are requested to be in their places at least 15 minutes before the commencement to hear announcements. The examination paper will be available for reading 10 minutes before commencement.

Use of Linguistic Dictionaries

All answers must be in English unless otherwise directed. Foreign students who have the written approval of the Assistant Registrar, Examinations and Student Records Section, may use standard linguistic dictionaries. Dictionaries should be presented for approval, not later than 14 days before the commencement of the examination period.

How are examinations conducted?

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 10 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. No candidate shall be admitted to an examination after 30 minutes from the time of commencement of the examination.
5. No candidate shall be permitted to leave the examination room before the expiry of 30 minutes from the time the examination commences.
6. No candidate shall be re-admitted to the examination room after he has left it unless during the full period of his absence he has been under approved supervision.

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

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

9. 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.

Abolition of Deferred Examinations

The system of formal deferred examinations administered by the Registrar's Division was abolished from 1 March 1978. Schools and Faculties may carry out whatever additional assessment may be considered appropriate, including assessment or additional assessment on medical or compassionate grounds.

Can I buy copies of previous examination papers?

Yes—for 5c each from the University Union's Upper Campus Shop in the Commerce Building.

Essays

Should I list my sources?

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

Student Conduct on Campus

Is there a detailed code of rules related to the general conduct of students?

No. The University has not considered it necessary to formulate a detailed code of rules relating to the general conduct of students.

Now that you have become a member of the University you should understand that this involves an undertaking on your part to observe its rules, by-laws and other requirements, and to pay due regard to any instructions conveyed by any officer of the University.

What are the rules related to attendance at classes?

You are expected to be regular and punctual in attendance at all classes in the course or subject in which you are enrolled. All applications for exemption from attendance at lectures or practical classes must be made in writing to the Registrar.

In the case of illness or of absence for some other unavoidable cause you may be excused by the Registrar for non-attendance at classes for a period not more than one month or, on the recommendation of the Dean of the appropriate Faculty, for a longer period. Applications should be addressed to the Registrar and, where applicable, should be accompanied by a medical certificate. If assessment procedures have been missed, this should be stated in the application.

If you attend less than 80 per cent of possible classes, you may be refused final assessment in that subject.

Why is my University and Union card important?

All students enrolled for courses leading to degrees and/or diplomas, except those exempt from fees, are issued with a University and Union membership card. Your card must be carried during attendance at the University and shown on request.

The number appearing on the front of the card above your name is your 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 some inconvenience in completing re-enrolment.

If you lose your card it is important to notify the University Union as soon as possible.

New students will be issued with cards on enrolment.

Why should I inform the University if I change my address?

If you change your address you should notify the Student Records Section of the Registrar's Division as soon as possible. Failure to do this could lead to important correspondence (including examination results) not reaching you. The University cannot accept responsibility if official communications fail to reach students who have not notified their change of address. Change of Address Advice Forms are available at Faculty and School offices and at the Enquiry Desk on the Ground Floor of the Chancellery Building.
All communications from the University, including examination results, will be sent to the session address. Change of address advice will be accepted up to 30 November, except for final-year students wishing to change their Submission of Details Associated with Graduation form. Changes to this form will be accepted up to a date four weeks before the student’s graduation ceremony.

Will the University release information to third parties without my permission?

In general, no. The University treats examination results 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, there are sometimes accusations made that the University has revealed information, including addresses (especially to insurance companies).

All students should be aware that students’ addresses are eagerly sought by various commercial agents and that sometimes tricks are used to obtain them. For example, from time to time 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 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.

How are student records kept up to date?

Enrolment details forms will be sent to all students on 28 April and 15 September. It is not necessary to return these forms unless any information recorded thereon is incorrect. Amended forms must be returned to the Examinations and Student Records Section within fourteen days. Amendments notified after the closing date will not be accepted unless exceptional circumstances exist and approval is obtained from the Registrar. Amended forms returned to the Registrar will be acknowledged in writing within 14 days.

Is there any rule related to the ownership of students’ work?

Yes. 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 you as part of your courses, or submitted for any award or competition conducted by the University.

Can I get a permit to park on campus?

Only a limited amount of parking is available on campus. Copies of the University’s parking rules may be obtained on application to Room 240, Chancellery Building.

Lost Property?

All enquiries concerning lost property should be made to the Superintendent on extension 3580 or to the Lost Property Office at the Union.

Further Information

Where can I get further information concerning courses, admission requirements, scholarships and enrolment procedure?

General

Any student who requires information on the application of these rules or any service which the University offers, may make enquiries in the Chancellery and in case of difficulties should visit the office of the Deputy Registrar (Student Services).

Notices

Official University notices are displayed on the notice boards 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), Electrical Engineering Building, Main Building (Physics and Mining Engineering) and in the Western Grounds Area.

Notices are placed on the University notice boards each month detailing forthcoming important dates. Any change to the Calendar of Dates is included in these notices.

Appeals

Section 5(c) of Chapter III of the By-laws provides: "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.

The Calendar

Please consult the Calendar if you want a more detailed account of the information contained in this section.

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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:

**Full-time Students**

In the Faculties of Architecture, Arts, Biological Sciences, Commerce, Law:

Monday 26 February 1979
11 am in the Clancy Auditorium

In the Faculties of Applied Science, Engineering, Medicine, Professional Studies, Science, and the Board of Studies in Science and Mathematics:

Tuesday 27 February 1979
11 am in the Clancy Auditorium

**Part-time Students**

Tuesday 27 February 1979
6.30 pm in the Clancy Auditorium

**Meeting for Parents of New South Wales**

Friday 2 March 1979
7.30 pm in the Clancy Auditorium
Foreword

This handbook is primarily for undergraduate students in the Faculty of Engineering and aims to provide information concerning the requirements for admission, enrolment and re-enrolment, conditions for the award of the different Bachelor degrees in the Faculty and the subject matter of the courses offered, including textbooks. 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.

At the same time, it is appreciated that a student’s choice in regard to course and other matters remains to be discussed with members of the academic staff. Some students do not need to make their final choice of degree course before the start of third year.

Standard programs for courses leading to the award of Bachelor degrees in Aeronautical Engineering*, Civil Engineering, Electrical Engineering, Industrial Engineering, Mechanical Engineering, Naval Architecture* and Surveying are contained in the section Course Outlines later in this handbook. For further information, students should consult the head of the appropriate school or one of the persons listed below:

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<th>School of Civil Engineering</th>
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*These courses are taught within the School of Mechanical and Industrial Engineering.
The Faculty of Engineering

School of Civil Engineering

The School of Civil Engineering consists of four departments: Water Engineering, Civil Engineering Materials, Structural Engineering, and Engineering Construction and Management. The School conducts both part-time and full-time undergraduate courses in Civil Engineering. In addition, all departments conduct graduate courses and carry out graduate research programs in many fields.

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

School of Electrical Engineering

The School of Electrical Engineering comprises five departments — Communications, Computer Science, Electric Power Engineering, Solid State Electronics, and Systems and Control Engineering.

Each department carries out research in its own field and offers lecture and laboratory courses at the undergraduate and graduate levels. Subjects of common interest are provided by the School as a whole.

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.

School of Mechanical and Industrial Engineering

Full-time 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. Part-time courses leading to the award of the degree of Bachelor of Science (Engineering) are offered in the same four fields. Either degree may be taken out by a combination of full-time/part-time study, subject to approval by the Head of School.

The first two years of the full-time degree, and the first four stages of the part-time degree are common to all 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 Stage 4 for part-time students.

Formal graduate courses of study are available, with a wide choice of subjects, leading to the degree of Master of Engineering Science. There are special Master of Engineering Science degree courses in Refrigeration and Air Conditioning, and in Industrial Engineering. The Department of Industrial Engineering within the School offers a course leading to the award of a Graduate Diploma.
Graduates with a good first degree may register for the higher degrees of Master of Engineering and Doctor of Philosophy. Current research fields are as follows — Aerodynamics, Agricultural Engineering, Applied Plasticity, Automatic Control, Bio-mechanics, Dynamics, Gas Dynamics, Heat Transfer, Fluid Mechanics, Metal Cutting, Naval Hydrodynamics, Refrigeration and Air Conditioning, and Two-phase Flow.

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 in the University of New South Wales was established in 1961. The School presently 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.

The School is presently situated in the Electrical Engineering building at Kensington. Library, workshop, digital and analogue computing facilities are available. 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 Engineering Research Division at Lucas Heights.

The School of Surveying consists of three Departments: Geodesy; Photogrammetry, Including Land Studies and Cartography; and Surveying, including Astronomy and Computations. It offers a full-time course of three years duration leading to the degree of Bachelor of Surveying. The Sandwich course, which was available until 1978, has now been integrated with the full-time course, in which students may take leaves of absence for one or more sessions, as desired, to obtain professional experience. The part-time course has been phased out during the last few years and is no longer available. The graduate courses offered are Master of Surveying Science, a two-year part-time or one-year full-time course; and the research degrees 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 programmable calculators, user terminals and a library of programs for use on the University’s Cyber computer.

Current research is in the fields of physical geodesy, photogrammetry, geometrical geodesy, error theory, computer applications, spatial information systems and cadastral systems.

The Schools of Transportation and Traffic and Highway Engineering have been amalgamated in the new School of Transport and Highways. The fusing of the disciplines of the separate Schools—the one oriented towards planning and analysis and the other to design and construction—permits greater flexibility in the choice of MEngSc programs. The new School continues to offer graduate diplomas and special courses in Transport, Highway Engineering and Traffic Planning & Control. It supervises research degrees in a wide range of topics including urban and regional planning,
highway maintenance, transport systems, transport terminal operators, public transport, land use and transport interactions, environmental impact, road safety, noise and pollution.

Courses in Chemical Engineering, Ceramic Engineering, Metallurgy, Metallurgical Process Engineering, Mining Engineering and Textile Engineering are taught 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. Central to this discussion are the basic objectives which are implicit in the various engineering 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 undergraduates. 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 executive committee and faculty. 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.

H. R. Vallentine  
Dean  
Faculty of Engineering  

N. L. Svensson  
Chairman  
Faculty of Engineering
Faculty Information

Who to Contact

If you require advice about enrolment, degree requirements, progression within courses or any other general faculty matters contact:
Ms Margaret Leonard, Administrative Assistant, Faculty of Engineering, Room 508A, Surveying and Geography Building.

For information and advice about subject content and requirements, contact the appropriate schools. Full details are published on pages 21-22.

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 1979 or enrolling in graduate courses should obtain a copy of the free booklet Enrolment Procedures 1979 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 serves the information needs of senior undergraduate students, graduate students and members of the academic staff. It contains books, a large collection of journals, and guides to the literature including abstracting and indexing journals in the subject areas of pure and applied science, technology, engineering and architecture. The library also houses a growing map collection and some microform material. All material in the library bears the prefix 'P' and is indexed in the library's central catalogue on Level 2. There is also a catalogue in the Physical Sciences Library. There is seating for approximately 300 people, and a number of room carrels and seminar rooms are available for use. Photocopying facilities are provided. Journals may not be borrowed from the collection. The library staff on Level 7 are ready to assist readers with any 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

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**Student Clubs and Societies**

Students have the opportunity of joining a wide range of clubs and societies. Many of these are affiliated with the Students’ Union. There are numerous religious, social and cultural clubs and also many sporting clubs which are affiliated with the Sports Association.

Clubs and societies seeking to use the name of the University in their title, or seeking University recognition, must submit their constitutions either to the Students' Union or the Sports Association if they wish to be affiliated with either of these bodies, or to the Registrar for approval by the University Council.

The following societies serve the interests of students in the various courses in the Faculty of Engineering: Mechanical Engineering Society (MESOC); Electrical Engineering Society (ELSOC); Civil Engineering Student Society (CVSOC); Naval Architecture Student Association (NASA); Surveying Society (SURVSOC); Computing Science Association (CSA).

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

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**Location of Laboratories outside Kensington Campus**

**Randwick**
The School of Transport and Highways and the Structures Laboratory of the School of Civil Engineering occupy new 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.

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**Centre for Biomedical Engineering**

The Centre was established in 1976 to provide a focus for interdisciplinary studies and developments in engineering, medicine and the biological sciences. Various projects are being helped by the Centre in specific ways, and in general terms the Centre provides a link between hospital and University personnel and facilities.

An Advisory Board, appointed by the Vice-Chancellor, and consisting of eminent people from many diverse areas of expertise, is responsible for overall policymaking. A Management Committee, whose members are drawn from the disciplines of mechanical, electrical and chemical engineering, preclinical sciences, orthopaedics, cardiology and the medical electronics industry, guides the execution of policy objectives and the general activities of the Centre. Ad hoc project committees look after the progress of specific projects.

The Centre for Biomedical Engineering offers graduate programs leading to the award of the degree of Master of Biomedical Engineering, and in association with other Schools, the degree of Doctor of Philosophy. The Master's degree is primarily obtained through course work but includes a research project conducted in either a hospital or another approved institution. The PhD is primarily a research degree which normally involves some formal course work.

Further information regarding the programs and activities of the Centre are available from the Director, Room 402, Geography and Surveying Building.

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**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, our local one being the Sydney Division. Within each division are branches representing the main interests within the profession, eg civil, mechanical, electrical, chemical, transportation.

Students of an approved school of engineering may join the institution as a student member (StudIEAust).

Student members receive the fortnightly publication Engineers, Australia advising of site tours, conferences, technical meetings of all branches, harbour cruises, film nights etc. 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.

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 at 65 York Street, Sydney.

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 recognises 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 six Schools—Civil Engineering, Electrical Engineering, Mechanical and Industrial Engineering, Nuclear Engineering, Transport and Highways, and Surveying. The Schools of Civil Engineering, Electrical Engineering, 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 or Bachelor of Science (Engineering). The School of Surveying offers a full-time and sandwich course leading to the degree of Bachelor of Surveying. The Schools of Nuclear Engineering and Transport and Highways offer graduate courses only.

All the graduate activities of the Faculty are co-ordinated under the Graduate School of Engineering. For full details of such activities please see the Graduate School of Engineering Handbook and the University Calendar, or contact the appropriate school.

Common First Year

The Schools of Civil, and Mechanical and Industrial Engineering have similar first year courses in physics, mathematics and chemistry, facilitating the transfer of students from one Bachelor of Engineering course to another within these schools at the end of their first year without loss of standing.

The first year courses in the Schools of the Faculty differ. However, sympathetic consideration will be given to requests by students who have completed first year to transfer to an allied course. When such transfer is desired an application must be made with the Registrar.

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 time-tabled 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.
Undergraduate Study

Full-time Courses

Full-time courses of four-years' duration are offered in Civil, Electrical, Mechanical, Industrial, and Aeronautical Engineering, and in Naval Architecture: all of these lead to the degree of Bachelor of Engineering. A four-year full-time course in Surveying is offered by the School of Surveying leading to the degree of Bachelor of Surveying. The award of the degree of Bachelor of Engineering is recognized by the Institution of Engineers, Australia, as giving complete exemption from the examinations required for admission to the grade of Member. In nearly all cases substantial or complete recognition is accorded to these courses by overseas engineering institutions.

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.

- 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.

Part-time Courses

Since 1961 the Schools of the Faculty have offered six-year part-time courses in a variety of engineering fields leading to the degree of Bachelor of Science (Technology). From 1971 the name of this degree became Bachelor of Science (Engineering) but is not awarded retrospectively. Courses for the BSc(Eng) degree are offered in Civil, Electrical, Industrial and Mechanical Engineering and in Naval Architecture and Aeronautical Engineering (these two being offered by the School of Mechanical and Industrial Engineering). No enrolments are now accepted for the BSc(Eng) course in Civil Engineering; the last initial enrolment year was 1974.

The General Studies program is the same for part-time as for full-time students, except that part-time students do not take an Advanced Elective.

The award of the degree of BSc(Eng) is recognized at present by the Institution of Engineers, Australia, as giving complete exemption from the examinations required for admission to the grade of Member. However, recognition after 1980 is currently being reviewed by the Institution of Engineers, Australia.

Recognition by overseas engineering Institutions varies in the different branches of engineering, and particular 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) award 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 BSc(Eng) award 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.

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 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;
Engineering

(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 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.

Conditions for the Award of Degree of Bachelor of Surveying

1. A candidate for the degree of Bachelor of Surveying 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 prescribed. In general, this training should be completed before the commencement of Part 8 of the undergraduate studies*.

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, 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 follow an approved course of study in this University for at least two years.

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

*This condition shall not apply after 1979.
The School of Civil Engineering offers two degree courses in Civil Engineering: the Bachelor of Engineering (BE) course which can be taken on a 4-year full-time basis, a 7-stage part-time basis or any approved combination of full-time and part-time study; and the Bachelor of Science (Engineering) (BSc(Eng)) course which is a part-time program, comprising the first six stages of the 7-stage Bachelor of Engineering course. No enrolments are now accepted for the BSc(Eng) course in Civil Engineering; the last initial enrolment year was 1974.

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

The requirements for the BE degree include a period of at least sixty working days of approved industrial experience prior to enrolment in the final year; the requirements for the BSc(Eng) degree include a period of at least three years of suitable engineering experience concurrent with the university course.

A student who has completed the requirements for the award of the BSc(Eng) degree in Civil Engineering but has not taken out the degree by formal graduation may apply to the Head of School for enrolment on a part-time basis in the BE degree course.

**Civil Engineering Full-time Course**

**Bachelor of Engineering**

**BE**

**Year 1**

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Hours Per Week</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.981</td>
<td>Physics (CE)*</td>
<td>5 3</td>
</tr>
<tr>
<td>2.981</td>
<td>Chemistry ICE†</td>
<td>6 2</td>
</tr>
<tr>
<td>5.0102</td>
<td>Introduction to Engineering</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Design</td>
<td>2 0</td>
</tr>
<tr>
<td>5.0201</td>
<td>Engineering Dynamics</td>
<td>0 4</td>
</tr>
<tr>
<td>5.0301</td>
<td>Engineering Drawing</td>
<td>0 3</td>
</tr>
<tr>
<td>8.170</td>
<td>Statics</td>
<td>4 0</td>
</tr>
<tr>
<td>8.171</td>
<td>Mechanics of Solids</td>
<td>0 2</td>
</tr>
<tr>
<td>8.271</td>
<td>Introduction to Materials</td>
<td>0 2</td>
</tr>
<tr>
<td>8.670</td>
<td>Introduction to Engineering</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Construction</td>
<td>0 1</td>
</tr>
<tr>
<td>10.001</td>
<td>Mathematics I**</td>
<td>6 6</td>
</tr>
</tbody>
</table>

* † **For footnotes, see overleaf, column one.
*Students are advised to attempt 1.981 Physics ICE but if time-
tabling 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 have not satisfied the science prerequisite for 1.081 
Physics ICE (ie 2 or 4 unit Science including Physics or Chemistry 
at Grades 1, 2 or 3) are advised to apply to enrol in two 
acceptable alternative subjects, 2.111 Introductory Chemistry and 
2.121 Chemistry IA. 
**Students who have achieved a certain standard may attempt 
10.011 Higher Mathematics I.

### Year 2

<table>
<thead>
<tr>
<th>Subject</th>
<th>Hours Per Week</th>
</tr>
</thead>
<tbody>
<tr>
<td>8.172 Mechanics of Solids II</td>
<td>S1  4  S2  0</td>
</tr>
<tr>
<td>8.181 Structural Design I</td>
<td>S1  2½  S2  2½</td>
</tr>
<tr>
<td>8.272 Civil Engineering Materials I</td>
<td>S1  4  S2  4</td>
</tr>
<tr>
<td>8.301 Systems Engineering</td>
<td>S1  2  S2  2</td>
</tr>
<tr>
<td>8.571 Hydraulics I</td>
<td>S1  0  S2  3</td>
</tr>
<tr>
<td>8.671 Engineering Construction</td>
<td>S1  3  S2  0</td>
</tr>
<tr>
<td>10.022 Engineering Mathematics II</td>
<td>S1  4  S2  4</td>
</tr>
<tr>
<td>29.441 Surveying for Engineers</td>
<td>S1  0  S2  6</td>
</tr>
<tr>
<td>29.491 Survey Camp†</td>
<td>S1  1½  S2  1½</td>
</tr>
<tr>
<td>Two Electives**</td>
<td>S1  3  S2  3</td>
</tr>
</tbody>
</table>

*See Electives on following page.
†Students are required to attend a one-week Survey Camp, which is equivalent to 1½ class contact hours per week in each session.

### Year 3

<table>
<thead>
<tr>
<th>Subject</th>
<th>Hours Per Week</th>
</tr>
</thead>
<tbody>
<tr>
<td>8.173 Structural Analysis I</td>
<td>S1  3  S2  0</td>
</tr>
<tr>
<td>8.174 Structural Analysis II</td>
<td>S1  0  S2  3</td>
</tr>
<tr>
<td>8.182 Structural Design II</td>
<td>S1  3  S2  3</td>
</tr>
<tr>
<td>8.273 Civil Engineering Materials II</td>
<td>S1  3  S2  3</td>
</tr>
<tr>
<td>8.571 Engineering Mathematics</td>
<td>S1  5  S2  0</td>
</tr>
<tr>
<td>8.572 Hydraulics I</td>
<td>S1  3  S2  0</td>
</tr>
<tr>
<td>8.573 Hydraulics III</td>
<td>S1  0  S2  3</td>
</tr>
<tr>
<td>8.581 Water Resources I</td>
<td>S1  3  S2  0</td>
</tr>
<tr>
<td>8.582 Water Resources II</td>
<td>S1  0  S2  3</td>
</tr>
<tr>
<td>8.672 Planning and Management I</td>
<td>S1  0  S2  4</td>
</tr>
<tr>
<td>Two Electives**</td>
<td>S1  3  S2  3</td>
</tr>
</tbody>
</table>

*See Electives on following page.

### Year 4

<table>
<thead>
<tr>
<th>Subject</th>
<th>Hours Per Week</th>
</tr>
</thead>
<tbody>
<tr>
<td>8.001 Industrial Training</td>
<td>S1  0  S2  0</td>
</tr>
<tr>
<td>8.191 Structural Engineering</td>
<td>S1  3  S2  0</td>
</tr>
<tr>
<td>8.274 Civil Engineering Materials III</td>
<td>S1  3  S2  3</td>
</tr>
<tr>
<td>8.583 Water Resources III</td>
<td>S1  3  S2  0</td>
</tr>
<tr>
<td>8.873 Planning and Management II</td>
<td>S1  3  S2  0</td>
</tr>
<tr>
<td>8.874 Planning and Management III</td>
<td>S1  3  S2  0</td>
</tr>
<tr>
<td>8.051 Design Project — Materials</td>
<td>S1  0  S2  1½</td>
</tr>
<tr>
<td>8.052 Design Project — Structures</td>
<td>S1  0  S2  1½</td>
</tr>
<tr>
<td>8.053 Design Project — Water</td>
<td>S1  0  S2  1½</td>
</tr>
<tr>
<td>8.054 Design Project — Construction</td>
<td>S1  0  S2  1½</td>
</tr>
<tr>
<td>Six Electives**</td>
<td>S1  9  S2  9</td>
</tr>
</tbody>
</table>

*See Electives on following page.

**Includes 28 hours of Saturday fieldwork as an essential part of the subject.
†Students are required to attend a one-week Survey Camp, equivalent to 1½ class contact hours per week in each session.

### 3620

#### Civil Engineering — Part-time Course

#### Bachelor of Engineering

**BE**

#### Stage 1

<table>
<thead>
<tr>
<th>Subject</th>
<th>Hours Per Week</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.001 Physics I*</td>
<td>S1  6  S2  6</td>
</tr>
<tr>
<td>10.001 Mathematics*</td>
<td>S1  6  S2  6</td>
</tr>
</tbody>
</table>

*Students attending in the daytime may attempt alternative subjects. See the footnote following Year 1.

#### Stage 2

<table>
<thead>
<tr>
<th>Subject</th>
<th>Hours Per Week</th>
</tr>
</thead>
<tbody>
<tr>
<td>2.981 Chemistry ICE†</td>
<td>S1  6  S2  2</td>
</tr>
<tr>
<td>5.0102 Introduction to Engineering Design</td>
<td>S1  0  S2  4</td>
</tr>
<tr>
<td>5.0201 Engineering Dynamics</td>
<td>S1  0  S2  4</td>
</tr>
<tr>
<td>5.0301 Engineering Drawing</td>
<td>S1  0  S2  3</td>
</tr>
<tr>
<td>8.170 Statics</td>
<td>S1  4  S2  0</td>
</tr>
<tr>
<td>8.171 Mechanics of Solids</td>
<td>S1  0  S2  2</td>
</tr>
<tr>
<td>8.271 Introduction to Materials</td>
<td>S1  2  S2  0</td>
</tr>
<tr>
<td>8.670 Introduction to Engineering Construction</td>
<td>S1  1  S2  0</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Hours Per Week</th>
</tr>
</thead>
<tbody>
<tr>
<td>S1  13  S2  13</td>
</tr>
</tbody>
</table>

*See this footnote below Year 1 (at top of first column, this page).

#### Stage 3

<table>
<thead>
<tr>
<th>Subject</th>
<th>Hours Per Week</th>
</tr>
</thead>
<tbody>
<tr>
<td>8.172 Mechanics of Solids II</td>
<td>S1  0  S2  4</td>
</tr>
<tr>
<td>8.272 Civil Engineering Materials I</td>
<td>S1  4  S2  4</td>
</tr>
<tr>
<td>10.022 Engineering Mathematics II</td>
<td>S1  0  S2  4</td>
</tr>
<tr>
<td>29.441 Surveying for Engineers**</td>
<td>S1  6  S2  0</td>
</tr>
<tr>
<td>29.491 Survey Camp†</td>
<td>S1  1½  S2  1½</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Hours Per Week</th>
</tr>
</thead>
<tbody>
<tr>
<td>S1  15½  S2  13½</td>
</tr>
</tbody>
</table>

#### Stage 4

<table>
<thead>
<tr>
<th>Subject</th>
<th>Hours Per Week</th>
</tr>
</thead>
<tbody>
<tr>
<td>8.181 Structural Design I</td>
<td>S1  2½  S2  2½</td>
</tr>
<tr>
<td>8.273 Civil Engineering Materials II</td>
<td>S1  3  S2  3</td>
</tr>
<tr>
<td>8.301 Systems Engineering</td>
<td>S1  2  S2  2</td>
</tr>
<tr>
<td>8.571 Hydraulics I</td>
<td>S1  3  S2  0</td>
</tr>
<tr>
<td>8.671 Engineering Construction</td>
<td>S1  0  S2  3</td>
</tr>
<tr>
<td>Two Electives**</td>
<td>S1  3  S2  3</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Hours Per Week</th>
</tr>
</thead>
<tbody>
<tr>
<td>S1  13½  S2  13½</td>
</tr>
</tbody>
</table>

*See Electives on following page.
†One elective for 1978 Stage 1 students, if they have completed an elective.

### Double Degree

#### 3730

**Double Degree of BSc BE in Civil Engineering**

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

Normally, students enrolled in the BSc BE 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) within an approved program.

The course consists of the Civil Engineering program (3620), with six instead of ten electives, and at least fourteen units of the Science and Mathematics Course (5970) within an approved program.

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

The programs are identified by a four-digit number, each pair of digits indicating the school which offers the subject. The subjects from the Science and Mathematics Course. The school identifying numbers are given in the table preceding the subject descriptions.

<table>
<thead>
<tr>
<th>Physical Metallurgy and Chemistry</th>
<th>Geography and Environmental Chemistry</th>
</tr>
</thead>
</table>

For details of these programs see the Combined Sciences Handbook.
<table>
<thead>
<tr>
<th>Year 1</th>
<th>1.001 or 1.011</th>
</tr>
</thead>
<tbody>
<tr>
<td>2.981†</td>
<td>5.0102, 5.0201, 5.0301</td>
</tr>
<tr>
<td>8.170, 8.171, 8.271, 8.670</td>
<td></td>
</tr>
<tr>
<td>10.001**</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Year 2</th>
<th>2.012</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.022, 1.032</td>
<td></td>
</tr>
<tr>
<td>8.172, 8.181, 8.272</td>
<td></td>
</tr>
<tr>
<td>10.111A or 10.121A</td>
<td></td>
</tr>
<tr>
<td>29.441, 29.491</td>
<td></td>
</tr>
<tr>
<td>1 elective†</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Year 3</th>
<th>1.023, 1.043, 1.133 or 1.313 or 1.323</th>
</tr>
</thead>
<tbody>
<tr>
<td>8.173, 8.174, 8.182, 8.351, 8.571</td>
<td></td>
</tr>
<tr>
<td>10.111A or 10.121A</td>
<td></td>
</tr>
<tr>
<td>29.441, 29.491</td>
<td></td>
</tr>
<tr>
<td>1 elective†</td>
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</table>

<table>
<thead>
<tr>
<th>Year 4</th>
<th>1.033</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.133 or 1.313 or 1.323</td>
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</tr>
<tr>
<td>8.273, 8.301, 8.572, 8.573, 8.581, 8.582, 8.671, 8.672</td>
<td></td>
</tr>
<tr>
<td>1 elective†</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Year 5</th>
<th>8.001, 8.191, 8.274, 8.573, 8.674, 8.051, 8.052, 8.053, 8.054</th>
</tr>
</thead>
<tbody>
<tr>
<td>2 elective†</td>
<td></td>
</tr>
</tbody>
</table>

| Year 6 | Choose 1 or 2 units from Table 1 in the Combined Sciences Handbook at Level II or higher |

### Mathematics†

<table>
<thead>
<tr>
<th>Year 1</th>
<th>1.981*</th>
</tr>
</thead>
<tbody>
<tr>
<td>2.981†</td>
<td></td>
</tr>
<tr>
<td>5.0102, 5.0201, 5.0301</td>
<td></td>
</tr>
<tr>
<td>8.170, 8.171, 8.271, 8.670</td>
<td></td>
</tr>
<tr>
<td>10.001**</td>
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</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Year 2</th>
<th>8.172, 8.181, 8.272</th>
</tr>
</thead>
<tbody>
<tr>
<td>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</td>
<td></td>
</tr>
<tr>
<td>1 elective†</td>
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</tbody>
</table>

<table>
<thead>
<tr>
<th>Year 3</th>
<th>Choose either 1. or 2.</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. 10.311A or 10.321A, 10.311B or 10.321B</td>
<td></td>
</tr>
<tr>
<td>2. Choose 3 units from: 10.411B or 10.421B, 10.411A or 10.421A, 10.331, 10.211D or 10.221D, 10.1111, 10.1112 or 10.121C</td>
<td></td>
</tr>
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</table>

### Geology with some Mathematics†

<table>
<thead>
<tr>
<th>Year 1</th>
<th>1.981*</th>
</tr>
</thead>
<tbody>
<tr>
<td>2.981†</td>
<td></td>
</tr>
<tr>
<td>5.0102, 5.0201, 5.0301</td>
<td></td>
</tr>
<tr>
<td>8.170, 8.171, 8.271, 8.670</td>
<td></td>
</tr>
<tr>
<td>10.001**</td>
<td></td>
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</tbody>
</table>

<table>
<thead>
<tr>
<th>Year 2</th>
<th>8.172, 8.181, 8.272</th>
</tr>
</thead>
<tbody>
<tr>
<td>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</td>
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<tr>
<td>25.011</td>
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<td>3 elective†</td>
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<table>
<thead>
<tr>
<th>Year 3</th>
<th>2.042C</th>
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<tbody>
<tr>
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<tr>
<td>25.012, 25.022</td>
<td></td>
</tr>
<tr>
<td>29.441, 29.491</td>
<td></td>
</tr>
<tr>
<td>1 elective†</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Year 4</th>
<th>8.273, 8.301, 8.572, 8.573, 8.581, 8.582, 8.671, 8.672</th>
</tr>
</thead>
<tbody>
<tr>
<td>25.013, 25.023</td>
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</tbody>
</table>

<table>
<thead>
<tr>
<th>Year 5</th>
<th>8.001, 8.191, 8.274, 8.573, 8.674, 8.051, 8.052, 8.053, 8.054</th>
</tr>
</thead>
<tbody>
<tr>
<td>2 elective†</td>
<td></td>
</tr>
</tbody>
</table>

| Year 6 | Choose 1 or 2 units from Table 1 in the Combined Sciences Handbook at Level II or higher |

---

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

**Students who have not satisfied the Science prerequisite for 1.981 Physics 1CE 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 together with 2.981 Chemistry 1CE students will be exempted from one technical elective.

***Students who have achieved a certain standard may attempt 10.011 Higher Mathematics I.

†Note: AM material not in italics typeface refers to the BE degree component of this combined degree course.
Computing with some Mathematics‡

Year 1
1.981*
2.981†
5.0102, 5.0201, 5.0301
8.170, 8.171, 8.271, 8.670
10.001**

Year 2
6.620, 6.631, 6.641
8.173, 8.174, 8.182, 8.351, 8.571
10.2111 or 10.2211,
10.2112 or 10.2212
29.441, 29.491
1 elective†
Choose 1 Level II or Level III Mathematics unit from Table 1 in the Combined Sciences Handbook

Year 3
6.642, 6.643
8.173, 8.174, 8.182, 8.351, 8.571
10.2111 or 10.2211,
10.2112 or 10.2212
29.441, 29.491
1 elective†
Choose 1 Level II or Level III Mathematics unit from Table 1 in the Combined Sciences Handbook

Year 4
6.648, 6.647, 6.649
8.273, 8.301, 8.572, 8.573, 8.581, 8.582, 8.671, 8.672
1 elective†
Choose 1 Level II or Level III Mathematics unit from Table 1 in the Combined Sciences Handbook

Year 5
8.001, 8.191, 8.274, 8.583, 8.673, 8.674, 8.051, 8.052,
8.053, 8.054
2 electives†
Choose 1 or 2 units from Table 1 in the Combined Sciences Handbook at Level II or higher

School of Electrical Engineering

Head of School
Professor M. W. Allen

Executive Assistant to Head of School
Associate Professor C. A. Stapleton

Senior Administrative Officer
H. G. Phillips

Administrative Assistant
Ms Robyn Horwood

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

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

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

The School of Electrical Engineering offers a full-time course of four years duration leading to the degree of Bachelor of Engineering (pass or honours), and a six year part-time course for the degree of Bachelor of Science (Engineering): provided prerequisites are met and the program can be timetabled, a student in either course may, with the approval of the Head of the School, complete the requirements by a combination of full-time and part-time study. Each subject of the BSc(Eng) course is generally identical with a subject of the BE program and the requirements of these subjects can be completed by either day or evening study in most cases: a part-time student is expected to be able to attend classes on at least one afternoon a week.

The degrees of Bachelor of Engineering and Bachelor of Science (Engineering) are recognized by the Institution of Engineers, Australia and the Institution of Radio and Electronics Engineers, Australia, as giving complete exemption from the examinations required for admission to Graduate or Corporate membership. The Institution of Engineers, Australia, is reviewing its requirements for BSc(Eng) degree graduates completing their course after June 1980.

Honours

In the Bachelor of Engineering course the same formal program is offered to both pass students and to those aiming at honours. Honours will be awarded for meritorious performance over the course: special attention is paid to a candidate’s performance in the final year thesis project. A student with a creditable performance in the Bachelor of Science (Engineering) course may be awarded a degree with Merit.

Industrial Experience

All students in the BSc(Eng) degree course must complete three years of concurrent appropriate industrial training. Students should enrol in the subject 6.902 Industrial Experience in the year in which they expect to graduate.

‡ † † † See footnotes at foot of previous page.
All students in the BE course must complete at least 60 days industrial experience usually in the summer recesses at the end of Years 2 and 3. Details of the BE requirements are available in the Industrial Training booklet produced by the Student Employment Service and Scholarships Unit:

### 3640 Electrical Engineering

**Bachelor of Engineering BE**

#### Year 1

<table>
<thead>
<tr>
<th>Course</th>
<th>Hours Per Week</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>1.961 Physics I</strong></td>
<td>S1 6 S2 6</td>
</tr>
<tr>
<td><strong>2.121 Chemistry</strong></td>
<td>S1 6 S2 0</td>
</tr>
<tr>
<td><strong>5.030 Engineering C</strong></td>
<td>S1 6 S2 0</td>
</tr>
<tr>
<td><strong>6.010 Electrical Engineering I</strong></td>
<td>S1 0 S2 6</td>
</tr>
<tr>
<td><strong>10.001 Mathematics I</strong></td>
<td>S1 6 S2 6</td>
</tr>
<tr>
<td><strong>Either</strong></td>
<td></td>
</tr>
<tr>
<td><strong>2.131 Chemistry</strong></td>
<td>S1 0 S2 6</td>
</tr>
<tr>
<td><strong>5.010 Engineering A</strong></td>
<td>S1 1 1/2 S2 1 1/2</td>
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<tr>
<td>One General Studies Elective</td>
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*Students who have achieved a certain standard may attempt similar material at a higher level.

**Year 2**

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<thead>
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<tr>
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<td><strong>6.021A Circuit Theory I</strong></td>
<td>S1 4 S2 0</td>
</tr>
<tr>
<td><strong>6.021B Power</strong></td>
<td>S1 0 S2 4</td>
</tr>
<tr>
<td><strong>6.021C Electronics</strong></td>
<td>S1 0 S2 4</td>
</tr>
<tr>
<td><strong>6.021D Introduction to Computing</strong></td>
<td>S1 0 S2 4</td>
</tr>
<tr>
<td><strong>6.021E Digital Logic and Systems</strong></td>
<td>S1 4 S2 0</td>
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<tr>
<td><strong>10.111A Pure Mathematics II (Linear Algebra)</strong></td>
<td>S1 2 S2 2</td>
</tr>
<tr>
<td><strong>10.1113 Pure Mathematics II</strong></td>
<td>S1 2 1/2 S2 0</td>
</tr>
<tr>
<td></td>
<td>- Multivariable Calculus*</td>
</tr>
<tr>
<td><strong>10.1114 Pure Mathematics II</strong></td>
<td>S1 0 S2 2 1/2</td>
</tr>
<tr>
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<td>- Complex Analysis*</td>
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<tr>
<td><strong>10.2111 Applied Mathematics II</strong></td>
<td>S1 3 S2 0</td>
</tr>
<tr>
<td></td>
<td>- Vector Calculus*</td>
</tr>
<tr>
<td><strong>10.2112 Applied Mathematics II</strong></td>
<td>S1 0 S2 2 1/2</td>
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<tr>
<td></td>
<td>- Mathematical Methods for Differential Equations*</td>
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*Students who have achieved a certain standard may attempt similar material at a higher level.

†Two General Studies electives in 1979.

#### Year 3*

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<tr>
<th>Course</th>
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<tbody>
<tr>
<td><strong>1.992 Thermal Physics and Mechanics†</strong></td>
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<td><strong>3.302 Fuels and Energy†</strong></td>
<td>S1 0 S2 4</td>
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<tr>
<td><strong>6.056 Mechanical Engineering†</strong></td>
<td>S1 0 S2 4</td>
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<tr>
<td><strong>8.113 Civil Engineering†</strong></td>
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<td><strong>10.033 EE Maths III</strong></td>
<td>S1 2 S2 2</td>
</tr>
<tr>
<td><strong>10.361 Statistics SE</strong></td>
<td>S1 2 S2 2</td>
</tr>
<tr>
<td><strong>Electrical Engineering III</strong></td>
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</tr>
<tr>
<td><strong>6.0311 Circuit Theory II</strong></td>
<td>S1 4 S2 0</td>
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<tr>
<td><strong>6.0312 Utilization of Electric Energy</strong></td>
<td>S1 4 S2 0</td>
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<tr>
<td><strong>6.0313 Electronic Circuits I</strong></td>
<td>S1 4 S2 0</td>
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<td><strong>6.0314 Systems and Control</strong></td>
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<td><strong>6.0315 Electrical Energy</strong></td>
<td>S1 0 S2 4</td>
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<tr>
<td><strong>6.0316 Electronic Circuits II</strong></td>
<td>S1 0 S2 4</td>
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<tr>
<td><strong>6.0317 Communication Systems I</strong></td>
<td>S1 0 S2 4</td>
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</table>

†Each student elects two of these four; a free choice may not be possible.

*Students who intend to major in particular disciplines should note that certain subjects are prerequisites for the professional electives they will choose in Year 4. Thus, 6.613 and 6.641 are prerequisites for some of the professional computing electives and may be requested by substitution rules.

**Two General Studies electives in 1979.

#### Year 4

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<th>Course</th>
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<tbody>
<tr>
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<td>S1 2 S2 21</td>
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<tr>
<td><strong>Electrical Engineering IV</strong></td>
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<tr>
<td><strong>(6 electives)†</strong></td>
<td>S1 20 S2 10</td>
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<tr>
<td>and General Studies Elective</td>
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<table>
<thead>
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<tbody>
<tr>
<td>25</td>
<td>31</td>
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</table>

†In Session 1 two hours per week and in Session 2 three days per week are devoted to directed laboratory and research work on an approved subject under the guidance of members of the lecturing staff. Generally, the project 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.

**Electrical Engineering IV**

Four Electives are taken in Session 1 and two in Session 2. The program selected by each student must be approved by the Head of School. Not all electives are offered every session; students are advised each year which electives are available. Each elective is 5 hours per week for one session.

The list of electives is:

<table>
<thead>
<tr>
<th>Course</th>
<th>Hours Per Week</th>
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<tbody>
<tr>
<td><strong>6.041 Electrical Measurements</strong></td>
<td>S1 0 S2 10</td>
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<tr>
<td><strong>6.042 Digital and Analogue Signals</strong></td>
<td>S1 0 S2 10</td>
</tr>
<tr>
<td><strong>6.044 Electrical Product Design and Reliability</strong></td>
<td>S1 0 S2 10</td>
</tr>
<tr>
<td><strong>6.202 Power Engineering I</strong></td>
<td>S1 0 S2 4</td>
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<tr>
<td><strong>6.203 Power Engineering II</strong></td>
<td>S1 0 S2 4</td>
</tr>
<tr>
<td><strong>6.212 Power Engineering—Utilization</strong></td>
<td>S1 0 S2 4</td>
</tr>
<tr>
<td><strong>6.222 High Voltage and High Current Technology</strong></td>
<td>S1 0 S2 4</td>
</tr>
<tr>
<td><strong>6.303 High Frequency Circuits and Electronics I</strong></td>
<td>S1 0 S2 4</td>
</tr>
<tr>
<td><strong>6.313 High Frequency Circuits and Electronics II</strong></td>
<td>S1 0 S2 4</td>
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</table>

**Electrical Engineering IV**
Course Outlines

6.322 Electronics
6.323 Communication Systems 2A
6.333 Communication Systems 2B
6.383 Biomedical Engineering
6.412 Automatic Control
6.413 Modern Systems Engineering
6.432 Computer Control and Instrumentation
6.512 Advanced Semiconductor Device Theory
6.522 Transistor and Integrated Circuit Design
6.607A Computer Hardware Architecture
6.607B Advanced Software Technology
6.612 Computer Systems Engineering
6.622 Computer Application and Systems

*Students who have completed the prerequisites may request substitution of Science 3 Computing Science electives.

3650
Electrical Engineering

Bachelor of Science (Engineering)
BSc(Eng)

Stage 1

<table>
<thead>
<tr>
<th>Course</th>
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<tbody>
<tr>
<td>1.001 Physics I</td>
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<td>10.001 Mathematics I</td>
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Stage 2

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<tr>
<td>2.121 Chemistry</td>
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<tr>
<td>5.030 Engineering C</td>
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<tr>
<td>6.010 Electrical Engineering I</td>
<td>6</td>
</tr>
<tr>
<td>6.021A Circuit Theory I</td>
<td>0</td>
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<tr>
<td>10.1113 Pure Mathematics II</td>
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<tr>
<td>— Multivariable Calculus</td>
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</tr>
<tr>
<td>10.1114 Pure Mathematics II</td>
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<tr>
<td>— Complex Analysis</td>
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Stage 3

<table>
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<tbody>
<tr>
<td>1.982 Solid State Physics</td>
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<td>6.021B Power</td>
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<tr>
<td>6.021C Electronics†</td>
<td>0</td>
</tr>
<tr>
<td>6.0311 Circuit Theory II</td>
<td>0</td>
</tr>
<tr>
<td>10.111A Pure Mathematics II — Linear Algebra</td>
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<tr>
<td>10.2111 Applied Mathematics II</td>
<td>2½</td>
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<tr>
<td>— Vector Calculus</td>
<td>0</td>
</tr>
<tr>
<td>10.2112 Applied Mathematics II</td>
<td>0</td>
</tr>
<tr>
<td>— Mathematical Methods for</td>
<td>2½</td>
</tr>
<tr>
<td>Differential Equations</td>
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Stage 4

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<tr>
<td>1.972 Electromagnetism</td>
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<tr>
<td>1.992 Thermal Physics and Mechanics</td>
<td>4</td>
</tr>
<tr>
<td>6.021D Computing</td>
<td>0</td>
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<tr>
<td>6.022 EE Materials†</td>
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<td>6.0312 Utilization of Electric Energy</td>
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<td>6.0313 Electronic Circuits I</td>
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Stage 5

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<tr>
<td>6.021E Digital Logic and Systems</td>
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<td>6.0314 Signal Processing</td>
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<td>6.0315 Electrical Energy</td>
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<td>6.0316 Electronic Circuits II</td>
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<td>5.361 Statistics SE</td>
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Stage 6

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<td>Three Professional Electives*</td>
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<tr>
<td>5.661 Mechanical Engineering</td>
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<td>6.902 Industrial Experience</td>
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</table>

Course Revision

The school is engaged in an on-going program of course revision and detailed changes are being made from time to time.

It is the responsibility of students to meet the course requirements applicable at the date of application for the degree. Following each course revision, students will be assessed on the basis of the new program but:

- no students will lose credit for any subject completed, and
- no students will be liable for increased requirements if they progress normally.

Students in Year 3 in 1979 are required to do three of 6.022, 1.992, 3.302, 5.661 and 8.113 instead of four as in old program and two as in new program.

†Because 6.022 does not operate in 1979, students in Stage 4 must do 6.021C (if not already completed) or 6.021E.

†In 1979 students attempt 1.972.
Prerequisites and Co-requisites
Full-time Bachelor of Engineering Degree Course 1979

<table>
<thead>
<tr>
<th>Year</th>
<th>Subject</th>
<th>Prerequisites</th>
<th>Co-requisites</th>
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<td>2.121</td>
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<td>2.131</td>
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<td>5.010</td>
<td>The Electricity &amp; Magnetism section of 1.961</td>
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<td>6.021A</td>
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<td>6.021D</td>
<td>Computing strand of 5.030. If not, do 6.620</td>
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<td>6.0311, 6.0314</td>
<td></td>
</tr>
<tr>
<td></td>
<td>6.413</td>
<td>6.412</td>
<td></td>
</tr>
<tr>
<td></td>
<td>6.432</td>
<td>6.0311, 6.0313, 6.0316</td>
<td></td>
</tr>
<tr>
<td></td>
<td>6.512</td>
<td>6.0313</td>
<td></td>
</tr>
<tr>
<td></td>
<td>6.522</td>
<td>6.0313, 6.0316</td>
<td></td>
</tr>
<tr>
<td></td>
<td>6.612</td>
<td>6.021E or 6.602A or 6.631</td>
<td></td>
</tr>
<tr>
<td></td>
<td>6.622</td>
<td>6.620</td>
<td></td>
</tr>
<tr>
<td></td>
<td>6.911</td>
<td>(in graduating program only)</td>
<td></td>
</tr>
</tbody>
</table>

*One of the prerequisites may be taken as a co-requisite.

**Working knowledge of elementary Fourier transforms and probability as in 10.033 and 10.361 is assumed.
Electrical Engineering — 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 of the same length and level as the prescribed subject it replaces; and
2. The resulting overall program of study is suited to the award of either the BE or BSc(Eng) degree as applicable.

Examples are:
(1) Replacement of two General Studies subjects by an approved Arts subject;
(2) Replacement of General Studies subjects by subjects approved (by the Head of the Department of General Studies) selected from areas such as: Life Sciences; Earth Sciences; Accounting and Business Administration; Law; Economics; Industrial Management.
(3) If students proposing to attempt the BSc BE pattern include additional Computer Science or Applied Mathematics in their Year 2 Electrical Engineering program they open up a wider choice of subjects in their Science Year 3. Subjects omitted may be required to be taken in the student’s Year 3 of Electrical Engineering.
(4) The normal Year 4 of the BE degree program includes 6 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.
(5) Students proposing to major in Computer Science in the BE program may substitute appropriate Science units in Year 3 (for one technical elective and 6.0315), and in Year 4 for professional electives.

Applications for substitution must be made by Friday 5 January 1979.

Double Degrees

3970/3640
Double Degree of BSc BE in Electrical Engineering

Students in Electrical Engineering may qualify for this double degree in five years of full-time study. Having completed the first and second year of the Electrical Engineering course, students with a creditable performance may transfer to the Science and Mathematics Course (this is subject to the recommendation of the Head of the School of Electrical Engineering and the approval of the Faculty of Engineering and the Board of Studies in Science and Mathematics). In the Science and Mathematics Course, students take the appropriate General Studies subjects and complete a specific course of study consisting of four Level III units chosen from related disciplines and no less than either four other Level II or Level III units. The specific courses of study available for this double degree are shown in the Combined Sciences Handbook and lead to majors in computing science, mathematics or physics. Students contemplating this course should seek advice from the Head of School before completing their Year 2 enrolment.

In their fourth year the students revert to the Faculty of Engineering. Depending on the program followed in their year in Science they will have already completed parts of the normal third year program 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. Students who choose to omit the two General Studies electives from their Year 3 program on this ground must still do a full year’s work: that is, they would be expected to include some 6 session-hours of other material in lieu of the General Studies elective requirement. In their fifth year they will complete the fourth year of the Electrical Engineering course.

3720
Double Degree BA BE in Electrical Engineering

The double degree BA BE in Electrical Engineering may be gained by a five-year course of combined study. Students wishing to enrol for this double degree may do so: by initially enrolling as a student proceeding to the double degree, or by transferring to the BA BE program with advanced standing after partially completing the requirements or either degree, provided that suitable courses have been studied.

Any students wishing to enrol in, transfer into or continue in the double degree course BA BE shall have complied with all the requirements for prerequisite study and academic attainment (i.e. a creditable performance) of both the Faculties concerned. Students wishing to enrol in or to transfer into the double degree course may do so only after receiving the approval of the respective Deans of the Faculties of Arts and Engineering. Guidance should be sought from the School of Electrical Engineering, the relevant schools in the Faculty of Arts and the Arts Faculty Office.

Initial Enrolment for BA BE
A student enrolling initially for the double degree shall pursue a program for four years in which he completes subjects equivalent to 18 units in accordance with the regulations of the Faculty of Arts, provided that he includes: the subjects in Table A below, and a major sequence of subjects available within the Faculty of Arts (see that Faculty's regulations) in addition to his studies in the School of Mathematics. He shall also study concurrently subjects selected from Course 3640 in accordance with an acceptable program loading.
To complete his studies he must satisfy the requirements of a normal BE degree program in Electrical Engineering, less the General Studies subjects, one of the six units of Electrical Engineering IV, and one other subject approved by the Head of School of Electrical Engineering.

Table A*

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
</tr>
</thead>
<tbody>
<tr>
<td>10.001</td>
<td>Mathematics I</td>
</tr>
<tr>
<td>10.111A</td>
<td>Pure Mathematics II (Linear Algebra)</td>
</tr>
<tr>
<td>10.1113</td>
<td>Pure Mathematics II (Multivariable Calculus)</td>
</tr>
<tr>
<td>10.1114</td>
<td>Pure Mathematics II (Complex Analysis)</td>
</tr>
<tr>
<td>10.2111</td>
<td>Applied Mathematics II (Vector Calculus)</td>
</tr>
<tr>
<td>10.2112</td>
<td>Applied Mathematics II (Mathematical Methods for Differential Equations)</td>
</tr>
<tr>
<td>1.961</td>
<td>Physics I</td>
</tr>
<tr>
<td>1.972</td>
<td>Electromagnetism</td>
</tr>
<tr>
<td>1.982</td>
<td>Solid State Physics</td>
</tr>
<tr>
<td>1.992</td>
<td>Thermal Physics and Classical Mechanics</td>
</tr>
</tbody>
</table>

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

The requirements of the appropriate Schools in respect of prerequisites, sequencing or substitutions shall be adhered to.

Subsequent Transfer to BA BE Course

Students wishing to pursue this route shall at the time of transfer and subsequently comply with the requirements for students initially enrolling in the double degree BA BE.

Honours Degree in Arts

Students wishing to gain an Honours degree in Arts as part of their combined BA BE double degree program shall meet all the relevant requirements of the Faculty of Arts and of the appropriate Schools. Such students may enrol for the Honours year in Arts only after receiving the approval of the respective Deans of the Faculties of Arts and Engineering.

School of Mechanical and Industrial Engineering

Head of School
Professor R. A. A. Bryant

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

Senior Administrative Officer
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.

The study of the basic sciences — Mathematics, Physics and Chemistry — together with an introduction to Engineering, comprises the first year. In the second and fourth years contain a number of common core subjects together with specific departmental requirements. In the fourth and final year, in addition to core subjects and departmental requirements, provision is made for a limited degree of specialization in one or more elective subjects. Students in the Mechanical Engineering Course may take, subject to the approval of the Head of School, up to six credits of graduate subjects per session offered by the School in lieu of an equivalent quantity of final year undergraduate electives. Each full-time student is required to present a thesis at the end of his final year and to deliver a short paper on the subject of his thesis. General Studies form a regular part of all courses. In certain instances and with permission from the Head of the School students may substitute an Arts subject in lieu of two General Studies subjects.

Industrial experience is an integral part of the full-time courses. All students enrolled in the School must complete forty working days of approved industrial training between Years 2 and 3, also between Years 3 and 4, and irrespective of their specialization, are strongly recommended to gain as much industrial training as possible between Years 1 and 2.

The full-time courses in Aeronautical, Industrial and Mechanical Engineering and in Naval Architecture are of four years' duration and lead to the award of the degree of Bachelor of Engineering (BE).

All students will be considered for the award of Honours which will be granted for meritorious performance in the course with particular emphasis on the later years. With the approval of the Head of School, students may proceed to the BE degree via a combination of full-time and part-time study.

Part-time courses of six years' duration leading to the degree of Bachelor of Science (Engineering) are offered in the same four fields as the full-time courses.

Part-time courses may also be completed by a combination of part-time and of full-time study. Students proceeding to the BSc(Eng) degree whether by a combination of part-time and of full-time study, by part-time study alone, are required to undergo a minimum period of three years approved concurrent industrial training. (See also conditions for the award of the Degree of BSc(Eng) in the Calendar.)

Students should enrol in the subject 5.042 Industrial Experience in the year in which they expect to satisfy the requirement and, upon completion, submit to the School evidence from their employers of such industrial training.
A student who has successfully completed the first two stages of any of the Bachelor of Science (Engineering) courses mentioned above may transfer to the second year of any of the full-time BE courses offered by the School. A part-time student will be able to transfer at the end of Stage 4 of his course to the third year of the corresponding BE course. The BSc(Eng) degree may be awarded 'With Merit' to students whose performance in the course is superior.

The award of the degree BE or BSc(Eng) in Mechanical Engineering is recognized by the Institution of Mechanical Engineers, London, as giving exemption from Parts II and III of the examinations for admission to the grade of Member. Exemption from Part III is considered on a case by case basis, and is not automatic. Specific enquiries on this matter should be addressed to the Head of the School.

The award of the degree BE or BSc(Eng) in Industrial Engineering is similarly recognized by the Institution of Production Engineers, London.

The Institution of Engineers, Australia, grants full exemption from examinations for admission to the grade of Member to holders of the degree of BE or BSc(Eng) in any of the undergraduate courses offered by the School.

### 3680

**Mechanical Engineering — Full-time Course**

#### Bachelor of Engineering

**BE**

<table>
<thead>
<tr>
<th>Year 1</th>
<th>Hours Per Week</th>
<th>Hpw</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>S1</td>
<td>S2</td>
</tr>
<tr>
<td>1.951</td>
<td>4</td>
<td>4</td>
</tr>
<tr>
<td>2.951</td>
<td>0</td>
<td>6</td>
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<tr>
<td>5.010</td>
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<tr>
<td>5.030</td>
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<td>10.001</td>
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<td>6</td>
</tr>
<tr>
<td>10.011</td>
<td>6</td>
<td>6</td>
</tr>
</tbody>
</table>

#### Year 2

<table>
<thead>
<tr>
<th></th>
<th>Hpw</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>S1</td>
</tr>
<tr>
<td>5.032</td>
<td>2</td>
</tr>
<tr>
<td>5.111</td>
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<td>8.259</td>
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<tr>
<td>10.022</td>
<td>4</td>
</tr>
<tr>
<td>18.020</td>
<td>1.5</td>
</tr>
</tbody>
</table>

*One session only. Students must take this subject in either Session 1 or Session 2.

### 3690

**Mechanical Engineering — Part-time Course**

#### Bachelor of Science (Engineering)

**BSc(Eng)**

This course is of six years' duration, and leads to the degree of Bachelor of Science (Engineering).

<table>
<thead>
<tr>
<th>Year 1</th>
<th>Hours Per Week</th>
<th>Hpw</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>S1</td>
<td>S2</td>
</tr>
<tr>
<td>1.001</td>
<td>6</td>
<td>6</td>
</tr>
<tr>
<td>1.011</td>
<td>6</td>
<td>6</td>
</tr>
<tr>
<td>10.001</td>
<td>6</td>
<td>6</td>
</tr>
<tr>
<td>10.011</td>
<td>6</td>
<td>6</td>
</tr>
</tbody>
</table>

*Not available in the evening in 1979.*

---

Course Outlines

Hours Per Week

5.033 Experimental Engineering III 1½ 1½
5.043 Industrial Training I 0 0
5.071 Engineering Analysis 3½ 3½
5.112 Mechanical Engineering Design II 3 3
5.331 Dynamics of Machines I 2 2
5.412 Mechanics of Solids III 2 2
5.612 Fluid Mechanics/Thermodynamics II 3½ 3½
18.011 Industrial Engineering IA or 2 2
18.021 Industrial Engineering IB 3 3
6.853 Analogue & Digital Instrumentation* 3 or 3

#### Year 4

<table>
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<tr>
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<tr>
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<tr>
<td>5.051</td>
<td>6</td>
</tr>
<tr>
<td>5.062</td>
<td>2</td>
</tr>
<tr>
<td>5.324</td>
<td>3</td>
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</table>

General Studies Elective 1½ 1½

Plus 12 hours per week from the following technical electives:

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<tr>
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<tr>
<td>4.913</td>
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<tr>
<td>5.113</td>
<td>3</td>
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<tr>
<td>5.332</td>
<td>3</td>
</tr>
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<td>5.413</td>
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<td>5.614</td>
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<tr>
<td>5.615</td>
<td>3</td>
</tr>
<tr>
<td>8.026</td>
<td>3</td>
</tr>
<tr>
<td>18.012</td>
<td>3</td>
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<tr>
<td>18.022</td>
<td>3</td>
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<tr>
<td>18.551</td>
<td>3</td>
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<tr>
<td>23.051</td>
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Technical Orientation

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<tr>
<td>5.005</td>
<td>6</td>
</tr>
<tr>
<td>5.119</td>
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</tr>
<tr>
<td>5.315</td>
<td>6</td>
</tr>
<tr>
<td>18.023</td>
<td>3</td>
</tr>
</tbody>
</table>

Analogue & Digital Instrumentation* 3 or 3

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3690

**Mechanical Engineering — Part-time Course**

#### Bachelor of Science (Engineering)

**BSc(Eng)**

This course is of six years' duration, and leads to the degree of Bachelor of Science (Engineering).

<table>
<thead>
<tr>
<th>Stage 1</th>
<th>Hours Per Week</th>
<th>Hpw</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>S1</td>
<td>S2</td>
</tr>
<tr>
<td>1.001</td>
<td>6</td>
<td>6</td>
</tr>
<tr>
<td>1.011</td>
<td>6</td>
<td>6</td>
</tr>
<tr>
<td>10.001</td>
<td>6</td>
<td>6</td>
</tr>
<tr>
<td>10.011</td>
<td>6</td>
<td>6</td>
</tr>
</tbody>
</table>

*Not available in the evening in 1979.*
### Stage 2

<table>
<thead>
<tr>
<th>Course</th>
<th>Hpw</th>
<th>Hours Per Week</th>
</tr>
</thead>
<tbody>
<tr>
<td>2.951 Chemistry I (ME)</td>
<td>S1</td>
<td>6</td>
</tr>
<tr>
<td>5.010 Engineering A</td>
<td>S2</td>
<td>0</td>
</tr>
<tr>
<td>5.030 Engineering C</td>
<td></td>
<td>6</td>
</tr>
<tr>
<td>5.040 Engineering D</td>
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<td>8</td>
</tr>
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</table>

### Stage 3

<table>
<thead>
<tr>
<th>Course</th>
<th>Hpw</th>
<th>Hours Per Week</th>
</tr>
</thead>
<tbody>
<tr>
<td>5.330 Engineering Dynamics</td>
<td>S1</td>
<td>2</td>
</tr>
<tr>
<td>5.411 Mechanics of Solids II</td>
<td>S2</td>
<td>2</td>
</tr>
<tr>
<td>8.259 Properties of Materials</td>
<td></td>
<td>3</td>
</tr>
<tr>
<td>10.022 Engineering Mathematics II</td>
<td></td>
<td>4</td>
</tr>
<tr>
<td>General Studies Elective</td>
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<td>1½, 1½</td>
</tr>
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</table>

### Stage 4

<table>
<thead>
<tr>
<th>Course</th>
<th>Hpw</th>
<th>Hours Per Week</th>
</tr>
</thead>
<tbody>
<tr>
<td>5.032 Experimental Engineering II</td>
<td>S1</td>
<td>2</td>
</tr>
<tr>
<td>5.111 Mechanical Engineering Design I</td>
<td>S2</td>
<td>3</td>
</tr>
<tr>
<td>5.611 Fluid Mechanics/Thermodynamics I</td>
<td></td>
<td>4</td>
</tr>
<tr>
<td>6.801 Electrical Engineering</td>
<td></td>
<td>3</td>
</tr>
<tr>
<td>General Studies Elective</td>
<td></td>
<td>1½, 1½</td>
</tr>
</tbody>
</table>

### Stage 5

<table>
<thead>
<tr>
<th>Course</th>
<th>Hpw</th>
<th>Hours Per Week</th>
</tr>
</thead>
<tbody>
<tr>
<td>5.071 Engineering Analysis</td>
<td>S1</td>
<td>3½</td>
</tr>
<tr>
<td>5.112 Mechanical Engineering Design II</td>
<td>S2</td>
<td>3</td>
</tr>
<tr>
<td>5.331 Dynamics of Machines I</td>
<td></td>
<td>2</td>
</tr>
<tr>
<td>5.412 Mechanics of Solids III</td>
<td></td>
<td>2</td>
</tr>
<tr>
<td>5.612 Fluid Mechanics/Thermodynamics II</td>
<td></td>
<td>3½</td>
</tr>
<tr>
<td>General Studies Elective</td>
<td></td>
<td>1½, 1½</td>
</tr>
</tbody>
</table>

### Stage 6

<table>
<thead>
<tr>
<th>Course</th>
<th>Hpw</th>
<th>Hours Per Week</th>
</tr>
</thead>
<tbody>
<tr>
<td>5.042 Industrial Experience*</td>
<td>S1</td>
<td>0</td>
</tr>
<tr>
<td>5.113 Mechanical Engineering Design III</td>
<td>S2</td>
<td>6</td>
</tr>
<tr>
<td>5.324 Automatic Control Engineering</td>
<td></td>
<td>3</td>
</tr>
<tr>
<td>General Studies Elective</td>
<td></td>
<td>1½, 1½</td>
</tr>
</tbody>
</table>

---

**Plus one of the following technical electives:**

- 4.913 Materials Science or
- 5.332 Dynamics of Machines II or
- 5.413 Mechanics of Solids IV

*See the introduction of School of Mechanical and Industrial Engineering.

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### 3600 Aeronautical Engineering — Part-time Course

**Bachelor of Science (Engineering) BSc(Eng)**

This course is of six years' duration and leads to the degree of Bachelor of Science (Engineering). The first four stages are identical with the Mechanical Engineering part-time course.

### Stage 5

<table>
<thead>
<tr>
<th>Course</th>
<th>Hours Per Week</th>
</tr>
</thead>
<tbody>
<tr>
<td>5.071 Engineering Analysis</td>
<td>3½, 3½</td>
</tr>
<tr>
<td>5.412 Mechanics of Solids III</td>
<td>2, 2</td>
</tr>
<tr>
<td>5.611 Aerodynamics I</td>
<td>3, 3</td>
</tr>
<tr>
<td>5.822 Analysis of Aerospace Structures I</td>
<td>2, 2</td>
</tr>
<tr>
<td>5.303 Mechanical Vibrations</td>
<td>1½, 0</td>
</tr>
</tbody>
</table>

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**Year 4**

<table>
<thead>
<tr>
<th>Course</th>
<th>Hours Per Week</th>
</tr>
</thead>
<tbody>
<tr>
<td>5.044 Industrial Training II</td>
<td>0, 0</td>
</tr>
<tr>
<td>5.051 Thesis</td>
<td>6, 6</td>
</tr>
<tr>
<td>5.062 Communications</td>
<td>2, 2</td>
</tr>
<tr>
<td>5.801 Aircraft Design</td>
<td>4, 4</td>
</tr>
<tr>
<td>5.812 Aerodynamics II</td>
<td>3, 3</td>
</tr>
<tr>
<td>5.823 Analysis of Aerospace Structures II</td>
<td>2, 2</td>
</tr>
<tr>
<td>5.831 Aircraft Propulsion</td>
<td>2, 2</td>
</tr>
<tr>
<td>General Studies Elective</td>
<td>1½, 1½</td>
</tr>
</tbody>
</table>

**Plus one of the following technical electives:**

- 4.913 Materials Science or
- 5.324 Automatic Control Engineering or
- 8.026 Systems Methods in Civil Engineering or
- 18.022 Industrial Engineering II or
- 18.551 Operations Research

*One session only. Students take this subject in either Session 1 or Session 2.

---

**Year 3**

<table>
<thead>
<tr>
<th>Course</th>
<th>Hours Per Week</th>
</tr>
</thead>
<tbody>
<tr>
<td>5.033 Experimental Engineering III</td>
<td>1½, 1½</td>
</tr>
<tr>
<td>5.043 Industrial Training I</td>
<td>0, 0</td>
</tr>
</tbody>
</table>

---

**Bachelor of Engineering BE**

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

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**3610 Aeronautical Engineering — Full-time Course**

---
Course Outlines

<table>
<thead>
<tr>
<th>Stage 6</th>
<th>Hpw</th>
<th>S1</th>
<th>S2</th>
</tr>
</thead>
<tbody>
<tr>
<td>5.042 Industrial Experience*</td>
<td>0</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td>5.801 Aircraft Design</td>
<td>4</td>
<td>4</td>
<td></td>
</tr>
<tr>
<td>5.812 Aerodynamics II</td>
<td>3</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>5.823 Analysis of Aerospace Structures II</td>
<td>2</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>5.831 Aircraft Propulsion General Studies Elective</td>
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</table>

*See the Introduction to School of Mechanical and Industrial Engineering.

3700
Naval Architecture — Full-time Course

Bachelor of Engineering
BE

The first and second years of this course are identical with the first two years of the full-time 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 degree course at any other Australian tertiary institutions may be admitted to a two-year program leading to the Bachelor of Engineering degree in Naval Architecture.

Year 3

<table>
<thead>
<tr>
<th>Hours Per Week</th>
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<tbody>
<tr>
<td>5.033 Experimental Engineering III</td>
<td>1½ 1½</td>
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<tr>
<td>5.043 Industrial Training I</td>
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<tr>
<td>5.071 Engineering Analysis</td>
<td>3½ 3½</td>
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<tr>
<td>5.303 Mechanical Vibrations</td>
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<tr>
<td>5.412 Mechanics of Solids III</td>
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<td>5.911 Naval Architecture</td>
<td>4 4</td>
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<tr>
<td>5.921 Ship Structures I</td>
<td>0 4</td>
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<tr>
<td>5.931 Principles of Ship Design I A</td>
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<tr>
<td>5.932 Principles of Ship Design I B</td>
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<td>5.951 Hydrodynamics</td>
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<td>22 22</td>
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</table>

3710
Naval Architecture — Part-time Course

Bachelor of Science (Engineering)
BSc(Eng)

This course is of six years' duration and leads to the degree of Bachelor of Science (Engineering). The first four stages are identical with the Mechanical Engineering part-time course.

Stage 5

<table>
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<tbody>
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<td>5.303 Mechanical Vibrations</td>
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<td>5.412 Mechanics of Solids II</td>
<td>2 2</td>
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<tr>
<td>5.911 Naval Architecture</td>
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<td>5.921 Ship Structures I</td>
<td>0 4</td>
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<tr>
<td>5.931 Principles of Ship Design I A</td>
<td>3 0</td>
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Stage 6

<table>
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<tbody>
<tr>
<td>5.042 Industrial Experience*</td>
<td>0 0</td>
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<tr>
<td>5.922 Ship Structures II</td>
<td>4 0</td>
</tr>
<tr>
<td>5.933 Principles of Ship Design II</td>
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<td>5.934 Ship Design Project</td>
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<td>4 1½ 1½</td>
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</table>

*See the Introduction of School of Mechanical and Industrial Engineering.
Department of Industrial Engineering

The Department of Industrial Engineering offers a full-time and a part-time course in industrial engineering leading to the award of the degree of Bachelor of Engineering and Bachelor of Science (Engineering) respectively. These courses are designed for students with engineering ability whose interests lie in the planning, developing and control of manufacturing or service operations.

The first two years of the full-time course and the first four years of the part-time course 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. Finally, the problems associated with the practical economics of manufacturing operations are studied. These three fields of study provide the student with the training 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 in relation to buildings to permit efficient handling of materials; the avoidance or elimination 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.

All full-time students must obtain approved industrial training for a period of forty working days between Years 2 and 3, also between Years 3 and 4. They are also strongly advised to obtain further experience during the long vacation between Years 1 and 2.

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 from it. 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, finally, 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. Modern electronic computers may be called upon to help 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 incorporates also problems of equipment 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.

4. Methods Engineering

Methods engineering is particularly concerned with the co-ordination of men, materials and machines, so that an enterprise will run at maximum efficiency. A considerable knowledge of engineering in general, as well as an understanding of human factors and materials science, is necessary for methods engineering work. Time and motion study is part of methods engineering. In many cases the methods engineer works in close co-operation with the design department and executives engaged in industrial economic analysis.

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.
Course Outlines

3660
Industrial Engineering — Full-time Course

Bachelor of Engineering
BE
The first and second years of this course are identical with the first two years of the full-time course in Mechanical Engineering.

Year 3

<table>
<thead>
<tr>
<th>Course</th>
<th>Hours Per Week</th>
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<tbody>
<tr>
<td>5.033 Experimental Engineering III</td>
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<tr>
<td>5.043 Industrial Training I</td>
<td>0  0</td>
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<tr>
<td>5.071 Engineering Analysis</td>
<td>3½  3½</td>
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<tr>
<td>5.112 Mechanical Engineering Design II</td>
<td>3  3</td>
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<tr>
<td>5.331 Dynamics of Machines I</td>
<td>2  2</td>
</tr>
<tr>
<td>5.412 Mechanics of Solids III</td>
<td>2  2</td>
</tr>
<tr>
<td>14.001 Introduction to Accounting A</td>
<td>1½  0</td>
</tr>
<tr>
<td>14.002 Introduction to Accounting B</td>
<td>0  1½</td>
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<tr>
<td>18.011 Industrial Engineering IA</td>
<td>2  2</td>
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<tr>
<td>18.021 Industrial Engineering IB</td>
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Total: 20½  20½

Stage 5

<table>
<thead>
<tr>
<th>Course</th>
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<tr>
<td>5.112 Mechanical Engineering Design II</td>
<td>3  3</td>
</tr>
<tr>
<td>5.331 Dynamics of Machines I</td>
<td>2  2</td>
</tr>
<tr>
<td>14.001 Introduction to Accounting A</td>
<td>1½  0</td>
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<td>18.021 Industrial Engineering IB</td>
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Stage 6

<table>
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<td>5.042 Industrial Experience*</td>
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<td>18.022 Industrial Engineering IIB</td>
<td>3  3</td>
</tr>
<tr>
<td>18.432 Design of Production Systems</td>
<td>6  6</td>
</tr>
<tr>
<td>18.551 Operations Research</td>
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<td></td>
<td>13½  13½</td>
</tr>
</tbody>
</table>

*See the Introduction to School of Mechanical and Industrial Engineering.

3670
Industrial Engineering — Part-time Course

Bachelor of Science (Engineering)
BSc(Eng)
This course is of six years' duration and leads to the degree of Bachelor of Science (Engineering). For outline of the first four stages see the Mechanical Engineering part-time course.

School of Surveying

Head of School
Professor P. V. Angus-Leppan

Administrative Officer
J. V. Fonseka

The School of Surveying offers a full-time course of four years' duration leading to the Degree of Bachelor of Surveying. The sandwich course which was available until 1978, has now been integrated with the full-time course, in which students may take leaves of absence for one or more sessions, as desired, during the course to obtain professional experience. The part-time course has been phased out during the last few years and is no longer available.

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

The course has undergone comprehensive revision.
Features of the revisions 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 present 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 the 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 Bachelor of Surveying 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. Students enrolled in the Bachelor of Surveying degree course are required to equip themselves with an electronic calculator. Details of the features required are available from the School.

3740
Surveying — Full-time Course

Bachelor of Surveying
BSurv

Year 1

Session 1

<table>
<thead>
<tr>
<th>Hours</th>
<th>Course</th>
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<tbody>
<tr>
<td>6</td>
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<td>5.0102 Introduction to</td>
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<td></td>
<td>Engineering Design</td>
</tr>
<tr>
<td>6</td>
<td>10.001 Mathematics I</td>
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<tr>
<td>4½</td>
<td>29.001 Surveying I</td>
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<tr>
<td>3</td>
<td>29.600 Survey draughting</td>
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<tr>
<td>1½</td>
<td>29.700 Professional</td>
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<td>Orientation</td>
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<td>29.191 Survey Camp I†</td>
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<tr>
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</tbody>
</table>

†Students are required to attend a one-week Survey Camp, equivalent to 1½ class contact hours per week in each session.

*Introduction to Systems and Computers option.

Session 2

<table>
<thead>
<tr>
<th>Hours</th>
<th>Course</th>
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<tbody>
<tr>
<td>6</td>
<td>1.971 Physics I</td>
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<td>10.001 Mathematics I</td>
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†Students are required to attend a one-week Survey Camp, equivalent to 1½ class contact hours per week in each session.

Year 2

Session 1

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<tr>
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<td>1.962 Physics of Measurement</td>
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<td>4</td>
<td>10.022 Engineering Mathematics (1st part)</td>
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<td>2</td>
<td>10.341A Statistics SU</td>
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<td>27.295 Physical Geography for Surveyors †</td>
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<td>5</td>
<td>29.003 Surveying III</td>
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<td>4</td>
<td>29.151 Survey Computations I</td>
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<td>29.192 Survey Camp II*</td>
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†One-day field tutorial is an essential part of this course.

Session 2

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<td>29.801 Cartography I</td>
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<td>29.121 Electronics for Surveyors</td>
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*Students are required to attend a one-week survey camp, which is equivalent to 1½ class contact hours per week in each session.
### Session 2

<table>
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<tr>
<td>29.211</td>
<td>Geodesy I</td>
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<td>29.311</td>
<td>Astronomy I</td>
<td>3</td>
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<td>29.511</td>
<td>Photogrammetry I</td>
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<td>29.652</td>
<td>Land Development II</td>
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<td>29.631</td>
<td>Land Inventory I</td>
<td>2</td>
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<td>29.662</td>
<td>Cadastral Surveying and Land Law II</td>
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<td>29.195</td>
<td>Survey Camp III**</td>
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<td><strong>Students are required to attend a two-week survey camp, which is equivalent to 6 class contact hours per week.</strong></td>
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### Year 4

#### Session 1†

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<td>Geodesy II</td>
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<tr>
<td>29.312</td>
<td>Astronomy II</td>
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<td>29.512</td>
<td>Photogrammetry II</td>
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<td>29.653</td>
<td>Land Development III</td>
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<td>29.704</td>
<td>Management I</td>
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<td>29.702</td>
<td>Seminar II</td>
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<td>29.196</td>
<td>Survey Camp IV**</td>
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*See Year 4: Electives, immediately below.

#### Session 2†

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<td>29.703</td>
<td>Seminar III</td>
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<td>Electives*</td>
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<td><strong>Available from 1980.</strong></td>
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<td>18</td>
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*See Year 4: Electives, immediately below.

#### Year 4: Electives

Total of two General Studies Advanced Electives and five technical electives in any combination which results in 6 hours for Session 1 and 15 hours for Session 2.

Technical electives (of 3 hours per week each, except 29.174) are chosen from:

- 29.031 Electronic Distance Measurement
- 29.032 Precise Surveying in Industry and Engineering
- 29.033 Characteristics of Modern Theodolites and Levels
- 29.034 Mine Surveying
- 29.035 History of Surveying
- 29.153 Adjustment of Control Surveys
- 29.161 Hydrographic Surveying I
- 29.162 Hydrographic Surveying II
- 29.173 Project
- 29.174 Major Project (6 hours per week)
- 29.213 Geodesy III
- 29.231 Geophysics for Surveyors
- 29.232 Atmospheric Effects on Geodetic Measurement
- 29.313 Astronomy III
- 29.513 Photogrammetry III
- 29.514 Remote Sensing Principles
- 27.043 Remote Sensing Applications
- 29.654 Land Development IV
- 29.632 Land Inventory II
- 29.663 Cadastral Surveying and Land Law III
- 29.664 Modern Title Concepts
- 29.802 Cartography II
- 29.803 Mapping Technology

*Offered in 1979 only.

†See Year 4: Electives (Part 8 — Old Course), immediately below.
Bachelor of Surveying
BSurv

The Sandwich Course from 1979 has been integrated with the full-time course. The School encourages students to take leave of absence for one or more sessions, as desired, to obtain professional experience. The following transitional arrangements are offered in 1979 and Session 1, 1980 only:

Part 6†

<table>
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<th>Course Title</th>
<th>Hours Per Week</th>
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<tbody>
<tr>
<td>29.005</td>
<td>Surveying V</td>
<td>5</td>
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<tr>
<td>29.152</td>
<td>Survey Computations II</td>
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<tr>
<td>29.661</td>
<td>Cadastral Surveying and Land Law I</td>
<td>2</td>
</tr>
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<td></td>
<td>General Studies Electives</td>
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<td>29.211</td>
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Part 7 (Old Course)**

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<tbody>
<tr>
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<td>Professional Training</td>
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<tr>
<td>29.194</td>
<td>Survey Camp*</td>
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</tbody>
</table>

**Students are required to attend a four-week survey camp, equivalent to 160 hours of class contact.

Sandwich Course — Stages 1 and 2

Students commencing the course on a sandwich course basis in 1979 may also take the First Year of the course by part-time study in two stages over a period of two years, as shown below:

Stage 1

<table>
<thead>
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<th>Course Title</th>
<th>Hours Per Week</th>
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<tbody>
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<td>1.001</td>
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<tr>
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<td>Mathematics I</td>
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Stage 2

<table>
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<td>Introduction to Engineering Design</td>
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<td>29.001</td>
<td>Surveying I</td>
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Electives (Part 8 — Old Course)

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<tr>
<td>29.162</td>
<td>Hydrographic Surveying II</td>
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<tr>
<td>29.183</td>
<td>Cartography Advanced Elective</td>
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<tr>
<td>29.213</td>
<td>Geodesy III</td>
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<td>29.313</td>
<td>Astronomy III</td>
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<td>Land Development III</td>
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<td>Land Inventory II</td>
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<td>Land Law and Tenure II</td>
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Part 8†

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<td>29.212</td>
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<td>29.312</td>
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†Offered in Session 1, 1980 only.

Electives (Part 8)

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<td>29.514</td>
<td>Principles of Remote Sensing</td>
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<td>29.802</td>
<td>Cartography II</td>
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†Offered in Session 1, 1979 only.

‡Students are required to attend a one week survey camp which is equivalent to 1½ class contact hours per week in each session.

‡‡See Electives (Part 8 — Old Course), immediately below.

‡‡Offered in Session 2, 1979 only.

*Introduction to Systems and Computers Option.
Graduate School of Engineering

Graduate Study

In November 1964 Council approved the establishment of the Graduate School of Engineering to co-ordinate and develop the graduate activities of the Faculty. For full details of such activities please see the Graduate School of Engineering Handbook and the brochures prepared by the Schools.

The Faculty of Engineering provides facilities for well-qualified graduates to engage in advanced studies and research leading to the award of the degrees of Doctor of Philosophy, Master of Engineering or Master of Surveying in all six schools. In addition the degree of Master of Science is available through the Schools of Civil Engineering, Electrical Engineering, Mechanical and Industrial Engineering, and Transport and Highways.

The Master of Engineering Science/Master of Surveying Science are faculty-wide degrees, and allow for flexibility of choice between formal course work and research together with the possibility of interdisciplinary studies. In 1976 a new set of faculty-wide regulations for graduate diplomas was introduced, which includes provision for interdisciplinary study in the new Graduate Diploma in Engineering Developments, as well as more flexibility in the Graduate Diplomas in Highway Engineering, Human Communication, Industrial Engineering and Transport.

Students are advised to consult the Graduate School of Engineering Handbook for further information.

The conditions for the award of the various higher degrees and graduate diplomas are published later in this Handbook.

The degrees of Master of Engineering Science and Master of Surveying Science may be awarded through:

1. formal course work; or

2. a combination of formal course work and the completion of a report on a project or a research thesis; or

3. completion of a research thesis.

The number of credits for a project report shall be 9, and for a research thesis 18 or 36.

Candidates proceeding to the award of the degree of Master of Engineering Science and Master of Surveying Science are encouraged to develop interdisciplinary attitudes and, with the approval of the Head of the School, may take subjects from other schools of the Faculty, other Faculties of the University and other universities or institutions. By means of this system, a student, with the approval of the Head of School, is able to select a program of studies best suited to his needs.

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. A minimum of thirty-six credits is required for the award of the Master of Engineering Science and Master of Surveying Science degrees in the Faculty.

The subjects which may be available for candidates proceeding to the award of the degree of Master of Engineering Science or Master of Surveying Science are listed below under the various Schools. Not all electives will necessarily be offered in any particular year.

Part-time candidates may be required to attend lectures on one half day per week in addition to the evenings.
**Faculty of Engineering Enrolment Procedures**

All students re-enrolling in 1979 or enrolling in graduate courses should obtain a copy of the free booklet *Enrolment Procedures 1979* 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.

---

### School of Civil Engineering

<table>
<thead>
<tr>
<th>Course Code</th>
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<th>Credits</th>
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<tbody>
<tr>
<td>8.701G</td>
<td>Economic Decision Making in Civil Engineering</td>
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<td>8.702G</td>
<td>Network Methods in Civil Engineering</td>
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<td>8.703G</td>
<td>Optimization Techniques in Civil Engineering</td>
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<td>Stochastic Methods in Civil Engineering</td>
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<td>8.705G</td>
<td>Systems Modelling</td>
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<td>Experimental Methods in Engineering Research</td>
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<td>Advanced Topics in Optimization in Civil Engineering</td>
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<td>8.714G</td>
<td>Advanced Topics in Systems Modelling</td>
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<td>Construction Design</td>
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<td>8.724G</td>
<td>Construction Technology</td>
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<td>Construction Accounting and Control</td>
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<td>Construction Law and Professional Practice</td>
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<td>8.727G</td>
<td>Construction Planning and Estimating</td>
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<td>Design of Construction Operations</td>
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<td>Pavement Materials 1</td>
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<td>Terrain Engineering</td>
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<td>8.753G</td>
<td>Soil Engineering</td>
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<td>8.754G</td>
<td>Applied Soil Mechanics</td>
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<td>Materials of Construction (Concrete Technology) I</td>
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<td>Materials of Construction (Concrete Technology) II</td>
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<td>Soil Mechanics</td>
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<td>8.759G</td>
<td>Rock Mechanics</td>
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<td>Materials of Construction (Concrete Technology) II</td>
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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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<td>8.772G</td>
<td>Soil Dynamics and Earthquake Analysis</td>
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<td>8.780G</td>
<td>Geological Engineering</td>
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<td>Plastic Analysis and Design of Steel Structures I</td>
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<td>Analysis of Plates and Shells</td>
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<td>Experimental Structural Analysis I</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>Soil-Water Hydrology</td>
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<td>Water Resources Policy</td>
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<td>Water Distribution and Sewage Collection</td>
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<td>Water Treatment</td>
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<td>Water Quality Management</td>
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<td>Estuarine Hydraulics</td>
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Graduate Study: Graduate School of Engineering

8.901 G Civil Engineering Elective I  
8.902G Civil Engineering Elective II  
8.909G Project  
8.918G Research Project  
8.936G Research Project  

Credits
3  
3  
9  
18  
36

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

School of Electrical Engineering

Each subject (except 6.909G, 6.918G, 6.936G and 6.339G) counts as three credits. (6.339G* is 6 credits.)

6.050G Occasional Elective  
6.053G Advanced Mathematics II  
6.054G Numerical Computation  
6.071G Electrical Measurements  
6.073G Precise Electrical Measurements  
6.074G Superconductivity  
6.075G Electric Contacts  
6.150G Communication Elective  
6.160G Field Theory in Electrical Engineering  
6.161G Field Mapping  
6.164G Microwave Antenna Theory and Applications  
6.167G Propagation and Transmission of Electromagnetic Waves  
6.189G Microwave Circuits: Theory and Techniques  
6.170G Microwave Electronics  
6.224G Electrical Insulation Engineering  
6.225G Electrical Discharges and their Technical Applications  
6.226G Electrical Apparatus Design  
6.227G Assessment of Insulation Performance in Electrical Plant  
6.228G Power System Equipment  
6.234G Power System Protection  
6.244G Power Systems I  
6.246G Power System Operation and Control  
6.247G Power System Analysis  
6.248G Power System Planning  
6.249G Dynamic Performance of Power Systems  
6.250G Power Elective I  
6.251G Power Elective II  
6.254G Electrical Machines I  
6.255G Electrical Machines II  
6.256G Underground Systems  
6.257G Electric Power Distribution Systems  
6.337G Sound Broadcast Systems  
6.338G Television Systems  
*6.339G Electroacoustics  
6.340G Communication Electronics  
6.341G Signal Analysis  
6.343G Digital and Analogue Communications  
6.344G Communication Theory  
6.345G Analogue and Digital Filters  
6.347G Digital Communications  
6.348G Optical Communications  
6.349G Radar and Navigation Aids  
6.350G Solid State Electronics Elective  
6.373G Semiconductor Devices  
6.375G Integrated Circuit Technology  
6.376G Reliability Engineering  
6.377G Integrated Circuit Design  
6.378G Solar Energy Conversion  
6.452G Principles of Feedback Control  
6.453G Computer Methods of Optimization  
6.455G System Identification and Modelling  
6.456G General Concepts in Formal System Theories  
6.458G Decision and Syntactic Systems for Digital Pattern Recognition  
6.459G Control Computing  
6.460G Real Time Computing  
6.464G Applied Optimal Estimation and Prediction  
6.466G Computer-Aided Design of Multivariable Control Systems  
6.468G Computer Display Systems and Interactive Instrumentation  
6.470G Advanced Topics in Control  
6.471G Systems and Control Elective  
6.484G Biological Signal Analysis  
6.485G Medical Instrumentation  
6.650G Computer Science Elective  
6.651G Digital Electronics  
6.654G Digital Systems  
6.655G Computer Organization and Architecture  
6.656G Software Systems A  
6.657G Software Systems B  
10.061G Advanced Mathematics I  
10.361G Statistics  
†6.909G Project 9 credits  
6.918G Research Project 18 credits  
6.936G Research Project 36 credits  
†Nine credit projects are not normally approved by the School of Electrical Engineering.

School of Mechanical and Industrial Engineering

5.045-6-7G Advanced Topics in Mechanical Engineering 2, 2, 2  
5.073G Ordinary Differential Equations in Mechanical Engineering 3  
5.075-6G Computation Methods in Mechanical Engineering I, II 2, 2  
5.077-8G Analogue Computation in Mechanical Engineering I, II 2, 2
5.101-2G Optimization Methods for Mechanical Engineers I, II 
5.110G Morphology of Design 
*5.151-2G Refrigeration and Air Conditioning Design I, II 
5.304-5G Advanced Dynamics I, II 
5.315-6G Mechanisms I, II 
*5.321-2G Automatic Control I, II 
5.328-9G Control and Modelling of Mechanical Systems I, II 
5.335G Vibrations 
5.401G Experimental Stress Analysis 
5.415-6G Stress Analysis for Mechanical Engineering Design I, II 
5.417G Mechanics of Fracture and Fatigue 
5.423G Advanced Mechanics of Materials 
**5.490G Solid Mechanics (for Medical Graduates) 
5.491-2G Biomechanics I, II 
**5.491-2G Biomechanics I, II 
**5.493G Mechanics of the Human Body 
**5.494G Mechanical Properties of Biomaterials 
**5.495G Biomechanics of Physical Rehabilitation 
5.615G Reciprocating Internal Combustion Engines 
5.621-2G Gasdynamics I, II 
5.631-2G Lubrication Theory and Design I, II 
5.653-4G Acoustic Noise I, II 
*5.712-3G Convection Heat Transfer I, II 
5.718G Conduction Heat Transfer 
5.719G Radiation Heat Transfer 
5.725G Statistical Thermodynamics 
5.735G Direct Energy Conversion 
*5.751-2G Refrigeration, Air Conditioning and Cryogenics I, II 
*5.758G Refrigeration and Air Conditioning Applications 
5.903G Project 
5.912-3G Naval Hydrodynamics I, II 
5.918G Research Project 
†5.939G Research Project 

*5.271G Theory of Machining and Forming Processes 
*5.272G Technology of Machining and Forming Processes 
*5.371G Factory Design and Layout 
*5.461G Design for Production 
*5.462G Industrial Design 
*5.463G Tool Design 
*5.471G Design Communication 
*5.472G Engineering Design Analysis 
18.571G Operations Research I 
18.574G Operations Research II 
18.579G Case Studies in Operations Research 
18.671G Decision Theory 
18.761G Simulation in Operations Research 
18.763G Variational Methods in Operations Research 
18.770G Stochastic Control 
18.772G Information Processing Systems in Organisations 
18.774G Applied Stochastic Processes 
18.775G Networks and Graphs 
18.776G Production and Inventory Control 
18.777G Time Series and Forecasting 
18.778G Scheduling and Sequencing 
18.779G Game Theory 
18.862G Linear Programming 
18.863G Non-Linear Programming 
18.871G Mathematics for Operations Research 
18.874G Dynamic Programming 
18.875G Geometric Programming 
18.876G Advanced Mathematics for Operations Research 
18.877G Large-scale Optimisation 
18.878G Industrial Applications of Mathematical Programming 
18.879G Mathematical Programming Analysis 
18.900G Production Engineering Seminar 
18.957G Advanced Topic in Production Engineering 
18.958G Advanced Topic in Production Engineering 
18.969G Advanced Topic in Production Engineering 
18.970G Operations Research Seminar 
18.977G Advanced Topic in Operations Research 
18.978G Advanced Topic in Operations Research 
18.979G Advanced Topic in Operations Research 
18.909G Project 
18.918G Research Project 
†18.936G Research Project 


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School of Nuclear Engineering

Head of School
Professor J. J. Thompson

Each subject counts as three credits.

23.013G Neutron Transport and Diffusion
23.014G Fewgroup Reactor Theories
23.015G Multigroup Reactor Theories
23.016G Neutron Kinetics and Reactor Dynamics
23.023G Reactor Thermal Performance
23.024G Boiling and Two Phase Flow
23.025G Reactor Structural Mechanics
23.026G Reactor Systems Analysis
23.027G Boiling Reactor Dynamics
23.028G Reactor Accident and Safety Analysis
23.032G Mathematics Analysis and Computation
23.033G Matrix Theory and Computation
23.034G Random Processes and Reactor Noise
23.042G Nuclear Fuel and Energy Cycles
23.043G Nuclear Power Costing and Economics
23.044G Nuclear Engineering Optimization
23.045G Uranium Enrichment Technology
23.909G Project 9 credits
23.918G Research Project 18 credits
23.936G Research Project 36 credits

School of Transport and Highways

Head of School
Professor W. R. Blunden

Credits

24.001G Human Factors in Transport 3
24.002G Transport, Environment, Community 6
24.003G Theory of Land Use/Transport Interaction 3
24.004G Local Area Transport Planning 3
24.005G Urban Transport Planning Practice 3
24.006G Regional Transport Planning 3
24.007G Transport System Design (Non-Urban) 3
24.008G Transport System Design (Urban) 3
24.009G Interchange Design 3
24.010G Highway Engineering Practice Part 1 3
24.011G Highway Engineering Practice Part 2 3
24.012G Economics for Transport Studies 3
24.013G Transport Economics 3
24.014G Transport Systems Part 1 3
24.015G Transport Systems Part 2 3
24.016G Traffic Engineering 6
24.017G Transport and Traffic Flow Theory 6
24.018G Statistics for Transport Studies Part 1 3
24.019G Statistics for Transport Studies Part 2 3
24.020G Mathematical Techniques for Transport Studies 3
24.021G Law and Administration 3
24.022G Pavement Materials 1 3
24.023G Pavement Materials 2 3
24.024G Pavement Design and Evaluation 1 3
24.025G Pavement Design and Evaluation 2 3
24.026G Bridges and Highway Structure Part 1 3
24.027G Bridges and Highway Structure Part 2 3
24.028G Transport and Highways Elective 3
24.809G Project 9
24.818G Research Project 18
24.836G Research Project 36

School of Surveying

Credits

29.106G Special Topic A 3
29.107G Special Topic B 3
29.154G Adjustment of Observations 6
29.163G Mathematical Methods 1
Numerical Analysis 3
Statistics of Observations 3
29.164G Mathematical Methods 2
29.165G Mathematical Methods 3
Ellipsoidal Harmonics 3
Geometrical Geodesy 3
29.215G Geodetic Surveying 3
29.223G Dynamic Geodesy 3
29.224G Physical Geodesy 6
29.314G Geodetic Astronomy 6
29.516G Mathematical Model of the Imaging Process 3
29.517G Stereophotogrammetry 3
29.518G Analytical Photogrammetric Orientation 3
29.519G Photogrammetric Instrumentation 3
29.520G Photogrammetric Production Processes 3
29.521G Control Extension A 3
29.522G Control Extension B 3
29.909G Project 9
29.918G Research Project 18
29.936G Research Project 36

Graduate Diplomas in Engineering

The Faculty of Engineering also offers courses leading to the award of a graduate diploma in several areas. Currently these are Graduate Diplomas in Engineering Developments; in Highway Engineering; in Human Communication; in Industrial Engineering; and in Transport. Candidates must complete a program totalling 30 credits, the number of credits for each subject being determined by Faculty on the recommendation of Heads of Schools; normally one credit is equal to attendance for one hour per week for one session. Forty percent of the credits 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. Before enrolment, an applicant must submit his intended program for approval by the head of the school or division which will offer the majority of the credits and ensure that he has the necessary prerequisite background for any subjects taken in other schools, faculties or institutions.

The program may be taken full-time, part-time or externally by tape correspondence or by a combination of these.

The purpose of offering these graduate diplomas is to provide engineers with the opportunity to update their professional knowledge in their own speciality, and to have access to a program of study in other areas which are relevant to their professional activities by virtue of changes and developments that are occurring. The subjects offered have been specially chosen for these purposes and many of them are available by radio and television broadcasts in the Sydney metropolitan area from year to year.

The Graduate Diploma in Engineering Developments is intended for those who wish to take a more general program in several areas of interest. The course may contain subjects from the Division of Postgraduate Extension Studies (by radio, tape correspondence, etc) and elsewhere. Subjects offered by tape correspondence are listed in this handbook under the Division of Postgraduate Extension Studies. Subjects from other schools to be offered in any year by the Division of Postgraduate and Extension Studies are determined after consultation with that school and examination will be through that school.

Other subjects which may be available in the graduate diploma course are listed below under the various schools. Not all electives are necessarily offered in any particular year.

### School of Electrical Engineering

<table>
<thead>
<tr>
<th>Code</th>
<th>Subject</th>
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<tr>
<td>6.457G</td>
<td>Cybernetic Engineering</td>
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<tr>
<td>6.481G</td>
<td>Biology and Physiology for Engineers</td>
<td>3</td>
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### School of Mechanical and Industrial Engineering

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<tbody>
<tr>
<td>18.080G</td>
<td>Organization and Administration</td>
<td>2</td>
</tr>
<tr>
<td>18.083G</td>
<td>Industrial Studies</td>
<td>2</td>
</tr>
<tr>
<td>18.084G</td>
<td>Industrial Applications of Probability Theory</td>
<td>4</td>
</tr>
<tr>
<td>18.380G</td>
<td>Methods Engineering</td>
<td>4</td>
</tr>
<tr>
<td>18.580G</td>
<td>Operations Research</td>
<td>6</td>
</tr>
<tr>
<td>18.680G</td>
<td>Decision Making Under Uncertainty</td>
<td>2</td>
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<td>18.681G</td>
<td>Engineering Economic Analysis</td>
<td>3</td>
</tr>
<tr>
<td>18.780G</td>
<td>Production Control</td>
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<tr>
<td>14.001</td>
<td>Introduction to Accounting A</td>
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<tr>
<td>14.002</td>
<td>Introduction to Accounting B</td>
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<tr>
<td>14.042G</td>
<td>Industrial Law</td>
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<tr>
<td>14.062G</td>
<td>Accounting for Engineers</td>
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### School of Transport and Highways

<table>
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<th>Code</th>
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<tr>
<td>24.101G</td>
<td>Characteristics of Transport</td>
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<tr>
<td>24.102G</td>
<td>Fundamentals of Transport Economics</td>
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### Division of Postgraduate Extension Studies*

#### Human Communication

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.

<table>
<thead>
<tr>
<th>Code</th>
<th>Subject</th>
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</tr>
</thead>
<tbody>
<tr>
<td>97.001G</td>
<td>Linguistics and Written and Spoken Communication</td>
<td>2</td>
</tr>
<tr>
<td>97.002G</td>
<td>Basic Information Theory</td>
<td>6</td>
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<tr>
<td>97.004G</td>
<td>Psychology of Communication</td>
<td>3</td>
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<tr>
<td>97.005G</td>
<td>Audio and Video Equipment — Capabilities and Applications</td>
<td>4</td>
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<tr>
<td>97.007G</td>
<td>Audio Video 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>97.012G</td>
<td>Project</td>
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<tr>
<td>97.013G</td>
<td>Presentation of Information</td>
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<tr>
<td>97.010G</td>
<td>Basic Fortran</td>
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†Half-session only.

#### Subjects offered by Tape Correspondence

<table>
<thead>
<tr>
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<th>Subject</th>
<th>Credits</th>
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<tbody>
<tr>
<td>5.075G</td>
<td>Computational Methods in Mechanical Engineering, Part 1</td>
<td>2</td>
</tr>
<tr>
<td>5.076G</td>
<td>Computational Methods in Mechanical Engineering, Part 2</td>
<td>2</td>
</tr>
<tr>
<td>6.373G</td>
<td>Semiconductor Devices</td>
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<tr>
<td>6.376G</td>
<td>Reliability Engineering</td>
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<tr>
<td>6.377G</td>
<td>Integrated Circuit Design</td>
<td>3</td>
</tr>
<tr>
<td>6.378G</td>
<td>Solar Energy Conversion</td>
<td>3</td>
</tr>
<tr>
<td>6.490G</td>
<td>Using Microprocessors in Real-time Applications</td>
<td>2</td>
</tr>
<tr>
<td>8.708G</td>
<td>Finite Element Methods in Civil Engineering</td>
<td>3</td>
</tr>
<tr>
<td>97.010G</td>
<td>Basic Fortran</td>
<td>2</td>
</tr>
<tr>
<td>97.031G</td>
<td>Linguistics, and Written and Spoken Communication</td>
<td>1</td>
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<tr>
<td>97.032G</td>
<td>Basic Information Theory</td>
<td>1</td>
</tr>
<tr>
<td>97.034G</td>
<td>Psychology of Communication</td>
<td>2</td>
</tr>
<tr>
<td>97.035G</td>
<td>Audio Video Equipment</td>
<td>2</td>
</tr>
<tr>
<td>97.037G</td>
<td>Audio Video Signals in Communication</td>
<td>1</td>
</tr>
<tr>
<td>97.038G</td>
<td>Body in Communication</td>
<td>1</td>
</tr>
<tr>
<td>97.043G</td>
<td>Presentation of Information</td>
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</tr>
<tr>
<td>97.345G</td>
<td>Active and Adaptive Circuits for Integrated Systems</td>
<td>3</td>
</tr>
</tbody>
</table>

*See the Calendar for further Information on the Division of Postgraduate Extension Studies.
Projects and Research Projects — Research Areas by School

Supervision of projects and research projects will generally be available in 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.
- Structure — foundation interaction analysis for space frames supported on a raft foundation.
- Stabilization of acidic soils.
- Deformation and failure of soil under three dimensional stress state (experimental).
- Influence of deflects on strength and deformation of rocks.
- Theoretical and experimental studies of blasting hard rocks.
- Foundations subject to dynamic loading.
- Tensile creep of concrete.
- Influence of admixtures on creep and shrinkage of concrete.
- Magnitude and distribution of cracks in reinforced concrete beams.
- Creep of wood.
- Analytical and experimental study of fibre reinforced plastics.

**Hydraulics**
- Two-fluid systems with small density differences.
- Sediment motion.
- Air entrainment in water in open channel flow.
- Wave action and coastal engineering.
- Flow through porous media.
- Hydraulic transportation of solids.

**Public Health Engineering**
- Sewage sludge conditioning and filtration.
- Desalination of water.
- Clarifiers and sedimentation in water and waste water treatment.
- Filtration.
- Water-oil separation by flotation and skimming.

**Reinforced Concrete Structures**
- Torsion, bending and shear in reinforced concrete and prestressed concrete beams.
- Creep and shrinkage effects in reinforced concrete structures.
- Characteristics of plastic hinges.

**Structural Analysis**
- Development of computer methods for 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.

**Water Resources Engineering**
- Multi-objective inter resources planning.
- Hydro-economic studies.
- Optimization problems in water resource systems design.

**Electrical Engineering**

**Communications**
- Communication theory including system theory.
- Digital systems.
- Digital filters.
- Active and adaptive circuits.
- Microwaves, antennas and waveguides.
- Lasers and optical systems.
- Wave propagation in anisotropic and non-linear media.
- Solid state devices including surface elastic wave devices.
- Acoustics, including psychoacoustics.
- Electronic music.
**Systems and Control**
Analysis and design of non-linear systems.
Structural problems in identification, especially feedback problems.
Numerical methods of optimization including large scale systems.
Deterministic and stochastic control, self tuning regulators.
Cybernetics.
Computer aided design including linear and non-linear simulations, MIMO frequency domain design.
Biological signal analysis and system modelling.
Application of the above ideas including: control of a cement kiln; boiler identification and control; reactor boiling channel identification; quality control of eggs; fermentation process control; computer control and instrumentation; micro-processors; renal dialysis.

**Electric Power**
The stability, dynamics and control of electric power systems.
Instrumentation and protection in power systems.
Power system security and on-line security analysis.
Applications of field theory.
Electrical measurements.
Superconductivity.
Electrical machines and thyristor control schemes.
Special Electrical machines.
High voltage and heavy current phenomena.
Electrical discharges and their uses.
Insulation research including partial discharges.
Data acquisition and transmission and switching control in power systems.

**Computer Science**
Extensible Computer systems.
Real time incremental computing systems.
Observable computer systems.
Algorithms for industrial scheduling.
Artificial intelligence.
Digital systems description, specification and design.
Commercial software engineering.
Operating systems.
Microprocessor development systems.

**Solid State 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.

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**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.
Multi-mode vibrations.
Lubrication and wear.
Computer aided design.
Plastic deformation.

**Fluid Mechanics/Thermodynamics — Including Aeronautical Engineering and Naval Architecture**
Two-phase flow with and without heat transfer. Slurries.
Hydraulic transients.
Hydrodynamics, water hammer. Fluidics.
Conduction, convection and radiation. Natural convection.
Refrigeration and air conditioning.
Energy conversion and conservation.
Solar energy and systems.
Engine performance and emissions.
Gas dynamics. Transonic flow. Shock waves.
Jets, turbulent mixing. Noise.
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 planning surfaces.

**Industrial Engineering — including Operations Research and Production Engineering**
Engineering economic analysis.
Efficiency of production lines.
Optimum length of 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.
Social psychology in industry.
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.
Reactor channel hydrodynamics.
Boiling and two-phase flow.
Nuclear reactor dynamics, stability and control.
Numerical methods for reactor analysis and simulation.
Nuclear power planning and reactor strategy.
Optimization and optimal control in nuclear engineering.
Structural mechanics in reactor technology.
Laser-plasma interaction.

**Land Studies**

Land tenure, registration and survey systems.
Integrated survey systems.
Land data banks, spatial information systems.
Land development.
Residential value models, mass valuation techniques.

**Geodesy**

Satellite geodesy, precise orbit determinations, satellite altimetry analysis.
Physical geodesy, geoid and gravimetric studies, Earth models.
Remote sensing ocean dynamics from satellites, sea surface topography, unification of vertical datums.
Applications of lunar laser ranging and very long baseline interferometry in polar motion and earth rotation.
Systems design for secular geodynamics from geometric observations.
Geometric geodesy and geodetic surveying, use of Doppler systems in regional geodesy, geodetic astronomy.
Effects of atmosphere on distance and angular measurements, micrometeorological studies.

**Photogrammetry**

Production and evaluation of orthophotos and other map products.
Cartographic enhancement of orthophoto maps.
Monocular and stereoscopic pointing to photographic images, applications to ground targets, instrument cursors, cartographic symbolization.
Geometry of image sensors, remote-sensing imaging devices, mapping from panoramic photographs.
Non-topographic applications.
Restoration of digital image data.
Accuracy limitations of analogue stereoplotters.
Aerotriangulation, computer applications, block adjustment, independent model triangulation.
Digital terrain models.
Terrestrial photogrammetry.

**Precise Surveying**

Deformation and settlement of structures.
Electronic distance measurements: high precision applications, calibrations.
Gyrotheodolite theory and applications.
Development of instrumentation.

**Transport and Highways**

The testing of aggregates.
The properties of pavement materials subjected to repeated loading.
The surface texture of aggregates.
The stability of bituminous mixes.

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Adjustments and Error Theory

Applications in geodetic surveying and photogrammetry.
Solution of large systems of equations.
Computation systems for desk top computers.
The testing of full scale pavement systems.
The effects of porosity on the properties of rocks and road making aggregates.
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.
Problems of land use and transport interaction.
Theories of traffic structure and flow.
Measurements, planning and control of traffic.
Transport systems analysis.
Investigation of human factors.
Economic evaluation of transport investments.
Transport planning — urban systems.
Investigations into transport economics and policy.
Design of information systems.
Graduate Study

Conditions for the Award of Higher 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.

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: Faculty Table (Graduate Study) in the Calendar.

For the statements Preparation and Submission of Project Reports and Theses for Higher Degrees and Policy with respect to the use of Higher Degree Theses see the Calendar.

<table>
<thead>
<tr>
<th>Title</th>
<th>Abbreviation</th>
<th>Calendar/Handbook</th>
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<tbody>
<tr>
<td>Doctor of Science</td>
<td>DSc</td>
<td>Calendar</td>
</tr>
<tr>
<td>Doctor of Letters</td>
<td>DLitt</td>
<td>Calendar</td>
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<tr>
<td>Doctor of Laws</td>
<td>LLD</td>
<td>Calendar</td>
</tr>
<tr>
<td>Doctor of Medicine in the Faculty of Medicine</td>
<td>MD</td>
<td>Calendar</td>
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<tr>
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<tr>
<td>Master of Arts</td>
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<tr>
<td>Master of Blomedical Engineering</td>
<td>MBiomedE</td>
<td>Engineering</td>
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<tr>
<td>Master of Building</td>
<td>MBuild</td>
<td>Architecture</td>
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<tr>
<td>Master of Business Administration</td>
<td>MBA</td>
<td>AGSM</td>
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<tr>
<td>Master of Chemistry</td>
<td>MChem</td>
<td>Sciences*</td>
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<td>Master of Counselling (Education)</td>
<td>MCouns(Ed)</td>
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<td>MOptom</td>
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<tr>
<td>Master of Psychology</td>
<td>MPsy chol</td>
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<td>Applied Science</td>
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<td>Master of Science without Supervision</td>
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<td>Architecture</td>
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<td>MSc(Acoustics)</td>
<td>Health</td>
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<td>Master of Science and Society</td>
<td>MScSoc</td>
<td>Sciences*</td>
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<tr>
<td>Master of Science (Biotechnology)</td>
<td>MSc(Biotech)</td>
<td>Sciences*‡</td>
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<tr>
<td>Master of Science (Building)</td>
<td>MSc(Building)</td>
<td>Architecture</td>
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<td>Master of Social Work</td>
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<td>Professional Studies</td>
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<tr>
<td>Master of Statistics</td>
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<tr>
<td>Master of Surgery</td>
<td>MS</td>
<td>Medicine</td>
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</table>
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 of equivalent standing from another approved university; or
   (3) if he 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 recognized by the appropriate Faculty or Board of Studies 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 Faculty or Board of Studies.

3. When the Faculty or Board of Studies is not satisfied with the qualifications submitted by a candidate, the Faculty or Board of Studies may require him, before he is permitted to register, to undergo such examination or carry out such work as the Faculty or Board of Studies may prescribe.

4. A candidate for registration for a course of study leading to the degree of Doctor of Philosophy shall:
   (1) apply to the Registrar on the prescribed form at least one calendar month before the commencement of the session in which he desires to register; and
   (2) submit with his application a certificate from the head of the University school in which he proposes to study stating that the candidate is a fit person to undertake a course of study and research leading to the degree of Doctor of Philosophy and that the school is willing to undertake the responsibility of supervising the work of the candidate and of reporting to the Faculty or Board of Studies at the end of the course on the merits of the candidate's performance in the prescribed course.
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 his degree, who before registration was engaged upon research to the satisfaction of the Faculty or Board of Studies, may be exempted from not more than two academic sessions;

(2) in special circumstances the Faculty or Board of Studies may grant permission for the candidate to spend not more than one calendar year of his program in advanced study and research at another institution provided that his work can be supervised in a manner satisfactory to the Faculty or Board of Studies;

(3) in exceptional cases, the Professorial Board on the recommendation of the Faculty or Board of Studies 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 himself for examination not later than ten academic sessions from the date of his registration. A candidate not fully engaged in research shall present himself for examination not later than twelve academic sessions from the date of his registration. In special cases an extension of these times may be granted by the Faculty or Board of Studies.

7. The candidate shall be required to devote his whole time to advanced study and research, save that:

(1) the Faculty or Board of Studies may permit a candidate on application 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 Faculty or Board of studies shall prescribe a minimum period for the duration of the program;

(3) in special circumstances, the Faculty or Board of Studies 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 his program in a school of the University. In such a case the Faculty or Board of Studies shall prescribe for the duration of his program a minimum period which, in its opinion, having regard to the proportion of his time which he is able to devote to the program in the appropriate University school is equivalent to the six sessions ordinarily required.

8. Every candidate shall pursue his program under the direction of a supervisor appointed by the Faculty or Board of Studies 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 Faculty or Board of Studies may permit candidates to conduct their 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 his research for approval by the Faculty or Board of Studies. After the topic has been approved it may not be changed except with the permission of the Faculty or Board of Studies.

10. A candidate may be required by the Faculty of Board of Studies to attend a formal course of study appropriate to his work.
11. On completing his 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 his research. In special cases work done conjointly with other persons may be accepted, provided the Faculty or Board of Studies is satisfied on the candidate's part in the joint research.

13. Every candidate shall be required to submit with his thesis a short abstract of the thesis comprising not more than 600 words. 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 his thesis any work or material which he has previously submitted for a university degree or other similar award.

15. The candidate shall give in writing two months' notice of his intention to submit his thesis and such notice shall be accompanied by the appropriate fee.

16. Four copies of the thesis shall be submitted together with a certificate from the supervisor that the candidate has completed the course of study prescribed in his case. The 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 he has 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 Faculty or Board of Studies, at least one of whom shall be an external examiner.

19. After examining the thesis the examiners may:

(1) decide that the thesis reaches a satisfactory standard; or

(2) recommend that the candidate be required to re-submit his thesis in revised form after a further period of study and/or research; or

(3) recommend without further test that the candidate be not awarded the degree of Doctor of Philosophy.

*See Conditions for the Award of Degrees in the Calendar.
20. If the thesis reaches the required standard, the examiners shall arrange for the candidate to be examined orally, and, at their discretion, by written papers and/or practical examinations on the subject of the thesis and/or subjects relevant thereto, save that on the recommendation of the examiners the Faculty or Board of Studies may dispense with the oral examination.

21. If the thesis is of satisfactory standard but the candidate fails to satisfy the examiners at the oral or other examinations, the examiners may recommend the University to permit the candidate to represent the same thesis and submit to a further oral, practical or written examination within a period specified by them but not exceeding eighteen months.

22. At the conclusion of the examination, the examiners will submit to the Faculty or Board of Studies a concise report on the merits of the thesis and on the examination results, and the Faculty or Board of Studies shall recommend whether or not the candidate may be admitted to the degree.

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

Master of Biomedical Engineering (MBiomedE)

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.

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 he submits 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.

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 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 research 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 four complete sessions from the date of registration.
4. 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.

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

1. The degree of Master of Engineering may be awarded by the Council on the recommendation of the Higher Degree Committee of the appropriate Faculty (hereinafter referred to as the Committee) to a candidate who has demonstrated ability to undertake research by the submission of a thesis embodying the results of an original investigation.

2. (1) 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, in an appropriate school.

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

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 he has published whether or not such work is related to the thesis.
Engineering

Recommendation for Admission to Degree

(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.

Fees

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.

Master of Engineering Science (MEngSc) and Master of Surveying Science (MSurvSc)

Qualifications

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) A graduate with a pass degree of good standing from an appropriate degree course with academic standards equivalent to the Bachelor courses in Engineering or Surveying at the University of New South Wales may be admitted on the recommendation of the Head of School and the confirmation of the Committee.

(3) In special circumstances a person may be permitted to register as a candidate for the degree if he 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.

Registration

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 will 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 will 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 Committee on the recommendation of Heads of Schools. Where the formal course work comprises no more than 50% of the total study, the candidate will be required to submit a research thesis and where the formal work comprises 50% or more but less than 100% the candidate will 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 thesis shall be conducted under a supervisor appointed by the Committee or under such conditions as 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 (18 or more 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 work he has published whether or not such work is related to the thesis. The format of the report on a 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 as provided in paragraph 3. (3) (b) 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.

(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.

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.

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.

Qualifications
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 in an appropriate School or Department.

   (2) In exceptional cases a person may be permitted to register as a candidate for the degree if he submits evidence of such academic and professional attainments as may be approved by the Professorial Board on the recommendation of 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 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 in which the candidate is registered a report on the progress of the candidate. The Committee shall review the report and as a result of its review may 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 approval of the Committee. A candidate who is fully engaged in research for the degree shall present himself for examination not later than six academic sessions from the date of registration. A candidate not fully engaged in research shall present himself for examination not later than twelve academic sessions from the date of his registration. In special cases an extension of these times may be granted by the Committee.
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 he 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.

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. 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.

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 and consideration by the Higher Degree Committee of the appropriate Faculty (hereinafter referred to as the Committee) not less than six months before the intended date of submission of the thesis. A graduate who intends to apply in this way should in his 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.

4. (1) (a) Every candidate for the degree shall be required to submit three copies of a thesis embodying the results of an original 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 he 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 his 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.
Engineering

(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.

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

Master of Surveying (MSurv)

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.

Qualifications

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) A graduate with a pass degree of good standing from an appropriate degree course with academic standards equivalent to the Bachelor’s courses in Engineering or Surveying at the University of New South Wales may be admitted on the recommendation of the Head of School and the confirmation of the Committee.

(3) In special circumstances a person may be permitted to register as a candidate for the degree if he 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.

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.

(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 he 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.

Graduate Diploma

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 he desires to register. Fees shall be paid in advance.
Subject Descriptions

Identification of Subjects by Numbers

Each of the subjects taught in the University is identifiable both by number and by name. This is a fail-safe measure at the points of enrolment and examination against a student nominating a subject other than the one intended. Subject numbers are allocated by the Assistant Registrar, Examinations and Student Records, and the system of allocation is:

1. The School offering a subject is indicated by the number before the decimal point;

2. If a subject is offered by a Department within a School, the first number after the decimal point identifies that Department;

3. The position of a subject in a sequence is indicated by the third number after the decimal point. For example, 2 would indicate that the subject is the second in a sequence of subjects;

4. Graduate subjects are indicated by the suffix G.

As indicated above, a subject number is required to identify each subject in which a student is to be enrolled and for which a result is to be returned. Where students may take electives within a subject, they should desirably be enrolled initially in the particular elective, and the subject numbers allotted should clearly indicate the elective. Where it is not possible for a student to decide on an elective when enrolling or re-enrolling, and separate examinations are to be held in the electives, Schools should provide to the Examinations and Student Record Section in April (Session 1) and August (Session 2) the names of students taking each elective. Details of the actual dates in April and August are set out in the Calendar of Dates earlier in this volume.

Those subjects taught in each Faculty are listed in full in the handbook of that Faculty, together with the subject description, in the section entitled Subject Descriptions.

Servicing Subjects are those taught by a School or Department outside of its own faculty and are listed at the end of Undergraduate Study and Graduate Study of the relevant subject. Their subject descriptions are published in the handbook of the faculty in which the subject is taught.

The identifying numbers for each School are set out on the following page.

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

Information Key

The following is the key to the information supplied about each subject listed below: 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 not known at time of publication); L (Lecture, followed by hours per week); T (Laboratory/Tutorial, followed by hours per week); C (Credit or Credit units).

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

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.
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<td>18 School of Mechanical and Industrial Engineering (Industrial Engineering)</td>
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<td>21 Department of Industrial Arts</td>
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<td>22 School of Chemical Technology</td>
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<td>23 School of Nuclear Engineering</td>
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<tr>
<td>24 School of Transport and Highways</td>
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<td>124</td>
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<tr>
<td>25 School of Applied Geology</td>
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<td>26 Department of General Studies</td>
<td>Board of Studies in General Education</td>
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<td>27 School of Geography*</td>
<td>Applied Science</td>
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<td>28 School of Marketing</td>
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<td>29 School of Surveying</td>
<td>Engineering</td>
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<tr>
<td>30 Department of Organizational Behaviour**</td>
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<tr>
<td>31 School of Optometry*</td>
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<td>32 School of Building Architecture</td>
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<td>33 School of Town Planning*</td>
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<td>34 School of Landscape Architecture</td>
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<th>School, Department etc</th>
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<td>35 School of Building Architecture</td>
<td>Architecture</td>
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</table>

**Formerly Department of Behavioural Science; new name effective from 1 January 1979.
Accountancy

Undergraduate Study

14.001 Introduction to Accounting A S1 L1%Ta

14.002 Introduction to Accounting B S2 L1%Ta
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.

Chemical Engineering

Undergraduate Study

3.302 Fuels and Energy
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. A variety of alternative energy sources and review of the national and global energy situation.

Chemistry

Undergraduate Study

2.111 Introduction Chemistry S1 L2T4
Prerequisite: None.
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 of selected elements. Acids, bases, salts, neutralization. Stoichiometry, the mole concept. Electron transfer reaction. Qualitative treatment of reversibility and chemical equilibrium, the pH scale. Introduction to the diversity of carbon compounds.

2.021 Chemistry IE S1 or S2 L3T3
A terminating subject for students in the Aeronautical, Civil, Electrical, Industrial, Mechanical and Mining Engineering, and Naval Architecture courses.
Classification of matter and theories of the structure of matter. Atomic and molecular structure, the periodic table and chemical behaviour. Chemical bonding and the nature and properties of chemical systems. Equilibrium and energy changes in chemical systems. Introduction to colloidal systems.

2.121 Chemistry IA S1 or S2 L2T4
Prerequisites:
HSC Exam
Percentile
Range Required
2 unit Science (any strands) or 4 unit Science (multistrand)
31-100
31-100
Stoichiometry and solution stoichiometry. Structure of matter, solids, liquids, gases. Thermochemistry. Equilibria and equilibrium constants, entropy changes, free energy changes, the relationship between equilibrium and standard free energy changes. Ideal solutions, colligative properties. Equilibria in electrolyte solutions, acid-base equilibria, solubility equilibria and redox equilibria. The rate of a chemical change and chemical kinetics.

2.131 Chemistry IB S1 or S2 L2T4
Prerequisite: 2.111 or 2.121.
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 prior to enrolment in the final year.

8.002 Industrial Experience
Prerequisite: 8.671. Requirement for the Bachelor of Science (Engineering) degree.

A minimum of three years of satisfactory industrial experience must be obtained concurrently with attendance in the course. Students are required to submit to the School a report on their industrial experience prior to enrolment in the final year.

8.015 Road Engineering
Prerequisites: 8.272, 8.671.


8.016 Hydraulics
Prerequisite: 8.573.

Use of hydraulic models for rivers and coastal works. Further studies on open channel flow and estuarine hydraulics.

8.017 Transportation Engineering
Prerequisite: 8.301, 8.671.

History, development and characteristics of modes of transport. Fundamentals and evaluation of transport systems, performance and output. Interaction between land use and traffic demand.

8.018 Construction Engineering
Prerequisites: 8.301, 8.671.

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

8.019 Railway Engineering
Prerequisite: 8.301.


8.020 Hydrology
Prerequisite: 8.592.

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.

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; \( \Phi \) and \( \psi \) functions. Laplace equation, standard flow patterns; practical applications.
Engineering

8.024 Foundation and Dam Engineering SS L2T1
Prerequisite: 8.273.

8.025 Structural Failures SS L2T1
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 SS L2T1
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 SS L2T1

8.028 New Materials II SS L2T1
Prerequisites: 8.273, 8.182.

8.029 Continuum Mechanics SS L2T1
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 SS L2T1
Co-requisite: 8.672.
Civil Engineering Construction organization, management and control.

8.031 Construction Project Finance SS L2T1
Co-requisite: 8.672.
Civil Engineering construction project feasibility, financial management, cash flow, cost control, insurance and company finance.

8.032 Law for Builders SS L2T1
Co-requisite: 8.672.
Introduction to the law, including brief outline of sources of law in New South Wales and the System of judicial precedent. General principles of law of contract. Some special forms of building contract.

8.033 Industrial Law and Arbitration SS L2T1
Prerequisites: 8.672, 8.032
Introduction to industrial law, including reference to Commonwealth and State statutory provisions dealing with conciliation and arbitration, State and Commonwealth awards. Industrial disputes. Employers' association. Trade unions. Introduction to real property and local government law.

8.034 Engineering Economy SS L2T1
Prerequisite: 8.672.
Economic evaluation of civil engineering projects, including benefit-cost analysis and rate of return analysis.

8.035 Special Topics In Reinforced Concrete Design SS L2T1
Prerequisite: 8.182.
General design process; limit states concepts. Design for bending and compression; ductility. Biaxial bending. Shear and torsion. Serviceability design.

8.036 Computer Programming SS L2T1
Introduction to FORTRAN Programming, use of WATFIV compilers, flow charts and simple problems.

8.037 Advanced Engineering Geology SS L2T1

8.038 Geological Engineering SS L2T1
Prerequisite: 8.272.
8.042 Water Resources SS L2T1
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 SS L2T1
Prerequisite: 8.581.

8.047 History of Civil Engineering SS L2T1
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 project in the field of civil engineering materials.

8.052 Design Project — Structures
Prerequisite: 8.191*
Final year design project in the field of structural engineering.

8.053 Design Project — Water
Prerequisites: 8.573, 8.582.
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 SS L2T1
Prerequisite: 8.191*
Practical applications 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 SS L2T1
Prerequisite: 8.191*
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 SS L2T1
Prerequisite: 8.182.
Historical development, methods of prestressing, general flexural theory, calculation of losses, anchorage zone design, partial prestressing.

8.058 Special Topics in Steel Design SS L2T1
Prerequisites: 8.174, 8.182.
Plastic analysis and design of steel members and frames. Elastic-plastic material behaviour, moment-rotation relations. Lower bound and upper bound theorems. Plastic design of steel structures.

8.059 Structural Vibrations SS L2T1
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 SS L2T1
Prerequisite: 8.272.
Introduction to finite element method; application of finite element and finite difference techniques to various soil mechanics and rock mechanics problems such as stability analysis of foundations, retaining walls, tunnel openings; prediction of settlement of footings, piles and raft foundations; seepage and consolidation analysis.

8.113 Civil Engineering for Electrical Engineers S1 L2T2
Includes an introduction to the various branches of civil engineering, the nature and organization of the profession. Relationship between clients and design consultants. The historical development of Civil Engineering. Theory of beams and trusses, resultant forces, structural action, stress and strain. Relation between load, shear force and bending moments, geometric properties of sections, deflection of beams. Properties of materials used in structures: various steels, concrete (plain, reinforced and prestressed), aluminium and timber. Brittle fracture. Introduction to buckling. Engineering failures. Introduction to design of transmission lines and towers.

8.170 Statics SS L2T2
Equilibrium equations. Internal actions, bending moment and shear force. Simple beams and trusses.

*Students who have failed this subject may apply for permission to enrol simultaneously in this subject and the subsequent subject.
8.171 Mechanics of Solids I  SS L1½ T½
Prerequisite: 8.170.
Concepts of stress, strain. Stress and deformation due to axial force; linear and non-linear problems; compound bars. Concepts of stiffness and flexibility. Bending moment and shear force in simple beams. First and second moments of area. Stress and deformation due to bending; linear and non-linear problems; use of step functions.

8.172 Mechanics of Solids II  SS L2T2
Prerequisite: 8.171.
Structural statics. Bending moments, shear force and torsion. Stresses due to shear force 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  SS L2T1
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  SS L2T1
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.

8.181 Structural Design I  FL1T1½
Prerequisite: 8.171.
Introduction to design concepts, leading to selection of appropriate structural systems. Behaviour of structural members at service loading and in the overload range up to failure. Safety. Simple beams, tension and compression members and connections in timber, concrete and steel. Proportioning of members and connections from basic principles. The objective is an understanding of structural behaviour, and the ability to produce practical and rational designs based on the elementary theory of mechanics of solids.

8.182 Structural Design II  FL1T2
Prerequisites: 8.172, 8.181.
Extension of the fundamental concepts developed in Structural Design I to the behaviour and design of more advanced members and structures. Further consideration of safety and design loads including wind and earthquake loading. Some reference to codes of practice, concentrating on the principles behind the more important sections.

8.191 Structural Engineering  SS L1½ T1½
Prerequisites: 8.174*, 8.182*.
2. Timber design. Emphasis on special properties of timber affecting the design of timber structures. Introduction to plastic design of steel structures. Application to continuous beams and portal frames.

8.259 Properties of Materials  FL1T2

8.271 Introduction to Materials  SS L2T0
Types of civil engineering materials: historical development, characteristics, response to environment; material selection; traditional and new materials. Nature of materials: structure, imperfections; relationship of properties to structure; phase equilibria, iron-carbon system.

8.272 Civil Engineering Materials I  FL2T2
Co-requisite: 8.271.

*Students who have failed this subject may apply for permission to enrol simultaneously in this subject and the subsequent subject.
8.273 Civil Engineering Materials II FL1½T1½
Prerequisites: 8.172, 8.272.
Introduction to continuum mechanics; equilibrium equations; compatibility equations; constitutive equations; linear elasticity. Failure theories for ductile and brittle materials; fracture stress and strain; mechanisms of fracture; fatigue fracture. Basic soil properties; classification; site investigation; effective stress law; soil suction; failure and shear strength of soils and rocks; stress strain characteristics of soils and rocks; stability of soil masses; steady seepage; consolidation; stabilization; slope stability; earth and rockfill dams.

8.274 Civil Engineering Materials III FL1½T1½
Prerequisite: 8.272. Co-requisite: 8.182.

8.301 Systems Engineering FL1T1
Prerequisites: 10.001, 5.0102, 8.670.
The systems approach to engineering problem formulation, modelling and decision analysis is presented in a course integrating analytical theory, case studies and project work. Relevant system modelling concepts, techniques and decision models are introduced during development of a project designed to encourage the student's own creative approach.

8.351 Engineering Mathematics SS L2½T2½
Prerequisite: 10.022.

8.571 Hydraulics I SS L1½T1½
Prerequisite: 8.571.
Fluid properties: hydrostatics, stability of floating bodies; fluid acceleration; flow patterns, continuity: Euler, Bernoulli, energy and momentum equations.

8.572 Hydraulics II SS L1½T1½
Prerequisite: 8.571.
Dimensional analysis, hydraulic model theory, scale effect. Fluid turbulence, velocity distribution, surface resistance in flow past plane boundaries and in pipes and channels. Pipe flow, pipe networks, steady flow in uniform channels.

8.573 Hydraulics III SS L1½T1½
Prerequisite: 8.571.

8.581 Water Resources I SS L1½T1½
A prior knowledge of elementary hydraulics is assumed.

8.582 Water Resources II SS L1½T1½
A prior knowledge of elementary hydraulics is assumed.
The hydrologic cycle, water and energy balances, climatology, atmospheric moisture, precipitation, runoff cycle, infiltration, stream gauging, hydrograph analysis, storm runoff and loss rates, design storms, flood estimation, yield and storage determination, groundwater.

8.583 Water Resources III SS L1T2
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 SS L1T0
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 SS L2T1
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 SS L2T2
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   SS L1T2
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   SS L1T2
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.

8.702G Network Methods in Civil Engineering   C3
Graphs, flow-in networks, optimal paths, critical path schedule, resources levelling, simulation networks, stochastic networks, project management, further applications.

8.703G Optimization Techniques in Civil Engineering   C3
Search, linear programming, non-linear programming, geometric programming, calculus of variations, maximum principle, applications.

8.704G Stochastic Methods in Civil Engineering   C3
Queueing, Markov processes, theory of storage, reliability, renewal, application, transportation and allocation.

8.711 Engineering for Surveyors I   SS L1½T1½

8.712 Engineering for Surveyors II   SS L3T0
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.

8.710G Advanced Topics in Optimization in Civil Engineering   C3
Special studies in optimization in Civil Engineering design and construction to be offered from time to time by appropriate specialists.

8.714G Advanced Topics in System Modelling   C3
Special studies in system modelling to be offered from time to time by appropriate specialists.

8.723G Construction Design   C3
Design of field services and structures; compressed air services, coffer-dams, ground anchors, floating plant, formwork and falsework, bridge centring, wall-points and dewatering systems.

8.724G Construction Technology   C3
Blasting techniques, tunnelling, rock-bolting and other ground support, harbours, railways, dams, bridges, structural steelwork techniques, pipeline construction, foundation grouting, pile-driving, compressed air work.

Graduate Study

8.701G Economic Decision Making in Civil Engineering   C3
Review of practical engineering decision-making problems and relevant techniques. Engineering economics, benefit/cost analysis, consideration of inflation and taxation in investment decisions, bidding, decision theory, microeconomic theory, objectives and criteria, multiple objective planning.
8.725G Construction Accounting and Control C3

8.726G Construction Law and Professional Practice C3

8.727G Construction Planning and Estimating C6
Project initiation and development, feasibility studies, planning and estimating procedures, contract administration; estimating costs of labour, plant and materials, indirect costs 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.

8.748G 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 surfacings: use of non-standard materials in pavements; 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; subgrade conditions and traffic loadings: design principles methods, and criteria for flexible pavements: design principles, methods and criteria for rigid and semi-rigid pave-
ments, including stabilized soil and multilayer pavements: design principles, methods and criteria for design of rail-tracks. 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, microcracking and failure mechanisms; significance of tests and relation to design requirements. Variability, target strength, code and special criteria for acceptance and rejection of concrete. Non-destructive testing. Accelerated curing and special high-strength concretes for column and prestressed construction. Recent developments in constituent materials, special cements and admixtures. Workability, mix design theories and practical applications.

8.756G Materials of Construction (Metals and Plastics) 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) I
Concrete as a structural material, with special application to marine structures. Volume changes, shrinkage and thermal stresses; creep; predicted 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
History; relationship between structure and mechanical and physical properties. Elastomers, adhesives, reinforced plastics, natural composites. Applications and case studies.

8.768G Welding in Structural Engineering
Terminology, welding processes, metallurgy, weldability of ferrous and non-ferrous metals, pre-heat and post-heat treatments residual stresses and distortion, weld quality levels, destructive and non-destructive testing, economic welded design, quality assurance.

8.771G Foundation Engineering
A specialized study of theoretical and practical aspects of geotechnical engineering directly relevant to the analysis and design of foundation systems. The primary object of the course is to establish the state-of-art with particular emphasis on the application of recent theoretical developments to foundation engineering, including piles, rafts, raft-piles, laterally loaded piles, retaining structures and techniques of strengthening soils.

8.772G Soil Dynamics and Earthquake Analysis
Introduction to soil dynamics; basic principles involved in earthquake engineering; treatise of seismic waves; finite element analysis of foundations subjected to dynamic loading; analysis of dams and earth slopes due to earthquake loading; basis for design criteria. Offshore structures.

8.780G Geological Engineering

8.802G Elastic Stability I
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

8.804G Vibration of Structures I
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

8.806G Prestressed Concrete I
Historical development. Methods of prestressing. Elastic analysis and design. Flexural capacity and shear capacity of prestressed elements.

8.807G Prestressed Concrete II

8.808G Prestressed Concrete III

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 C3

8.812G Plastic Analysis and Design of Steel Structures I C3
The perfectly plastic material; the plastic hinge; plastic collapse of beams and frames; basic theorems; general design methods.

8.813G Plastic Analysis and Design of Steel Structures II C3
Estimation of deflections; factors affecting plastic moment; shake-down; three-dimensional plastic behaviour; minimum weight design.

8.814G Analysis of Plates and Shells C3

8.817G Experimental Structural Analysis I C3
Dimensional analysis and principles of similitude, model analysis and design of models. Instrumentation and special methods of measurement. Evaluation of data.

8.818G Bridge Design I C3

8.819G Bridge Design II C3

8.820G Structural Analysis and Finite Elements I C3

8.821G Structural Analysis and Finite Elements II C3

8.822G Structural Analysis and Finite Elements III C3
Application of the finite element method to analysis of structures. Verification of the results of standard computer programs. Structural stability and vibration of structures.

8.830G Hydromechanics C3
General equation of fluid motion, potential flow, conformal mapping, laminar flow, Navier-Stokes equations; turbulence, shear flows, jets and wakes, boundary layers, turbulent mixing, diffusion, air entrainment, cavitation, stratification.

8.831G Closed Conduit Flow C3
Theories for energy loss in conduit flows, roughness at pipe walls and tunnels, design applications. Cavitation in conduits, transport of water borne mixtures in pipes, accuracy of flow measurements in pipe lines.

8.832G Pipe Network and Transients C3

8.833G Free Surface Flow C3
Theory of water flow in open channels. Application of theory to design of hydraulic structures, spillways, control gates, energy dissipators, channel transitions. Use of hydraulic models.

8.835G Coastal Engineering I C3
Theory of periodic waves as applied to tides and wind generated waves in water of varying depths. Wave and tide prediction.

8.836G Coastal Engineering II C3
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
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.
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<th>Course Code</th>
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<tr>
<td>8.840G</td>
<td>Reservoir Design and Yield Determination</td>
<td>Storage-yield analysis, extension of runoff records, deterministic catchment models, stochastic hydrology, storage probability studies, spillway capacity and reservoir flood routing.</td>
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<td>8.841G</td>
<td>Hydrometeorology</td>
<td>Water and energy balances, atmospheric moisture, precipitation, evaporation and transpiration, snow and snowmelt, extreme precipitation.</td>
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<td>8.842G</td>
<td>Groundwater Hydrology</td>
<td>Confined and unconfined aquifers, analogue and digital models of aquifer systems, water movement in the unsaturated zone, recharge, groundwater quality, sea water intrusion.</td>
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<td>8.843G</td>
<td>Groundwater Hydraulics</td>
<td>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.</td>
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<tr>
<td>8.844G</td>
<td>Soil-Water Hydrology</td>
<td>Hydrologic characteristics of unsaturated media, hysteresis, theory of infiltration, drainage and redistribution studies, laboratory and field instrumentation, applications to field problems.</td>
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<td>8.845G</td>
<td>Water Resources Policy</td>
<td>Resource economics, water supply, water demand, multiple objective planning, multiple purpose projects, water law, water administration, case studies.</td>
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<td>8.846G</td>
<td>Water Resource System Design</td>
<td>Principles of the optimal design and operation of multiple purpose, multiple component, water resource systems; evaluation of cost and benefits in complex and simple systems.</td>
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<tr>
<td>8.847G</td>
<td>Irrigation</td>
<td>Soils, soil-water relationships, plants, climate, crop requirements; water budgets, sources, quality, measurement; Irrigation efficiency. Design of irrigation systems, appurtenant works, distribution.</td>
</tr>
<tr>
<td>8.850G</td>
<td>Drainage of Agricultural Land</td>
<td>Characteristics of drainage systems, steady and unsteady state drainage formulae, conformal transformations solutions, soil characteristics, field measurement of hydraulic conductivity and soil water pressure, significance of unsaturated zone, practical aspects.</td>
</tr>
<tr>
<td>8.851G</td>
<td>Unit Operations in Public Health Engineering</td>
<td>Theory of physical, chemical, biological, and hydraulic processes used in both water and wastewater treatment. Applications where these are common to both water and wastewater treatment.</td>
</tr>
<tr>
<td>8.852G</td>
<td>Water Distribution and Sewage Collection</td>
<td>Water collection, transmission and distribution systems—layout design and analysis, reservoirs, pumping. Sewage collection system design and analysis—capacities, corrosion, pumping.</td>
</tr>
<tr>
<td>8.854G</td>
<td>Water and Wastewater Analysis and Quality Require-</td>
<td>The effects of impurities in water and wastewater on its suitability for various beneficial uses, and methods used for detecting impurities. Analytical methods used in water and wastewater treatment for monitoring and process control.</td>
</tr>
<tr>
<td>8.855G</td>
<td>Water Treatment</td>
<td>Application of processes and process variations used to upgrade the quality of water for specified uses, with particular reference to the treatment of water for municipal use.</td>
</tr>
<tr>
<td>8.856G</td>
<td>Sewage Treatment and Disposal</td>
<td>Application of processes and process variations used to improve the quality of sewage effluent, and the disposal of the effluent. Re-use of effluents where applicable. Sludge treatment and disposal.</td>
</tr>
<tr>
<td>8.857G</td>
<td>Water Quality Management</td>
<td>Fundamental concepts; systems approach to quality aspects of water resource systems; quality interchange systems; quality changes in estuarine, surface, and ground water. Quality management by engineered systems. Economic criteria relating to water use and re-use systems.</td>
</tr>
<tr>
<td>8.858G</td>
<td>Investigation of Groundwater Resources I</td>
<td>Occurrence and extraction of groundwater, investigation and drilling methods, systems approach, optimization techniques, conjunctive use studies, quality of groundwater.</td>
</tr>
<tr>
<td>8.859G</td>
<td>Investigation of Groundwater Resources II</td>
<td>Geophysical methods, remote sensing, photointerpretation, arid-environment studies, analog models, case studies.</td>
</tr>
</tbody>
</table>

As for 97.001G (lectures only).

Information Theory
As for 97.002G (lectures only).

Psychology of Communication
As for 97.004G (lectures only).

Audio Video Equipment
As for 97.005G (lectures only).

Audio Video Signals in Communication
As for 9.007G (lectures only).

The Body in Communication
As for 97.008G (lectures only).

Presentation of Information
As for 97.013G (lectures only).

Active and Adaptive Circuits

Prerequisites: Electricity and magnetism section of 1.961.

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, and computers; systems and circuit theory; probability, information and communication. Laboratory exercises and project work in these areas include instrumentation and device characteristics.

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

8.901G 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.

8.905G Project C9

8.918G Research Project C18

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Division of Postgraduate Extension Studies

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Graduate Study

97.001G Linguistics and Written and Spoken Communication S1 L2T1 C2
The broad purpose of the lectures on linguistics is to analyse the structure of English on the phonetic, phonemic, morphological and syntactical levels but in making this analysis, consideration is given to:

The different general approaches to linguistics: eg traditionalist, structuralist, generative and transformationalist; specific matters in theoretical disputes; eg the statistics of the phoneme; experimental and instrumental research; eg spectrographic examinations of English sounds and their combination; correlations between acoustic phenomena and the perceived sounds of English; the statistics of written and spoken English. Types of communication problems; establishing identity of purpose or common ground; essential differences between written and spoken English; limitation of words; visual aids to comprehension; preparation of factual or technical reports.

97.002G Basic Information Theory F L1T2 C6

97.004G The Psychology of Communication S1 L2T1 C3
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.

97.005G Audio and Video Equipment — Capabilities and Applications S2 L2T2 C4
Aims to give an understanding of the characteristics of equipment used in sound recording and broadcasting, television and printing with some reference to mechanical detail. Topics: audio systems; testing of audio equipment; microphones and loudspeakers; amplifiers; sound transmission; level control, recording and reproduction; studio acoustics; sound mixing; editing and effects. Television scanning; television signals; camera tubes and cameras; television receivers and picture monitors; basic concepts of colour television; the PAL colour television system; switching, mixing and processing of television signals; lighting equipment; studio floor equipment; digital signal processing equipment. Printing processes; letterpress, gravure and lithography. Photography.

97.007G Audio and Video Signals in Communication S1 L1T2 C3

97.008G The Body in Communication S2 L1T2 C2

97.010G Basic Fortran F L1 C2
Introduction to computer programming in FORTRAN IV 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; Implicit DO loops; Magnetic tape and disc READ and WRITE statements; Function subprograms and subroutine programs; Sorting and merging techniques; Common Storage; Program planning and debugging.
**Subject Descriptions**

### 6.021B Introduction to Electromagnetic Energy Conversion

**Prerequisite:** 6.021A.

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 electro-mechanical energy conversion.

### 6.021C Electronics

**Prerequisites:** 1.922, 6.021A.

A unified treatment of the fundamental principles of bipolar and field-effect transistors and their operation in simple circuits at low frequencies and room temperature in the static approximation (i.e., where the frequency and temperature characteristics of the device itself are neglected). Stress on showing how to set up the transistor currents and voltages to give the circuit characteristics desired of the device for switching, amplification, high (or low) input impedance, etc. An introduction to the Operational Amplifier and its uses.

### 6.021D Computing

**Prerequisite:** Computing strand of 5.030.

Programming: systematic development of algorithms and associated data-structures using PASCAL, a high-level, algorithmic, programming language which provides simple, high-level program-control and data-structure definitions facilities. The translation of a program expressed in such a high-level language to a program expressed in the more commonly encountered, lower-level, non-algorithmic programming language FORTRAN. Computer organization: simple machine architecture; data storage devices; simple operating system concepts.

### 6.021E Digital Logic and Systems

**Prerequisite:** 10.001.

A hardware oriented subject concerned with the design of digital circuits for control and general computational purposes. Includes representation of digital information, combinational logic design, clocked circuitry, digital systems and PDP 11 assembler programming.

### 6.022 Electrical Engineering Materials

**Prerequisites:** 1.961 or equivalent, 2.121.

Not offered in 1979.

A survey of materials and their technology for electrical and electronic devices and systems. Influence of molecular structure on the relevant properties of metals, semiconductors, glasses, ceramics, polymers, liquids and gases, with particular regard to their electrical, magnetic, mechanical, optical and transducing characteristics and their behaviour in electrostatic, magnetic, electromagnetic and thermal fields. Thick and thin film microcircuits. Superconductivity. Control of material properties through heat-treatment, additives, etc. Composite materials, joining and bonding techniques. Failure mechanisms and long-term stability. Effects of environment; corrosion. Stabilizing and protective treatments. Example applications to illustrate selection criteria for specific purposes, including both traditional applications as well as some of contemporary interest.

### 6.0311 Circuit Theory II

**Prerequisite:** 6.021A. **Co-requisite:** 10.111A, 10.1113, 10.1114.

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. Distributed circuits and transmission lines. Telegrapher's equation. Characteristic impedance and propagation constant. Terminated lines and reflection coefficient. Steady-state frequency response of lines and standing waves. Use of Smith chart. Transients and pulse reflection on lines.

### 6.0312 Utilization of Electric Energy

**Prerequisites:** 6.021A, 6.021B. **Co-requisite:** 6.0311.

A continuation of study of the utilization of electrical energy commenced in 6.021B. Topics treated included dc machines, three-phase and single-phase induction machines, induction motor speed control, synchronous machines, power electronics, the thermal behaviour of equipment and the rating of plant.

### 6.0313 Electronic Circuits I

**Prerequisites:** 6.021A, 6.021C. **Co-requisite:** 6.0311.

Active devices and how they may be interconnected with other circuit elements to achieve some desired result. Includes basic transistor theory and properties, simple amplifier configurations and applications of negative feedback.

### 6.0314 Systems and Control

**Prerequisite:** 6.0311.


### 6.0315 Electrical Energy

**Prerequisite:** 6.0312.

Features of the electrical supply system relevant to a user of electricity.

### 6.0316 Electronic Circuits II

**Prerequisite:** 6.0313.

Extension of 6.0313 to include tuned and difference amplifiers, operational amplifiers, power amplifiers, oscillators. Schmitts: comparators and multivibrators with increasing emphasis on the integrated circuit embodiment of these.
6.017 Communication Systems I
Overview of information acquisition, transmission and processing. Aims to enable a student not specializing in this field to qualitatively understand the communication problems he is likely to meet in his career, and a general background if he intends to specialize in communications.

6.041 Electrical Measurements
Prerequisite: 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: 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), digital filtering. Information transmission capacity of signals; entropy, source coding and channel capacity. 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
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.

6.058 Mechanical Engineering
Prerequisites: 1.961 or equivalent, 10.211A.
Topics: selected from 5.661 Mechanical Engineering III.

6.202 Power Engineering—Systems I
Prerequisite: 6.0315.
An elective emphasizing parameters and performance of power system components: transmission lines, power system over-voltages, transformers, fault calculation, circuit interruption, protection.

6.203 Power Engineering—Systems II
A subject emphasizing interconnected system operation, performance and control; synchronous machines, power systems analysis, operation and stability; power systems in society; distribution systems.

6.222 High Voltage and High Current Technology
An elective concerned with aspects of design and testing of high power electrical equipment. Topics selected from: fields and materials in high voltage apparatus; effects of high currents; design testing and measurement; effects of transients, earthing; applications of superconductivity.

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 aperture antennas. Parametric amplifiers. Microwave sources, with emphasis on Gunn and impact diodes.

6.322 Electronics
Prerequisites: 6.0313, 6.0314, 6.0316.
Theory and applications of some electronic devices and systems with an associated laboratory-design program, presented as in earlier years. Topics include: DC Amplifiers, active filters, transistor switch applications, phase locked loops, optical links, design factors of large electronic systems, power electronics, analogue and digital integrated circuits.
6.323 Communication Systems 2A S1 L2T3
Prerequisite: 6.0317. In addition, a working knowledge of elementary Fourier transforms and probability as in 10.033 Electrical Engineering Mathematics III and 10.361 Statistics SE is assumed.

Theory and practice of modern analogue and digital telecommunications techniques, including computer communications. Topics include: linear and nonlinear analogue modulation (AM, SSB, FM, etc) digital signal transmission, pulse code modulation, multiplexing (FDM and TDM), computer communication, error control, synchronization, relay systems, transmitters and receivers, aspects of transmission media relevant to telecommunication systems.

6.333 Communication Systems 2B S2 L2T3
Prerequisites: 6.0311, 6.0314, 6.0316, 6.0317.
Theoretical and practical coverage of the major broadcast and location systems, including: radio and sound systems (AM and FM, psychoacoustics, electroacoustics), television, radar, sonar, navigation systems, and aspects of radio propagation relevant to these systems.

6.333 Biomedical Engineering S2 L2T3
Prerequisites: 6.0314, 6.0316.
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 the basic physiology of cells, tissues, organs and organisms, instrumentation and measurement techniques and modelling of various types of biological systems.

6.412 Automatic Control S1 L2T3
Prerequisites: 6.0311, 6.0314.
The design and analysis of continuous, digital and sample data feedback control systems as encountered in industrial processes, biological systems, etc. Emphasis on the synthesis of a prescribed dynamic performance via both transient and frequency domain considerations. Simulation and computer-aided design. The effects of unwanted nonlinearities present in the system and the synthesis of nonlinearities into the system to improve dynamic performance.

6.413 Modern Systems Engineering S2 L2T3
Prerequisite: 6.412.
The understanding and use of methods to analyze and design control systems for complex dynamic plants. Applications from many fields, including power systems, communication systems, nuclear and steam generating plant, biological systems; extensive use of modelling, simulation and control design programs developed for the Cyber and Varian Computer systems.

6.432 Computer Control and Instrumentation SS L2T3
Prerequisites: 6.0311, 6.0313, 6.0316.

6.512 Advanced Semiconductor Device Theory SS L2T3
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 SS L2T3
Prerequisite: 6.0316.
Analysis of bipolar and field-effect transistor structure and operation as far as necessary for the development of accurate models for use in computer aided circuit design. Ebers Moll (EM) and Gummel-Poon transistor models. Aspects of the solution techniques used in modern CAD programs such as SPICE. Integrated circuit design including special circuit and layout considerations to take advantage of the inherent component matching. Consideration of selected circuits, for example, high-performance operational and instrumentation amplifiers, multipliers and other non-linear circuits, voltage controlled oscillators, A/D and D/A converters, etc, as class interests suggest.

6.600 Introduction to Computers S2 L3T2
Excluded: 6.620, 6.021D.
For those students who do not intend taking any further computing science subjects. Introduction to programming: design and correctness of algorithms and data structures; programming in a higher level algorithmic language which provides simple high-level program control and data structuring facilities. Using computers: Introduction to computing machinery, operating systems, command languages and use of computer terminals. Applications: Introduction to some of the application packages that are generally available on computing systems (eg inquiry, statistics, linear programming and text formatting packages).

6.606 Computing Science Honours

6.607A Computer Hardware Architecture S1 L3T2
Prerequisites: 6.602A, 6.602B, 6.602C, 6.602D at an acceptable level.
The basic principles of computer architecture. A comparative study of the architectural features of a number of significant computer systems.
6.607B Advanced Software Technology S2 L3T2
Prerequisites: 6.602A, 6.602B, 6.602C, 6.602D at an acceptable level.
A selection of topics from a list which normally includes Artificial Intelligence, Program Verification, High Speed Calculation of Mathematical Functions, Computer Graphics.

6.612 Computer Systems Engineering SS L2T3
Prerequisites: 6.021E or 6.602A.
Analysis and design of clocked-sequential and fundamental-mode sequential circuits. Use of hardware descriptive languages for digital system design and simulation language. Applications to the description, design and simulation of basic computer circuits and organizations. Machine organization and hardware, control units, micro programming, input-output, high-speed arithmetic units.

6.613 Computer Organization and Design SS L2T3
Data representation, coding, register transfer and micro operations, digital technology. CPU organization: arithmetic units, control units, microprogramming, control algorithms, memory organization. Input/output organization. Hardware/software interaction. Microprocessors.

6.620 Introduction to Computing Science S1 L3T2
Prerequisite: 10.001. Excluded: 6.600, 6.620, 6.021D.
For those students who intend to take further subjects in computing science. 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. Introduction to dynamic data structures, elementary logic. Introduction to computer organization: simple machine architecture. Introduction to operating systems and computing machinery.

6.622 Computer Application and Software SS L2T3
Prerequisite: 6.620.
Topics chosen from the following: simulation, heuristics, numerical analysis, mathematical optimization, data structures, machine organization, high-level languages, compilers and operating systems.

6.631 Digital Logic and Systems S2 L3T2
Prerequisites: 6.620 or 6.600 (C). Exclusions: 6.602A, 6.021E, 6.031D.
A hardware-oriented subject concerned with the design of digital circuits for control and general computational purposes. Includes representation of digital information, combinational logic design, clocked sequential circuits, digital systems and PDP11 assembler programming.

6.632 Operating Systems S2 L3T2
Prerequisites: 6.631, 6.641. Excluded: 6.602B.
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
Prerequisites: 6.632, 6.641.
Not offered before 1980.

6.641 Programming I S2 L3T2
Prerequisite: 6.620 or 6.600 (C).
Design and correctness of algorithms and data structures. Data structures: abstraction, representation, manipulation and axiomatization; basic data structures: sets, unions (variant records); dynamic data structures: lists, queues, stacks, trees, balanced trees. Recursion: backtracking algorithms. Key transformations (hashing). Files: sequential access, random access, merging, sorting, updating. String manipulation, pattern matching and associative algorithms.

6.642 Programming II S1 L3T2
Prerequisite: 6.641.

6.643 Compiling Techniques and Programming Languages S2 L3T2
Prerequisites: 6.641. Excluded: 6.602D.
1. Language description: phrase structure grammars, Chomsky classifications, context-free grammars, finite state grammars, Backus Naur Form, syntax graphs, LL(k), LR(k), SLR(k), LALR(k), simple-precedence and weak-precedence grammars.
2. Lexical analysis: translation of an input (source) string into a (machine independent) quasi-terminal symbol string. Finite state recognizers.
3. Syntax analysis: top-down compilation for LL(1) grammars using syntax graph driven analysers or recursive descent. Bottom-up compilation for simple- and weak-precedence and LR(k) grammars.
5. Compiler generators: automatic generation of compilers for LALR(1) grammars.
6. Code optimization by systematic program transformation.
7. Run-time organization: activation record stacks, heap management.
6.646 Computer Applications  S1 L3T2
Prerequisites: 6.620 or 6.600 (C). Excluded: 6.602C.
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; the SIMULA programming language; pseudo random number generation; simple queueing theory; applications of mathematical programming; statistical calculations; critical path methods; computer graphics.

6.647 Business Information Systems  S1 L3T2

6.649 Computer Practice*  S2 L3T2
Not offered before 1980.
For students majoring in Computer Science who seek a programming career in government or commercial industry. Topics, related to current computing practice, include: Comparative study of computer hardware in current popular use; Comparative study of the 'popular' programming languages, eg COBOL, RPG, BASIC, FORTRAN, PL/1, APL. Job control languages. Data Preparation procedures. Key-board entry. Verification; Word processing; report preparation; documentation. Social implications of computing. Professional responsibilities and ethics. Project management; software engineering; psychology of computer programming.
*Can only be counted with at least 3 other Level III Computer Science units.

6.851 Electronics and Instrumentation  S1 L1T2
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 modelling non-electrical systems. Included in the course is a project illustrating the application of electrical engineering to other disciplines. Also known as 1.922 Electronics.

6.853 Analog and Digital Instrumentation  SS L2T1
Prerequisites: 6.851 & 6.852.
Study of electrical and electronic equipment, emphasising analog and digital techniques applicable to the electrical measurement of non-electrical quantities. Open-loop and closed-loop control systems and some of their applications to instrumentation.

6.902 Industrial Experience
A minimum of three years of appropriate industrial experience must be obtained concurrently with attendance in Course 365. Students are required to submit to the School evidence from their employers confirming completion of the prescribed period of industrial training.

6.911 Thesis
For students in the final year of their BE degree course.

Servicing Subject
6.852 Electrical Machinery and Supply  S2 L1T2

Graduate Study
6.050G Occasional Elective  C3
This syllabus changes from one occasion to the next, allowing presentation of a modern topic at graduate level, particularly by visiting academics of eminence.

6.053G Advanced Mathematics II  C3
Mathematical techniques applicable to electrical engineering problems. Topics may include: an introduction to state variable theory, Green's functions, operator theory.
6.054G Numerical Computation C3
Topics include numerical solution of partial differential equations and approximation theory.

6.071G Electrical Measurements C3
Electrical measurements of moderate precision. Theory and practice of deflection measurements and null techniques at DC and low audio frequencies.

6.073G Precise Electrical Measurements C3
An advanced course primarily devoted to the special problems of precision measurements at DC and audio frequencies. Establishment of electrical standards.

6.074G Superconductivity C3
The theory of superconductivity and its application. Includes loss mechanisms, ac losses, flux jumps, superconducting materials, applications to electrical apparatus.

6.075G Electric Contacts C3
The theory of stationary electric contacts making use of classical field theory and the modern ideas of electronic conduction. Topics may include constriction and film resistance, elastic and plastic deformation of contacts, thermal behaviour, electron tunnelling through thin films, tarnishing, fritting, formation of whiskers and bridges, material transfer in small contacts.

6.150G Communications Elective C3
As for 6.050G Occasional Elective.

6.160G Field Theory in Electrical Engineering C3
Revision of metric transformations and co-ordinate systems. Solution of the Laplace and Poisson equations in the eleven Eisenhart co-ordinate systems in three dimensions. Extension to selected cases of the diffusion and wave equations.

6.161G Field Mapping C3
The Laplace and Poisson equations: complex variable techniques for 2-dimensional solutions. Graphical, experimental and numerical methods for 2- and 3-dimensional problems. The Helmholtz equation. Cases where solutions may be based on the Laplace equation. Review of selected examples in electrical engineering.

6.164G Microwave Antenna Theory and Applications C3
Co-requisite: 6.167G or similar.

6.167G Propagation and Transmission of Electromagnetic Waves C3

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.

6.224G Electrical Insulation Engineering C3
Co-ordinated approach to the design of insulation systems for application at high and low voltages. Basic principles, experimental and theoretical factors involved in the establishment of particular design criteria. Practical situations and demonstrations.

6.225G Electrical Discharges and their Technical Applications C3
Low and high pressure gaseous discharges, both naturally occurring and laboratory produced. Methods of production of discharges. Diagnostic techniques. Arcing in circuit interrupters and methods of control and extinction. Other technological applications of electrical discharges.

6.226G Electrical Apparatus Design C3
Based on fundamental concepts and in which thermal, electric and magnetic properties on a macroscopic scale and their inter-relationships are displayed in relation to the design of electrical and electronic apparatus.
6.248G Power System Planning

World energy resources and alternative methods of generation and transport of energy. Sources of electrical energy on a large scale. Economic evaluation of projects. Planning the location and rating of power stations. Transmission system planning: voltage levels, fault levels, basic network interconnections. High voltage DC transmission: comparison with high voltage AC. Problems in planning distribution systems (brief treatment only). Industrial system planning. Power system reliability.

6.249G Dynamic Performance of Power Systems

The dynamic behaviour of power systems. Modelling of power system components, simulation of their dynamic behaviour by computer program, and design of control systems for alternators in power systems.

6.250G Power Elective I

As for 6.050G.

6.251G Power Elective II

As for 6.050G.

6.254G Electrical Machines I

6.255G Electrical Machines II

These two independent options are concerned with the theory, design, operation and control of modern electrical machines.

6.256G Underground Systems

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

The engineering problems of distribution systems including industrial power systems, stressing the electrical distribution system as an entity. Distribution system planning. Overall design criteria. Co-ordination of thermal ratings. Protection of distribution network: cables and overhead lines. Design and performance of individual plant items. Particular problems of urban and rural distribution systems. Demonstrations and project work.

6.337G 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 C6
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 C3
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; CCDs and SEW devices, and their use in signal processing; introduction to active and other filters; factors involved in the design of large electronic systems.

Prerequisite or co-requisite for 6.170G and 6.345G.

6.341G Signal Analysis C3
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 non-linear devices, Poisson and Gaussian random processes. Estimation and measurement of power density spectra.


6.343G Digital and Analogue Communications C3
Co-requisite: 6.042 or 6.341G or similar. Excluded: 6.323 or similar.
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.

Prerequisite or co-requisite for 6.347G and 6.348G.

6.344G Communication Theory C3
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 C3
Theory and practice of modern filter design, particularly the design of active and digital filters. Includes: overview of modern filter methods, the approximation problem for analogue and digital filters, active filters and digital filters. In addition: classical LC filters, sensitivity and parasites, equalizer design, adaptive and/or non-linear equalization, mechanical filters, other digital signal processing techniques.

6.347G Digital Communications C3
Prerequisite: 6.343G or similar.
Extension of the digital communication material in 6.343G Digital and Analogue Communications in the areas of digital transmission systems, computer communication networks and random access techniques. Includes: Digital transmission systems: multiplexing, synchronization, high-speed transmission, system planning, integrated systems, switching, longhaul systems, coding, future systems. Computer communication networks: capacity assignment, traffic control, queuing theory, switching algorithms, protocols, routing, topology. Random access techniques: time-division multiple access, code modulation and other spread spectrum systems, error correction.

6.348G Optical Communications C3
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 C3
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.

Physics and technology of the photovoltaic conversion of sunlight to electricity using solar cells. A detailed treatment of the structure and operation of silicon cells and cells made from other semiconductors. Power conditioning and energy storage equipment. Design of photovoltaic power supplies. Operating principles and applications of related optoelectronic devices such as photodiodes, LED's, and semiconductor lasers. Introduction to optical systems.
Subject Descriptions

6.373G Semiconductor Devices
Theory and characteristics of semi-conductor 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.

6.375G Integrated Circuit Technology
An account of the modern planar technology of semiconductor device and integrated circuit fabrication.

6.376G Reliability Engineering
Principles and applications of the reliability engineering concept, with equal emphasis on design analysis, developmental engineering, calculation and prediction of reliability and associated parameters, quality control, failure mechanisms, reliability testing, economic basis of reliability and on reliability improvement techniques. Applicable to both electronic and non-electronic systems.

6.377G Integrated Circuit Design
An advanced course on the design of integrated circuits, including the properties and modelling of integrated circuit elements, dc and ac design of operational amplifiers, low-pass and bandpass circuits, digital gates and complex functions, computer-aided design.

6.378G Solar Energy Conversion

6.452G Principles of Feedback Control
An intensive series of lectures, laboratory and tutorial, for upgrading at the graduate level those students who are deficient in the basics of control. Material covered includes design of continuous and discrete feedback systems, via classical frequency response and time-domain methods, as well as state space techniques. Nonlinear systems and systems with random inputs.

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 representants will be reviewed with discussion based on differential and discrete models, and some form of pulsed automate.
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 perceptrons, subsystems 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
Review of fundamental principles of digital and analog computation with special reference to the solution of engineering and control problems. Topics include: small computer systems architecture; process control interfacing techniques; machine language programming; operation of hybrid computers and their applications.

6.460G Real Time Computing
An advanced treatment of digital, analog and hybrid computer methods, used to control physical plant in real times. Topics include: hardware techniques and software structures as encountered in industrial applications of small computers, hybrid methods for identification and optimization of systems. Students undertake individual project work, involving the planning and computer realization of specific control problems.

6.464G Applied Optimal Estimation and Prediction
The data handling aspects of optimal estimation and prediction. Includes: optimal linear filtering, recursive filters, Kalman filter, Riccati equation and Wiener filter; optimal smoothing; fixed-interval, fixed-point and fixed-leg; non-linear variance estimation, statistical linearization, non-linear least-squares estimation. Applications include prediction using economic models, data smoothing in seismic data processing of oil exploration and navigational problems. Development of techniques with known physical system models as well as 'black box' models.
6.466G Computer-Aided Design of Multivariable Control Systems C3
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, e.g., the linear quadratic regulator, or the frequency domain, e.g., 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 nonuniform sampling and quantization; image enhancement, sharpening and smoothing; image restoration and least squares filtering; image encoding, mapping, quantizing and encoding; image segmentation and description, grammars, languages and similarity. Material oriented towards scene analysis and world models for industrial robots including scenes; labelling; shadows; shape information; structural descriptions and representing knowledge; computer vision for robots.

6.468G Computer Display Systems and Interactive Instrumentation C3
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 C3
Advanced topics taught either by visiting academics or staff members with specific research interest. Typical topics are: design case studies; current research problems and review of important papers; game theory; multi-input-output design. Stochastic control theory. Distributed systems (diffusion, display, etc). Functional analysis.

6.471G Systems and Control Elective C3
As for 6.050G Occasional Elective.

6.481G Biology and Physiology for Engineers C3
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 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.

6.485G Medical Instrumentation C3
A critical survey of the theory and practical applications of medical transducers and electromedical equipment in common use in hospitals and research laboratories.

6.500G Computer Science Elective C3
As for 6.050G Occasional Elective.

6.651G Digital Electronics C3
Digital circuits and principles, sub-system organization, microprocessors, memory technology, interface design, integrated circuit technologies and characteristics.

6.654G Digital Systems C3
Computer architecture, implementation and realization. Use of hardware description languages for the analysis, design and specification of arithmetic units, storage and control Microprogramming techniques.

6.655G Computer Organization and Architecture C3
Number systems and computer arithmetic — storage, control, input/output. System organization.

6.656G Software Systems A C3
A theoretical and practical basis for subject matter within the following areas: compiler organization; data structures, table organization, flat structures, trees, stacks, etc), lexical analysis, syntax analysis, code generation, code optimization. Portability: solutions to the problem of moving software systems between different mechanisms. Compiler compilers: translator writing systems designed to provide facilities to aid the compiler writer.

6.657G Software Systems B C3
Overview of operating systems, sequential processes, concurrent processes, processor management, scheduling algorithms, resource protection, data communication case studies.

6.909G Project C9

6.918G Research Project C18

8.936G Research Project C36
Subject Descriptions

Geography

Undergraduate Study

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, aerial photo interpretation and examination of soil properties. There is a compulsory one-day excursion.

Graduate Study

27.901G Geomorphology for Hydrologists S2 L1½T1½

Mathematics

Undergraduate Study

10.001 Mathematics I F L4T2
Prerequisite:

<table>
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<tr>
<th>2 unit Mathematics</th>
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<tr>
<td>3 unit Mathematics</td>
<td>or</td>
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<tr>
<td>4 unit Mathematics</td>
<td>or</td>
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Excluded: 10.011, 10.021A, 10.021B, 10.021C.

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

10.022 Engineering Mathematics II F L2T2
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.

10.033 Electrical Engineering Mathematics III F L1½T½


10.111A Pure Mathematics II — Linear Algebra F L1½T½

10.1113 Pure Mathematics II — Multivariable Calculus S1 L1½T1
Multiple integrals, partial differentiation. Analysis of real valued functions of one and several variables.

10.1114 Pure Mathematics II — Complex Analysis S2 L1½T1
Analytic functions, Taylor and Laurent series, integrals. Cauchy's Theorem, residues, evaluation of certain real integrals.

10.2111 Applied Mathematics II — Vector Calculus S1 L1½T1
Vector fields; divergence, gradient, curl of a vector; line, surface, and volume integrals. Gauss' and Stokes' theorems. Curvilinear co-ordinates.

★Results in the percentile range 1-10 at a standard acceptable to the Professorial Board.
★★Results in the percentile range 11-30 at a standard acceptable to the Professorial Board.
10.2112 Applied Mathematics II — Mathematical Methods for Differential Equations S1 L1½T1


10.341 Statistics SU FL1T½

For students in the School of Surveying.

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

10.342A Statistics SU (Part A Sandwich Course) L1T½

An introduction to probability theory. Random variables and distribution functions; the binomial, Poisson and normal distributions in particular. Standard sampling distributions, including those of $\chi^2$, $t$ and $F$. Estimation by moments and maximum likelihood.

10.342B Statistics Su (Part B Sandwich Course) S1 L1T½

Confidence interval estimation. The standard tests of significance based on the above distributions, with a discussion of power where appropriate. An introduction to linear regression. Least squares adjustment of data.

10.351 Statistics SM FL1T½

For students in Aeronautical, Industrial and Mechanical Engineering and Naval Architecture as part of 5.071 Engineering Analysis.

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

10.361 Statistics SE FL1½T½

For students in the School of Electrical Engineering.

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


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.

10.062G Advanced Mathematics General

For research workers throughout the University requiring employment of advanced mathematics. Topics vary from year to year according to demand and interest.

10.361G Statistics

Probability theory; a survey of random processes with engineering applications — processes in discrete and continuous time. Markov processes, ergodicity, stationarity, autocorrelation, power spectra; estimation of auto-correlation and power spectra.

10.371G Statistics

Revision of probability and distribution theory, including estimation and hypothesis testing. Extension of this to include topics such as more complex probabilistic modelling, analyses of modified data (censored, truncated and missing observations), general statistical inference (decision theory), acceptance testing, and reliability analysis (hazard functions).

Mechanical and Industrial Engineering

Undergraduate Study

5.010 Engineering A$ SS L4T2

Prerequisites:

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<th>Exam</th>
<th>Percentage Range Required</th>
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<tr>
<td>HSC</td>
<td>31-100</td>
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</table>

$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 first year.

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.

5.0102 Introduction to Engineering Design SS L1T1
Engineering method, problem identification, creative thinking, mathematical modelling, computer-aided design, materials and processes, communication of ideas, the place of engineering in society.

5.020 Engineering B SS L4T2
Prerequisite: 5.010.

Engineering Dynamics: Kinetics of the plane motion of a particle; equations of motion, dynamic equilibrium, work and energy. Kinetics of systems of particles; impulse and momentum. Rotation of rigid bodies about a fixed axis. Belt, rope and chain drives, gear trains.


5.0201 Engineering Dynamics SS L2T2
Kinetics of the plane motion of a particle; equations of motion, dynamic equilibrium, work and energy. Kinetics of systems of particles; impulse and momentum. Rotation of rigid bodies about a fixed axis. Belt, rope and chain drives, gear trains.

5.030 Engineering C SS L2T4 or L/T6

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

1. (Mechanical, Industrial and Aeronautical Engineering and Naval Architecture students must take this option) Design for Manufacture I: The implementation of design and the need for its interaction with the various manufacturing processes. Selection of materials and processes. Need for functional tolerancing. Approximately 30 hours of practical training at the Technical College workshops 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.

2. Production Technology: Description and appraisal of the processes classified as: forming from liquid or solid, material removal, material joining. Machines. Analysis of the primary functions of the machine tools and an appraisal of their limitations. Principles of operation of common machine tools and illustrations of their use.

3. Introduction to Systems and Computers: Introduction to computers to follow the computer work in Mathematics I. To develop: (1) familiarity with algorithms; (2) the use of procedure-oriented languages; and (3) an introduction to computing equipment. Systems. To give students an appreciation of some of the concepts used in engineering, to relate the concepts to phenomena within their experience, and to illustrate them by case histories and engineering examples. Quantities. Concepts. Components. Systems.

4. (Chemical Engineering students must take this option) Introduction to Chemical Engineering: Routes to and end uses of industrial chemicals. Likely new industrial chemicals. A survey of several Australian chemical industries from the point of view of their historical and economic importance. Examination of the unit operations involved in the industry and the raw materials, equipment and services used. Environmental aspects of the chemical industry.

5. (Metallurgy students must take this option) Introduction to Metallurgical Engineering: History and significance of the exploitation of metals. Criers, 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.

6. (Mining Engineering students must take this option) Introduction to Mining Engineering: 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.

7. (Electrical Engineering students must take this option) Introduction to Computing: Introduction to computer programming design with emphasis on the design of correct, reliable programs. The subject is organized on a tutorial basis and a number of simple fundamental programming tasks are illustrated. Programs are written in a high level language which provides facilities for the specifications of algorithms and data structures.


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.

5.0301 Engineering Drawing SS LT/3
Fundamental concepts of descriptive geometry, including reference systems, representation of point, line and place; fundamental problems of position and measurement. Application of descriptive geometry to certain problems arising in engineering practice. Special emphasis on ability to visualize problems and processes involved in their solution. Instruction in the correct use of drawing instruments and the application of drawing standards. Measurements and dimensioning. Orthographic and isometric projections.

5.032 Experimental Engineering II F L1T1
Prerequisites: 1.001 or 1.951, 5.040, 10.001. Co- or prerequisites: 5.311 or 5.330, 6.801, 5.111, 5.611.
A series of lectures, demonstrations and experiments designed to show the theory and techniques of instrumentation in Mechanical Engineering.

5.033 Experimental Engineering III F L1T½
Prerequisites: 5.032. Co- or prerequisite: 5.071.
A series of experiments and associated lectures to illustrate some common problems in experimental work.

5.040 Engineering D SS L3T5
Co- or prerequisites: 5.010, 5.030.
Design for Manufacture II: Continuation of Design for Manufacture I with a further 30 hours of workshop training at the Technical Colleges.

5.042 Industrial Experience LOT0
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 LOT0
An industrial training report must be submitted to the School for assessment after completion of the period of training and must meet School requirements.
For details contact Mr G. Crawford, Industrial Training Officer.

5.044 Industrial Training II LOT0
An industrial training report must be submitted to the School for assessment after completion of the period of training and must meet School requirements.
For details contact Mr G. Crawford, Industrial Training Officer.

5.051 Thesis F LOT6
Prerequisite: All subjects in Years 1, 2 and 3.
For students in the full-time courses in the School of Mechanical and Industrial Engineering.

5.061 Technical Orientation S1 L2T0
A series of lectures and visits to engineering establishments arranged to familiarize students with the profession of engineering, the industries served by engineers and current activity in engineering research. Development of skill in observing and reporting on technical matters.

5.062 Communications F L2T0

5.071 Engineering Analysis F L2½T1
Prerequisite: 10.022.

5.111 Mechanical Engineering Design I F L1T2
Prerequisites: 5.010, 5.030, 5.040. Co- or prerequisites: 5.311 or 5.330, 5.611, 5.411, 6.259, 5.032.
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 currently available mechanical technology and use of standard equipment items, codes and trade literature.

5.112 Mechanical Engineering Design II F L1T2
Prerequisite: 5.111. Co- or prerequisite: 5.412.
Mathematical Modelling and Analyses, decision theory, computer programming for design applications. More advanced design analyses and drawing with individual and group project engineering experience.
5.113 Mechanical Engineering Design III  F L1½T4½
Prerequisite: 5.112.
Special analytical and experimental techniques of engineering design. Optimization; reliability analysis. Major and minor design projects.

5.301 Engineering Mechanics  SS L1T1
Prerequisites: 1.001 or 1.951, 5.010. Co- or prerequisite: 10.001.
Kinematics and kinetics of the plane motion of particles. Rectilinear, curvilinear and relative translational motion; work and energy; impulse and momentum.

5.303 Mechanical Vibrations  S1 L1T½
Prerequisites: 5.311 or 5.330, 10.022.

5.311 Engineering Mechanics  SS L1½T1
Prerequisites: 1.001 or 1.951, 5.010 & 10.001 or 10.011.
Kinematics and kinetics of rigid bodies in planar motion: absolute motion and motion relative to translating and rotating frames of reference; constraint and degrees of freedom; dynamic equilibrium; differential equations of motion; work and energy, variational principles; impulse and momentum, impact.

5.324 Automatic Control Engineering  F L2T1
Prerequisite: 10.022.
Laplace transforms and transfer functions. Mathematical modelling of dynamic engineering systems: block diagram methods; properties of linear elements; linearization; analysis of components and systems. Time response and stability: response of first- and second-order systems; system stability; Routh's criterion. Introduction to analog computing. Root locus method. Frequency response: the Nyquist Criterion; closed loop transient response from the open loop frequency response; Bode diagrams. Control systems: types of control action and their effects on system responses; controller selection and tuning; analysis of pneumatic control system components.

5.330 Engineering Dynamics  F L1T1
Prerequisites: 1.001 or 1.951, 5.010 & 10.001 or 10.011.
Kinematics and kinetics of particles and rigid bodies in planar motion: absolute motion and motion relative to translating and rotating frames of reference; constraint and degrees of freedom; moment of inertia; friction; dynamic equilibrium, differential equations of motion; gyroscopic couples; work and energy, variational principles; impulse and momentum, impact.

5.331 Dynamics of Machines I  F L1½T½
Prerequisites: 5.311 or 5.330, 10.022.
Mechanical Vibrations: Simple harmonic motion. One degree of freedom systems, free and forced vibrations, transmissibility and motion isolation. Whirling of shafts.

5.332 Dynamics of Machines II  F L2T1
Prerequisite: 5.331.

5.411 Mechanics of Solids II  F L1T1
Prerequisites: 5.010, 5.040.

5.412 Mechanics of Solids III  F L1½T½
Prerequisites: 5.411, 8.259, 10.022.

5.413 Mechanics of Solids IV  F L2T1
Prerequisite: 5.412.

5.611 Fluid Mechanics/Thermodynamics I  F L2T2
Prerequisites: 1.001 or 1.951, 5.010, 5.020, 10.001. Co- or prerequisites: 5.311 or 5.330, 10.002.
5.612 Fluid Mechanics/Thermodynamics II  F L2½T1
Prerequisite: 5.311 or 5.330, 5.611, 10.022.


5.801 Aircraft Design  F L2T2
Prerequisites: 5.303, 5.412, 5.800 (full-time only), 5.811, 5.822. Co- or prerequisite: 5.823.

Integrated lectures, drawing office for design of an aircraft.
2. Design of Aircraft Structures: Significance of design requirements: proof and ultimate load, load and safety factors, interpretation of V-g diagram. Stressing cases. Detailed structural and mechanical design of airframe, controls, joints; choice of materials; use of structures data sheets. Practical design of a simple aircraft structural component. Fatigue. Aeroelasticity.

5.614 Fluid Mechanics III  F L2T1
Prerequisite: 5.612.


5.811 Aerodynamics I  F L2T1
Prerequisites: 5.311 or 5.330, 5.611, 10.022.


5.615 Thermodynamics III  F L2T1
Prerequisite: 5.612.


5.812 Aerodynamics II  F L2T1
Prerequisites: 5.612 or 5.811; 5.303 or 5.331.

Compressible flow and high speed aerodynamics. Hypersonic and high enthalpy flow. Dynamic stability and control.

5.822 Analysis of Aerospace Structures I  F L1½T½
Prerequisites: 5.311 or 5.330, 5.411, 8.259, 10.022. Co- or prerequisite: 5.412.

Equilibrium of forces, plane frames, space frames; beams; two-moment equation, shear and bending-stress distribution in various thin-webbed beams, tapered beams, beams with variable flange areas. Semi-monocoque structures. Deflection of structures: Maxwell's and Castigliano's theorems, virtual work method. Statically indeterminate structures; beams, trusses, stiff-jointed frames; methods of superposition, energy, moment distribution, elastic centre; shear distribution in two-cell beam. Aircraft materials, physical properties and their measurement. Dimensionless stress-strain data.

5.823 Analysis of Aerospace Structure II  F L1½T½
Prerequisites: 5.412, 5.822.

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<thead>
<tr>
<th>Subject Description</th>
<th>Code</th>
<th>Credits</th>
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<tbody>
<tr>
<td><strong>5.831 Aircraft Propulsion</strong></td>
<td>FL1½T1½</td>
<td>Graduate credit</td>
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<tr>
<td>Prerequisites: 5.611, 5.811.</td>
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<tr>
<td><strong>5.811 Naval Architecture</strong></td>
<td>FL3T1</td>
<td>Graduate credit</td>
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<tr>
<td>Prerequisites: 5.311 or 5.330. Co- or prerequisite: 5.951 (full-time only).</td>
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<tr>
<td><strong>5.921 Ship Structures I</strong></td>
<td>S2 L3T1</td>
<td>Graduate credit</td>
</tr>
<tr>
<td>Prerequisites: 5.411, 5.259, 10.022. Co- or prerequisite: 5.412.</td>
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<tr>
<td><strong>5.922 Ship Structures II</strong></td>
<td>S1 L3T1</td>
<td>Graduate credit</td>
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<tr>
<td>Prerequisites: 5.071, 5.412, 5.921.</td>
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<tr>
<td><strong>5.931 Principles of Ship Design IA</strong></td>
<td>S1 L3T0</td>
<td>Graduate credit</td>
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<tr>
<td>Mathematical modelling and decision theory, as applied to design. Introduction to FORTRAN programming.</td>
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<tr>
<td><strong>5.932 Principles of Ship Design IB</strong></td>
<td>S2 L2T0</td>
<td>Graduate credit</td>
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<tr>
<td>Co-requisite: 5.911 (5.931 full-time only).</td>
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<tr>
<td><strong>5.933 Principles of Ship Design II</strong></td>
<td>FL2T1</td>
<td>Graduate credit</td>
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<tr>
<td>Prerequisite: 5.932.</td>
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<tr>
<td><strong>5.934 Ship Design Project</strong></td>
<td>S1 L0T3 S2 L0T4½</td>
<td>Graduate credit</td>
</tr>
<tr>
<td>Prerequisites: All subjects in Years 1, 2 and 3. Co- or prerequisites: 5.922, 5.933, 5.941.</td>
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<tr>
<td>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, free-board, tonnage, floodable length (if applicable), power requirements, propeller design, investigation of vibration, rudder design and final general arrangement.</td>
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<tr>
<td><strong>5.941 Ship Propulsion and Systems</strong></td>
<td>FL2½T1½</td>
<td>Graduate credit</td>
</tr>
<tr>
<td>Prerequisites: 5.071, 5.951 (full-time only).</td>
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<tr>
<td><strong>5.951 Hydrodynamics</strong></td>
<td>SS L1T½</td>
<td>Graduate credit</td>
</tr>
<tr>
<td>Prerequisites: 5.311 or 5.330, 5.611, 10.022. Co- or prerequisite: 5.071.</td>
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<tr>
<td>Kinematics of fluids, stream functions, velocity potentials, added mass, representation of bodies by source singularities, vorticity. Descriptive treatment of the effects of viscosity in typical situations, such as boundary layers and separation.</td>
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<tr>
<td><strong>Graduate Study</strong></td>
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<tr>
<td><strong>5.045G Advanced Topic In Mechanical Engineering</strong></td>
<td>C2</td>
<td>Graduate credit</td>
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<tr>
<td><strong>5.046G Advanced Topic In Mechanical Engineering</strong></td>
<td>C2</td>
<td>Graduate credit</td>
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<tr>
<td><strong>5.047G Advanced Topic In Mechanical Engineering</strong></td>
<td>C2</td>
<td>Graduate credit</td>
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<tr>
<td>Subjects which may be offered by a Visiting Professor for graduate credit.</td>
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<tr>
<td><strong>5.073G Ordinary Differential Equations in Mechanical Engineering</strong></td>
<td>C3</td>
<td>Graduate credit</td>
</tr>
<tr>
<td>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.</td>
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5.075G Computational Methods in Mechanical Engineering I  C2

5.076G Computational Methods in Mechanical Engineering II  C2
Partial differential equations; finite differences and finite elements. Mathematical formulation of physical problems in mechanical engineering and their solution.

5.077G Analogue Computation in Mechanical Engineering I  C2
Computing components; basic operations and mode control; programming methods; solutions of linear differential equations; system simulation; generation of functions of dependent and independent variables; approximate differentiation, roots of polynomial equations; transfer function simulation; simulation of non-linearities; scaling of linear and non-linear systems; static and dynamic check procedures; automatic iteration.

5.078G Analogue Computation in Mechanical Engineering II  C2

5.101G Optimization Methods for Mechanical Engineers I  C2
Mathematical theories of optimization. Calculus of variation.

5.102G Optimization Methods for Mechanical Engineers II  C2
Application of theory with special reference to design of mechanical elements and systems.

5.110G Morphology of Design  C4
Design strategy illustrated by a major engineering design. Problem recognition; economic analysis; decision making; model formulation and optimization. Design analysis, communication and implementation of solution.

5.151G Refrigeration and Air Conditioning Design I  C3

5.152G Refrigeration and Air Conditioning Design II  C3

5.304G Advanced Dynamics I  C2

5.305G Advanced Dynamics II  C2

5.315G Mechanisms I  C2
Selected topics from: Analysis of complex planar mechanisms; synthesis of planar mechanisms; spatial linkage; cams.

5.316G Mechanisms II  C2

5.321G Automatic Control I  C2
Continuous-action controllers: controller selection and tuning; optimum settings; maximum gain method. Control system simulation. Pneumatic systems for control.

5.322G Automatic Control II  C2

5.328G Control and Modelling of Mechanical Systems I  C2

5.329G Control and Modelling of Mechanical Systems II  C2
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

5.401G Experimental Stress Analysis  C2
Grid technique; Moire fringe method; Strain gauges; photoelasticity; crack detection techniques. Class project.
5.415G Stress Analysis for Mechanical Engineering Design I

5.416G Stress Analysis for Mechanical Engineering Design II


5.417G Mechanics of Fracture and Fatigue


5.428G Advanced Mechanics of Materials

Plasticity, Creep.

5.490G Solid Mechanics (for Medical Graduates)

The principles of the mechanics of solid bodies: force systems; kinematics and kinetics of rigid bodies; stress-strain relationships; stress analysis of simple elements.

5.491G Biomechanics I

Statics, dynamics of the musculoskeletal system: mathematical modelling, computer simulation, analysis of walking, working and athletic activities; analysis of pathological situations.

5.492G Biomechanics II

The physical properties of materials having significance in biomedical engineering: human tissues, skin, soft tissues, bone; metals. Polymers and ceramics: the effects of degradation and corrosion.

5.493G Mechanics of the Human Body

Lectures as for 5.491G Biomechanics I, with additional laboratory and tutorial work.

5.494G Mechanical Properties of Biomaterials

Lectures as for 5.492 Biomechanics II, with additional laboratory and tutorial work.

5.495G Biomechanics of Physical Rehabilitation

The application of biomechanics to: human performance assessment and testing, physical therapy, design of rehabilitation aids and equipment, design of prostheses and orthoses.

5.615G Reciprocating Internal Combustion Engines

Thermodynamic cycles, fuel air mixtures, combustion, real gases. Spark ignition, detonation, combustion chamber design, modelling of emissions performance, efficiency; charging, discharging, losses. Compression ignition, knock, combustion chamber design, modelling. Alternative fuels. Emission control. Laboratory tests.

5.621G Gasdynamics I


5.622G Gasdynamics II


5.631G Lubrication Theory and Design I


5.632G Lubrication Theory and Design II


5.633G Acoustic Noise I


5.654G Acoustic Noise II


5.712G Convection Heat Transfer I

Fluid Dynamics; boundary layer equations, solutions; transition, turbulence, Pipe flow, surface roughness. Pressure gradients. Isothermal two-phase flow. Forced convection; laminar flow; thermal boundary layers; variable fluid properties; approximate solutions; turbulent flows; high-speed flows; rarefied gases; transpiration, film cooling. Free convection; vertical surfaces, isolated bodies, horizontal surfaces, cavities, heat transfer with change of phase: condensation, evaporation; boiling, burnout; boiling in tubes; two-phase flow with phase changes. Heat exchangers; overall performance estimation.
5.718G Conduction Heat Transfer
Steady, one-dimensional conduction. Analysis of extended surfaces. Two- and three-dimensional conduction. Unsteady conduction in one or more dimensions; analytical, numerical and analogical methods of solution. Initial value and boundary value problems. Temperature fields with heat sources. Non-homogeneous bodies; anisotropic bodies; variable material properties.

5.719G Radiation Heat Transfer
Thermal radiation properties of materials, black bodies; characteristics of real solids, liquids and gases; radiation exchange between infinite surfaces and between finite surfaces; shape factor for various configurations; radiation in an enclosure; radiation behaviour of gases and vapours. Pyrometry. Solar radiation; solar angles; atmospheric absorptions of solar radiation; direct and diffuse radiation; pyrheliometers.

5.725G Statistical Thermodynamics

5.735G Direct Energy Conversion
Magneo-hydrodynamics (M.H.D.): governing equations, ionisation seeding of working gas; material property limitations; fossil, nuclear fuelled M.H.D. generator combined with conventional steam plant. Fuel cells: electro chemical fundamentals; maximum work. Gibbs function, enthalpy of formation, equilibrium constant, e.m.f., limitations, polarization, existing types. Thermoelectric generators: theory of irreversible thermodynamics, Onsager coefficients, coupled phenomena. Peltier, Thomson, Seebeck effects, thermal efficiency, max. power output; design of thermodynamic generator, thermoelectric cooler, magneto-thermoelectricity; radioisotope, solar powered generators; semiconductors, basic ideas of quantum physics, Fermi level and energy bands. Other modes of direct energy conversion: photovoltaic; thermionic, Nernst effect generator.

5.758G Refrigeration and Air Conditioning Applications

5.909G Research Project

5.912G Naval Hydrodynamics I
5.913G Naval Hydrodynamics II
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 Research Thesis
5.938G Research Thesis

Industrial Engineering

Undergraduate Study

18.011 Industrial Engineering 1A
Prerequisite: 10.022. Co- or prerequisites: 5.071, 5.111.

18.012 Industrial Engineering IIA  FL2T1
Prerequisites: 5.112, 18.011.


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, e.g., 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.

18.021 Industrial Engineering IB  FL1/2T1/2
Prerequisite: 10.022. Co- or prerequisite: 5.071.


18.022 Industrial Engineering IIB  FL2T1
Prerequisites: 5.071, 18.021.

Design of Manufacturing Facilities: Product and objectives, equipment selection. Charting and systematic improvement of methods, factory and workplace layout, the factory environment. The Use of Human and Physical Resources: Motion and time study, financial incentives, applications to machine controlled processes. Work sampling and data collection, predetermined motion-time systems.

Industrial Psychology: Individual differences, operator selection and learning, motivation to work, conflict and frustration, social aspects of industry, worker participation.

Production Control: The detailed mechanics of control of jobbing production, and its extension to batch and continuous production. Manufacturing organizations, functions, inter-relationships and information flow, application of data processing and control systems. Production planning and control. Analysis of some engineering planning decisions. Sampling techniques in quality control. Control charts. Further quantitative work.

18.431 Design for Production  FL1T2
Prerequisite: 5.112.


18.432 Design of Production Systems  FL2T4 (Project)
Prerequisites: 5.071, 18.011, 18.021.

This subject may be taken only by part-time students in their final year.

Interchangeable Manufacture: Design for production, tooling, gauges, metrology.

Process Selection: Evaluation of alternative processes, make or buy decisions, planning the process sequence, case studies. Production Planning: Forecasts, capacity decisions, plant location, factory design and layout.

Production Systems: Computer systems for production control and information flow, computer control of machines and groups of machines, socio-technical systems.

Project: The project will consist of the design analysis for production and the planning of the production system for the manufacture of a simple engineering assembly. A comprehensive written report will be required.

18.551 Operations Research  FL2T1
Prerequisites: Either 5.071 and 18.021 or 10.031, 10.331 and 18.121.

The formulating and optimization of mathematical models. The development of decision rules. Some techniques of operations research such as mathematical programming, queuing theory, inventory models, replacement and reliability models; simulation. These techniques applied to situations drawn from industrial fields, eg production planning and inventory control. Practical problems of data collection, problem formulation and analysis.

Servicing Subjects

18.121 Production Management  FL3T0
Prerequisites: 10.031, 10.331.

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.
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. Introduction to inventory control. Analysis of some engineering planning decisions.

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

Graduate Study

18.081G 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 of randomized block, latin square and factorial experiment designs.

18.082G 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.

18.073G Ergonomics C2

18.080G Organization and Administration C2
The development of the theory and practice of organization in industry. The nature and types of organizations. The application of the principles of organization in the design of organizational structures.

18.083G Industrial Studies C2
Studies in the organizational and executive action requirements of certain specific industrial situations, using the case study method. Members of the class are required to make formal verbal presentation of solutions.

18.084G Industrial Applications of Probability Theory C4
Probability and Statistics: An introduction to probability theory. Random variables and distribution functions. The Binomial, Poisson and Normal distributions in particular. Standard sampling distributions, including \( x^2 \), \( t \) and \( F \). Estimation by moments and maximum likelihood. Confidence interval estimation. The standard tests of significance based on the above distributions, with a discussion of power where appropriate. An introduction to linear regression. Least squares adjustment of data. Industrial Applications: Tutorial problems from the fields of sampling inspection, quality control, control charts.

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.

18.271G Theory of Machine and Forming Processes C3

18.272G Technology of Machining and Forming Processes C3
Selected topics from: Machine tool vibration; design of machine tool elements; economics of machining and forming; numerical and adaptive control of machine tools; design of dies and cutting tools for strength and wear resistance; automation.

18.371G Factory Design and Layout C3
18.380G Methods Engineering

18.461G Design for Production
Influence of manufacturing processes on design; design simplification and standardization; value engineering; economics of process selection; case studies.

18.462G Industrial Design
Economic considerations; fundamentals of design; influence of processes; case studies.

18.463G Tool Design
Advanced theories and techniques for design and specification of cutting tools; jig and fixture design; press tool design, gauge design; design of selected machine tool components; computer aided tool design.

18.471G Design Communication
Communication system in design; aids to design communication; engineering drawing practice; standardization; interpretation of design information.

18.472G Engineering Design Analysis
Further development of techniques for geometric analysis of engineering designs; application of probability to tolerance summations in general; economic tolerance selections. Fundamental features of jigs, fixtures and cutting tools, their design and tolerancing. Principles of gauging and application to gauge design including gauges for positional and other complex work. Case studies.

18.571G Operations Research I
The formulation and optimization of mathematical models. The development of decision rules. Some techniques of operations research such as mathematical programming, queueing theory, inventory models, replacement and reliability models and simulation. These techniques are applied to situations drawn from industrial fields, for example, production planning and inventory control. Practical problems of data collection, problem formulation and analysis.

18.574G Operations Research II

18.579G Case Studies in Operations Research
Problems confronting management are seldom in the form of clear cut textbook type exercises; rather they are often ill-structured and ambiguous. A variety of such problems in operations research management science is considered with emphasis on the common pitfalls that arise in solving real world problems and the comparison of different strategies for solution. Students are expected to prepare written reports on certain cases considered suitable for submission to management.

18.580G Operations Research
The formulating and optimization of mathematical models. The development of decision rules. Some techniques of operations research such as mathematical programming, queueing theory, inventory models, replacement and reliability models; simulation. These techniques applied to situations drawn from industrial fields, eg production planning and inventory control. Practical problems of data collection, problem formulation and analysis.

18.671G Decision Theory
Theories of choice, value, risk and uncertainty for the individual and for multi-person situations. Statistical decision theory, Bayes and minimax rules.

18.680G Decision Making under Uncertainty
The structure of decisions: payoff matrices, decision trees. Principles of choice; utility of risky choice; subjective probability; value of imperfect information. Bayesian criteria of choice and their application to solving realistic problems.

18.681G Engineering Economic Analysis
Price-output decisions under various competitive conditions. The time-value of money, net present worth and DCF rate of return, and their application in the selection and replacement of processes and equipment. Construction and optimization of particular models, eg replacement, capital rationing. Measures of profitability.

18.761G Simulation in Operations Research

18.763G Variational Methods in Operations Research
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, natural resource utilization and probability. Quality.
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
Not available in 1978.
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-relationships 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

18.871G Mathematics for Operations Research C2

18.874G Dynamic Programming C2

18.875G Geometric Programming C2
The geometric programming theory is developed for convex and non-convex mathematical programs. The theory is applied to polynomial and posynomial programming. As projects actual polynomial and posynomial programs will be solved.

18.876G Advanced Mathematics for Operations Research C2
A survey of mathematical ideas which are of value in Operations Research. Topics will be selected from the following areas: Set Theory, Real Analysis, Matrix Theory, Topology, Function Spaces, Linear Operator Theory, Inequalities, Stability, Complex Analysis, Convex Analysis, Distribution Theory, Group Theory and Measure–Theoretic Probability Theory.
**18.877G Large-scale Optimization**


**18.878G Industrial Applications of Mathematical Programming**

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**

Co-requisites: 18.871G; Linear Programming section of 18.571G.

Methods for the analysis of mathematical programs. Analysis of the properties of linearity, separability, convexity, quasi-convexity and duality, providing the basis for the conversion of mathematical programs to potentially simpler formulations. Includes the areas of geometric programming, convex programming and quasi-convex programming.

**18.909G Project**

**18.918G Research Project**

**18.938G Research Project**

**18.960G Seminar (Production Engineering)**

**18.967G Advanced Topic in Production Engineering***

**18.968G Advanced Topic in Production Engineering***

**18.969G Advanced Topic in Production Engineering***

**18.970G Seminar (Operations Research)**

**18.977G Advanced Topic in Operations Research***

**18.978G Advanced Topic in Operations Research***

**18.979G Advanced Topic in Operations Research***

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**Undergraduate Study**

**4.913 Materials Science**


Polymer materials. The structure and properties of polymers. Mechanisms for the modification of properties.

Ceramic materials. The structure and properties of ceramics. Similarities and differences with other crystalline solids. Ceramic-metal composites.

**4.921 Materials Science**


**4.931 Metallurgy**

For students of Civil Engineering. Part of 8.272 Civil Engineering Materials I.


**4.941 Metallurgy for Engineers**

For students of Civil Engineering. Part of 8.259 Properties of Materials.


*Subjects which allow the presentation of special topics, particularly by visiting academicians.*
Undergraduate Study

23.051 Nuclear Power Technology  F L2½ T½
Nuclear processes, reaction rates, fission and energy release. Neutron multiplication, slowing down and diffusion. Nuclear reactor criticality and burnup, neutron kinetics and reactor control.
Thermal and fast reactor types, operation, environmental and safety aspects. Nuclear fuel enrichment and utilization, nuclear power costing and economics.
Heat generation and removal, fluid dynamics and heat transfer aspects of gas and liquid coolants, boiling, two phase flow and burnout. Structural mechanics in reactor technology, thermo-mechanical performance of fuel pins and pressure vessels.

Graduate Study

Not all subjects are available in any one year.

23.013G Neutron Transport and Diffusion  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  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 L2½ T½ 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 L2½ T½ 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 L2½ T½ C3
The processes of heat generation, conduction, heat transfer, and heat and momentum transport in fluids, in relation to the thermal performance of reactor channels and cores.

23.024G Boiling and Two Phase Flow  S1 L2½ T½ C3
Subcooled and bulk boiling, boiling crises, and the special problems associated with the analysis of reactor channel and core performance under boiling and two-phase flow conditions.

23.025G Reactor Structural Mechanics  S1 L2½ T½ C3
A study of the theoretical models and numerical techniques required for the analysis of mechanical and thermal stress, deformation, and failure modes of reactor core components and containment structures under high temperature, neutron and gamma irradiation.

23.026G Reactor Systems Analysis  S2 L2½ T½ C3
Nonlinear and linear system dynamics and stability theory applied to reactor processes and components, for the development and use of overall reactor and power system dynamics models.

23.027G Boiling Reactor Dynamics  S1 L2½ T½ C3
The special problems associated with the dynamics and stability of fluid cooled reactors under boiling conditions.

23.028G Reactor Accident and Safety Analysis  S2 L2½ T½ C3
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  S1 L2½ T½ C3
Mathematical methods, partial differential equations, special functions, and numerical methods for digital computation, relevant to Nuclear Engineering.

23.033G Matrix Theory and Computation  S2 L2½ T½ C3
Matrix theory and matrix computations required for the numerical solution of problems in neutronics, fluid dynamics, structural mechanics, etc, arising in the analysis and prediction of nuclear power system performance.

23.034G Random Processes and Reactor Noise  S2 L2½ T½ C3
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 resource utilization.

23.909G Project

23.918G Research Project

23.918G Research Project

Physics Level I Units

1.001 Physics I

Prerequisite: 1.001
Co-requisite: 10.021


1.011 Higher Physics I

Prerequisite: As for 1.001. Co-requisite: 10.001 or 10.011.

For students of all Faculties except Medicine, Engineering and Architecture who have a good secondary school record and who wish to do a more challenging course. Full-time ★Results in the percentile range 1-10 at a standard acceptable to the Professorial Board.
Electrical Engineering students may be admitted after consultation with the School of Physics.

As for 1.001 with additional topics: space physics, mechanical properties of real materials, rotational dynamics, physics of biological systems, AC and charged particle dynamics, physics of energy resources and conversion.

1.961 Physics I (Mechanical Engineering)  F L2T2
A basic course on physics for students in the School of Mechanical Engineering.

1.961 Physics I (Electrical Engineering)  F L3T3
For students in the School of Electrical Engineering.
Electrostatics in vacuum, electrostatics in dielectrics, steady state currents, magnetostatics in vacuum, ferromagnetism, electromagnetic Induction, transient currents. Vectors, motion in one dimension, motion in a plane, particle dynamics, work and energy, the conservation of energy, conservation of linear momentum, collisions, rotational kinematics, rotational dynamics, simple harmonic motion, gravitation.
Temperature, heat and the first law of thermodynamics, kinetic theory of gases. Waves in elastic media, sound waves, geometrical optics, interference, diffraction, gratings and spectra, polarization.

1.971 Physics I (Surveying)  F L3T3
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 L3T2 or S2 L2T1

Physics Level II Units

1.962 Physics of Measurement (Surveying)  S1 L1\(\frac{1}{2}\) T1\(\frac{1}{2}\)
Prerequisite: 1.971.

1.972 Electromagnetism (Electrical Engineering)  S2 L2T2
Prerequisites: 1.961 or 1.001 or 1.011, 10.001. Co-requisites: 10.2111, 10.2112.
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 L2T2
Prerequisites: 1.961 or 1.001 or 1.011, 10.001. Co-requisites: 10.2111, 10.2112.
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 Thermal Physics and Classical Mechanics (Electrical Engineering)  F L1\(\frac{1}{2}\) T1\(\frac{1}{2}\)
Prerequisites: 1.961 or 1.001 or 1.011, 10.001. Co-requisites: 10.2111, 10.2112.
Kinetic theory, molecular velocity distribution, elementary transport theory, first law of thermodynamics; applications, microscopic aspect of thermal equilibrium, definition and properties of entropy, Boltzmann probability distribution, second law of thermodynamics, heat engine and refrigeration cycles, some thermodynamic relationships and their applications. Relativity, motion of a particle in one, two and three dimensions including frictional force problems, damped and forced harmonic oscillator and coupled oscillators, motion of a system of particles, moving co-ordinate systems, introduction to the mechanics of continuous media.
## Subject Descriptions

### Surveying

#### Undergraduate Study

**29.001 Surveying I**  
Prerequisite: 29.001.  

**29.002 Surveying II**  
Prerequisite: 29.001.  
Traversing: fieldwork, computation and adjustment. Principles of levelling, levels and associated equipment, field and reduction procedures, testing and adjustment of levels. Vertical staff tacheometry: principles, field and reduction procedures for stadia, self-reducing tacheometers. Survey methods for detail and contour surveys.

**29.003 Surveying III**  
Prerequisite: 29.002.  

**29.004 Surveying IV**  
Prerequisite: 29.002.  
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**  
Prerequisites: 29.121, 29.003.  
Electronic distance measurement principles, applications and instruments, propagation of electromagnetic waves, meteorological and geometric corrections, field procedures, instrumental scales. Precise angle measurement, observations and reduction procedures, sources of error and their testing.

**29.006 Surveying VI**  
Prerequisites: 29.005, 10.341A, 10.341B.  
Error theory, expression of uncertainty, testing of observations, applications to design and analysis of surveys. Precise levelling; equipment, field procedures. Project surveys, integrated surveys, surveys for large structures, precise surveys for deformation, measurement and setting out machinery, mining and tunnel surveys, hydrographic surveys.

*Also offered in Session 1, 1980.*

**29.031 Electronic Distance Measurement**  
Prerequisites: 29.005, 29.121.  
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**  
Prerequisites: 29.005, 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, automatic collimation, laser interferometry.

**29.033 Characteristics of Modern Theodolites and Levels**  
Prerequisite: 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 S2 L2T1
Prerequisite: 29.006.

29.035 History of Surveying S2 L1T2
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 S2 L1T1
Prerequisite: 1.971.

29.151 Survey Computations I S1 L2T2
Prerequisite: 29.002.

29.152 Survey Computations II S1 L2T2
Prerequisite: 29.151.

29.153 Adjustment of Control Surveys S2 L1½T1½
Prerequisites: 29.152, 29.212.

29.161 Hydrographic Surveying I S1 L3
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 S2 L0T3
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 reductions, linking 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 S1 or S2 L0T3
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 F L0T3 or S2 L0T6
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.

29.183 Cartography Advanced Elective* SS L1½T1½
Cartographic Technology: Drawing techniques, scribing techniques, type and symbols, photomechanical methods, screens and masks, colour registration, proofing methods, principles of lithography. Automation of cartographic techniques. Planning and organization.

29.191 Survey Camp I
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.
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.

*Offered for the last time in 1979.
29.193 Professional Training**
A five-month period of practical experience including the submission of a report.
In special circumstances, a five-week practical project, supervised by the School, may be substituted. The project is equivalent to 160 contact hours.

29.194 Survey Camp**
A two-week field camp followed by two weeks on campus for completion of computations.

29.195 Survey Camp III
Prerequisites: 29.008, 29.192, 29.511, 29.211, 29.311, 29.152, 29.661, 29.662.
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
Prerequisite: 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
Prerequisites: 10.022, 10.341A, 10.341B, 29.151.

29.212 Geodesy II† S2 L2T1
Prerequisite: 29.211.
Principles of physical geodesy. Satellite applications in gravity determination. Principles of doppler, laser ranging to satellites and the moon, and very long baseline interferometry. Geodynamic applications. Methods of establishing a world geodetic system. Adjustment of control surveys using the condition and parametric methods of least square adjustment for measured angular and linear quantities. The role of the variance-covariance matrix, variance factors and the weight coefficient matrix. Elementary testing of observations and adjusted values.

29.213 Geodesy III S2 L3
Prerequisite: 29.212.

29.231 Geophysics for Surveyors S2 L2T1

29.232 Atmospheric Effects on Geodetic Measurements S2 L3

29.311 Astronomy I S2 L2T1
Prerequisites: 29.003, 29.151, 10.341A, 10.341B.
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† S2 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 S2 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 SS L2T4

*Offered only in Session 1 from 1960.
†Offered for the last time in 1978.
29.491 Survey Camp
A one-week field camp.

29.511 Photogrammetry I*  S2 L2½ T1½
Prerequisite: 29.151.

29.512 Photogrammetry II†  S2 L2T1
Prerequisite: 29.511.

29.513 Photogrammetry III S2 L2½ T1½
Prerequisite: 29.512.

29.514 Principles of Remote Sensing  S1 L2T1

29.623 Land Development III**  S2 L2T1

29.631 Land Inventory I  S2 L1T1
Prerequisite: 27.295.

29.632 Land Inventory II  S2 L2T1
Prerequisite: 29.631.

29.642 Land Law and Tenure II** S2 L2T1

29.651 Land Development I  S1 L2T1

29.652 Land Development II  S2 L2T1
Prerequisite: 29.651.

29.653 Land Development III  S1 L1T2
Prerequisites: 8.712, 29.651, 29.652, 36.411.
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 *Also offered in Session 1, 1979.
†Offered in Session 1 from 1980.
**Offered for the last time in 1979.
road hierarchy. Plan of detailed lot layout: consideration of access, grades, drainage, drainage reserves, parks and pedestrian ways. Engineering design and plans: catchment details, longitudinal and cross-sections, drainage layout and longitudinal sections, flow schedule with calculations, longitudinal sections of kerb profiles.

29.654 Land Development IV S2 L2T1
Prerequisites: 29.652, 29.653.

29.661 Cadastral Surveying and Land Law I S1 L1½ T½
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 cadastre in NSW: an historical introduction, the role of the boundary surveyor and boundary control.

29.662 Cadastral Surveying and Land Law II S2 L2T1
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 S2 L2T1
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 S2 L2T1
Prerequisite: 29.662.

29.700 Professional Orientation S1 L1T½
Introduction to the total field of surveying activities and their relationship to associated disciplines. Surveying as the collection, measurement, management and inventory of land related data within a temporal and spatial framework. The provision of a framework within which land and its resources can be located and measured. Introduction to geodesy and position fixing from celestial bodies. Map projections and co-ordinates. Introduction to the use of aerial photographs. Angles and distances in a three-dimensional co-ordinate system. 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 S2 L0T1
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 S1 L0T1
Prerequisite: 29.701.
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 S2 L½ T½
Prerequisite: 29.701.
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 S2 L2T0

29.705 Management II S2 L2T0
Prerequisite: 29.704.
†Offered in Session 1 from 1980.
Engineering

29.800 Survey Draughting
Fundamentals of survey draughting. Abbreviations, symbols, sizes of drawing sheets, layout of drawing sheets, lines, letters, numerals, scales, projection and sectioning, dimensioning, architectural drawing, engineering survey and design drawings.

29.801 Cartography I

29.802 Cartography II
Prerequisite: 29.801.
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, photographic mosaics, differential rectification and orthophotomaps, cartographic completion of photomaps. Automation of cartographic processes, data collection and processing, plotting software and hardware, digital terrain models.

Graduate Study

29.106G Special Topic in Surveying A
A special subject to be lectured on by visiting professors or other visiting staff. Details of syllabus and lecturer to be communicated to the Higher Degree Committee on each occasion when the subject runs.

29.107G Special Topic in Surveying B
A special subject taken by an individual student or a small group of students by private study in conjunction with tutorial sessions with the member(s) of staff in charge of the subject.

29.154G Adjustment of Observations

29.163G Mathematical Methods I — Numerical Analysis

29.164G Mathematical Methods II — Statistics of Observations
Advanced applications to survey observations and least square adjustments of frequency distributions, variance, minimum variance, unbiased estimation, central limit theorem, multivariate distributions and statistical testing.

29.165G Mathematical Methods III — Ellipsoidal Harmonics
Vector theorems. Theory of spherical and ellipsoidal harmonics.

29.215G Geometrical Geodesy
29.2160 Geodetic Surveying

29.223G Dynamic Geodesy
Orbital motion of near earth satellites; the analysis of satellite orbits for low degree harmonics of the earth's gravitational field; the application of results at the surface of the earth.

29.224G Physical Geodesy
Fundamental equations for the solution of the boundary value problem; telluroid; solutions to the order of the flattening. The gravitational field of the rotating spheroid. The analysis of gravity; extension techniques. Astro-geodetic levelling; comparison of gravimetric and astro-geodetic solutions. The determination of the earth's gravitational field from satellite orbital analysis. The combination of satellite and surface gravity data. Computational data.

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 Process

29.521G Control Extension A
Prerequisite: 29.517G or consent of the instructor.

29.522G Control Extension B
Prerequisite: 29.518G.

29.909G Project
See Graduate School of Engineering Handbook for details of research areas in the School.

29.918G Research Project
See Graduate School of Engineering Handbook for details of research areas in the School.

29.936G Research Project
See Graduate School of Engineering Handbook for details of research areas in the School.
Engineering

Town Planning

Undergraduate Study

36.411 Town Planning SS L2T0

Transport and Highways

Graduate Study

The individual subject descriptions are set out below. In a number of cases, the same word or phrase, eg parking, appears in more than one description. Where this occurs, the item should be read in the context of the subject structure, which deals with the same problem from several aspects, eg planning, design, constructions.

24.001G Human Factors in Transport C3
Human capabilities, ergonomic principles, attitudes to new concepts, planning, the law; application to transport planning, design and implementation. The human as a processor of information, influence on design of transport facilities particularly information displays; signals, signs and lighting.

24.002G Transport, Environment, Community C6

24.003G Theory of Land Use/Transport Interaction C3
Theoretical aspects of land use transport planning. Basic concepts, data collection methods, systems models and equation of state (functional, behavioural, optimizing). Introduction to land use-transport modelling (land use, generation, distribution, modal assignment, network assignment, evaluation). Planning methodologies (short-, medium-, long-term; action planning, strategic planning; local, urban, regional, national).

24.004G Local Area Transport Planning C3
Application of theoretical methods to local area planning. Local government planning and engineering; pedestrian planning, frontage land use problems, analysis of residential areas, industrial estates, shopping centres and recreational facilities, accessibility studies, environmental studies, parking studies.

24.005G Urban Transport Planning Practice C3

24.006G Regional Transport Planning C3
The role of transport in economic and social development in regions including Third World countries; historical and contemporary analysis. Analytical techniques for regional planning. Planning practice, feasibility studies, evaluation methods. Case studies.

24.007G Transport System Design (Non-Urban) C3
Process of location of road, railway and airport facilities. Data collection, alternative routes, public discussion, methods, techniques, aids, plans and diagrams produced. Geometric form: differences between road, railway and airport carriageway layout. Optical guidance, design models, landscape, provision for surface-water signage, fencing and posts.

24.008G Transport System Design (Urban) C3
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.

24.009G Interchange Design C3
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, signage. Computer use. Safety measures during maintenance.
24.010G Highway Engineering Practice Part 1  C3

24.011G Highway Engineering Practice Part 2  C3

24.012G Economics for Transport Studies  C3

24.013G Transport Economics  C3
Cost and price analysis of 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.

24.014G Transport Systems Part 1  C3

24.015G Transport Systems Part 2  C3
Historical introduction to transport systems and development of various transport modes; road (vehicles, pedestrians, cycles), conveyor, rail, sea and air. Analysis of the operational characteristics of vehicles in the transport modes of road, rail and air. Analysis of the requirements of the rights of way for each transport mode. Development of optimum criteria for the distribution of cargo and passenger traffic. Terminals and mode transfer facilities. Development of system operational models. Energy consideration, new systems.

24.016G Traffic Engineering  C6

24.017G Transport and Traffic Flow Theory  C6
Analysis of deterministic and stochastic models of the traffic stream. Topics covered include the following: Definition and measurement of traffic stream parameters. Space and time distribution of speed. Overtaking models and the moving-observer method. Fundamental diagram of traffic. Car-following theory. Headway and counting distributions. Introduction to queuing theory. Simulation techniques. Signaled and unsignalized intersections.

24.018G Statistics for Transport Studies Part 1  C3

24.019G Statistics for Transport Studies Part 2  C3

24.020G Mathematical Techniques for Transport Studies  C3
Review of special techniques relevant to studies in the transport field including mathematical programming, network analysis, critical path and PERT, decision theory, queuing theory, probability theory.

24.021G Law and Administration  C3
The law relating to the planning and construction of roads and highways and associated works, transport law and regulations, commonwealth, state and local government responsibilities. Relevant sections of acts and ordinances.

24.022G Pavement Materials I  C3
As for 8.748G Pavement Materials I.

24.023G Pavement Materials II  C3
As for 8.749G Pavement Materials II.

24.024G Pavement Design and Evaluation I  C3
As for 8.750G Pavement Design and Evaluation I.

24.025G Pavement Design and Evaluation II  C3
As for 8.751G Pavement Design and Evaluation II.

24.026G Bridges and Highway Structure Part I  C3
Systems analysis in the choice of location and structure type of bridges, site investigation, foundation, waterways, aesthetics of design, design and planning constraints, optimum criteria, bridge structure analysis, orthotropic plate theory, articulated plate theory, theories of load distribution, matrix methods of analysis.
24.027G Bridges and Highway Structure Part II C3
Bridge design: concrete, steel, prestressed concrete, culvert design and construction under high fills, foundation, substructure and retaining-wall design, computer programs for design and optimization.

24.028G Transport and Highway Elective C3
An occasional offering in a specialized Transport and Highway Elective topic selected according to current demand and/or availability of a local or visiting specialist.

24.101G Characteristics of Transport C8
Historical introduction to sea and land transport systems. Description and methods of measurement of performance characteristics of different transport modes: rail, road, sea, air, pipeline, eg capacity, speed range, unit operation costs. Operating characteristics of terminal and transfer facilities. Cargo and passenger systems, description of cargo characteristics. Inventory, insurance and packaging costs. Criteria for distribution and assignment of cargo and passenger traffic.

24.102G Fundamentals of Transport Economics C6

24.103G Introduction to Statistics C6

24.104G Introduction to Traffic Theory C6

24.105G Fundamentals of Transport Planning C6
Generation of traffic, estimation of traffic growth and assignment of traffic to competing traveling modes. Land use and transport interaction.

24.106G Traffic Operation and Control C6
Traffic measurements and data handling. Studies of capacity of roads and intersections, levels of service, delay. Accident analysis and treatments. Traffic service—street lighting and guidance. Principles of traffic design, improvements.

24.107G Soil Mechanics Applied to Road Engineering C8

24.108G Road Engineering Practice C8

Highway Law: Highway Law, the law of contracts, definition of a contract, five necessary elements for a valid contract. Operation and interpretation, fundamental principles and established practice, time for performance, discharge or dissolution, remedies for breach of contract, variations. Powers and duties of the engineer, agency, commercial arbitration, approvals, scope of obligations and authority, both legal and ethical, related contracts, carriage of goods by land, insurance, master and servant (contracts of employment), sale of goods, arbitration act.

Contract Documents: Engineering contracts, types of contracts, contract documents, general conditions of contract, drawings, specification, schedule or Bill of Quantities, tenders, letter of acceptance, the agreement, mechanics of execution of a contract, contract law in other countries. Specifications, purpose and relationship to other contract documents, principles of specification writing, basic layout, method of approach and composition, bills of quantities, purpose and relationship to other contract documents, methods of presentation, principles of preparation and standard procedures, units.


24.108G Road Location and Design — Part I  C7
Preliminary and final survey, geometric designs of roads for rural and urban conditions, sight distances, stopping distances, passing distances, road gradients, super-elevation horizontal curves, vertical curves, appreciation of visual effects of combinations of horizontal and vertical curves, design models, types of cross section, speed change lanes, median lanes, median openings, design of at grade road junctions, expressways and parkways, types of and design of grade separation crossings. Road planning, design traffic load estimation, urban highway network planning and design road capacity and level of service. Drawing office examples in design for rural and urban conditions.

24.110G Road Location and Design — Part II  C7
Traffic Engineering: Traffic measurements, relation between flow and concentration, speed, sampling, headway distributions and gap acceptance, delays to conflicting streams, car following behaviour, traffic signals (isolated and linked), street lighting, accident studies and traffic control warrants. Photogrammetry: Drawing office methods of photo measurement and interpretation, radial line plotting, parallax bar measurements, controlled mosaic assembly.

Town Planning and Landscape Architecture: Analysis of the 20th century town, principles of land use zoning, planning for traffic and transport, public open spaces, the planning of residential areas, planning for industry, visual quality of urban and rural environment, the city centre, vegetation and environment, plant materials, principles of landscape design, examples of landscape design, street and roadside planting, urban sociology.

Hydrology: Urban drainage design, hydraulic design of highway structures, introduction to runoff process and estimates, review of and discussion of the theoretical basis for the most important existing methods of calculating culvert and gully sizes.

24.111G Road Construction  C6
Specifications, bills of quantities, engineering drawings for roadworks, feasibility and cost-benefit analyses, supervision of construction, progress payments, cost estimation, construction and personnel management, report writing.

Construction planning, use of critical path methods, setting out roadworks, selection and use of roadmaking plant including fixed and mobile units, quality control.

24.112G Highway Materials  C6
Selection, evaluation and specification of materials for flexible and rigid pavements and for road embankments. Forms and origins of bituminous materials and road tars, laboratory tests, seal-coats, primes and prime seals, design of bituminous mixes, wearing courses, full depth asphalt pavements, manufacture of bituminous concrete, maintenance procedures.
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 Faculty Information section the prizes and scholarships 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 the Student Employment and Scholarships Unit, located on the Ground Floor of the Chancellery.

Unless otherwise indicated in footnotes, applications for the following scholarships should be made to the Registrar by 14 January each year. Please note that not all of these awards are available every year.

<table>
<thead>
<tr>
<th>Donor</th>
<th>Value</th>
<th>Year/s of Tenure</th>
<th>Conditions</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>General</strong></td>
<td></td>
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<tr>
<td>Bursary Endowment Board*</td>
<td>$150 pa</td>
<td>Minimum period of approved degree/combined degree course</td>
<td>Merit in HSC and total family income not exceeding $4000.</td>
</tr>
<tr>
<td>Sam Cracknell Memorial</td>
<td>Up to $3000 pa payable in fortnightly instalments</td>
<td>1 year</td>
<td>Prior completion of at least 2 years of a degree or diploma course and enrolment in a full-time course during the year of application; academic merit; participation in sport both directly and administratively; and financial need.</td>
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</table>

*Apply to The Secretary, Bursary Endowment Board, Box 460, PO, North Sydney 2060 immediately after sitting for HSC.
### Undergraduate Scholarships (continued)

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<tr>
<th>Donor</th>
<th>Value</th>
<th>Year/s of Tenure</th>
<th>Conditions</th>
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<tbody>
<tr>
<td><strong>General (continued)</strong></td>
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<tr>
<td>Girls' Realm Guild Scholarship</td>
<td>Up to $1500 pa</td>
<td>1 year renewable for the duration of the course subject to satisfactory progress and continued demonstration of need</td>
<td>Available only to female students under 35 years of age enrolling in any year of a full-time undergraduate course on the basis of academic merit and financial need.</td>
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<tr>
<td><strong>Engineering</strong></td>
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<tr>
<td><strong>Electrical Engineering</strong></td>
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<tr>
<td>The Tyree Electrical Company Pty Ltd</td>
<td>Up to $4000 over 4 years</td>
<td>1 year renewable for the duration of the course, subject to satisfactory progress</td>
<td>Eligibility for admission to the full-time degree course in Electrical Engineering.</td>
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<tr>
<td><strong>Mechanical Engineering</strong></td>
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<tr>
<td>The Fox Manufacturing Company</td>
<td>Up to $1500 pa</td>
<td>1 year renewable for the duration of the course, subject to satisfactory progress</td>
<td>Eligibility for admission to the full-time degree course in Mechanical Engineering.</td>
</tr>
<tr>
<td>James Howden &amp; Co Australia Pty Ltd</td>
<td>Up to $400 pa</td>
<td>1 year</td>
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<tr>
<td><strong>Surveying</strong></td>
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<tr>
<td>The Institution of Surveyors, NSW Division</td>
<td>Up to $250 per session</td>
<td>In parts 4, 5, 6 and 8 of the full-time course</td>
<td>Permanent residence in Australia and eligibility for admission to the full-time degree course in Surveying.</td>
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</tbody>
</table>
Engineering

Graduate Scholarships

Application forms and further information are available from the Student Employment and Scholarships Unit, which is located on the ground floor of the Chancellery. This Unit produces the booklet Graduate Awards, and also provides information on additional scholarships which may become available from time to time, mainly from funds provided by organizations sponsoring research projects.

Where possible, the scholarships are listed in order of schools within the faculty.

<table>
<thead>
<tr>
<th>Donor</th>
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</thead>
<tbody>
<tr>
<td>University of New South Wales Research Awards</td>
<td>1-2 years for a Masters and 3-4 years for a PhD degree</td>
<td>As above</td>
<td>Applicants must be honours graduates (or equivalent). Applications to Registrar by 31 October (30 November in special circumstances).</td>
</tr>
<tr>
<td>Commonwealth Postgraduate Research Awards</td>
<td>Living allowance of $4200 pa. Other allowances may also be paid</td>
<td>1-2 years; minimum duration of course</td>
<td>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 (in special circumstances applications will be accepted by 30 November).</td>
</tr>
<tr>
<td>Commonwealth Postgraduate Course Awards</td>
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<tr>
<td>Australian American Educational Foundation Travel Grant*</td>
<td>A total of $500-$3200</td>
<td>Up to 1 year</td>
<td>Applicants must be graduates, senior scholars or post-doctoral Fellows. Applications close 30 September.</td>
</tr>
<tr>
<td>Australian Federation of University Women</td>
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<td>Applicants must be female graduates from any accredited Australian or overseas university.</td>
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*Application forms are available from: The Secretary, Department of Education, AAEF Travel Grants, PO Box 826, Woden, ACT 2606.
## Graduate Scholarships (continued)

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<tbody>
<tr>
<td><strong>General (continued)</strong></td>
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</tr>
<tr>
<td>The British Council</td>
<td>Cost of travel to</td>
<td>2 years</td>
<td>Applicants must be: 1. University staff on study leave. Applications close with Registrar by 30 November, for visits to commence during ensuing financial year 1 April to 31 March. 2. Graduate research workers holding research grants. Applications close with Registrar by 31 January for visits to commence during ensuing 1 April to 31 March.</td>
</tr>
<tr>
<td>Commonwealth University</td>
<td>UK or other Commonwealth country university</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Interchange Scheme</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>The Caltex Woman Graduate of the Year</td>
<td>$5000 pa for further studies in USA, UK, Northern</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.</td>
</tr>
<tr>
<td>Scholarship</td>
<td>Europe or in special cases Australia. There are no special allowances for travel or accommodation for married graduates</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Canadian Pacific Airlines</td>
<td>One free economy class return flight a year to Canada</td>
<td></td>
<td>Graduates of an Australian University who are Australian citizens or permanent residents. Candidates must have been accepted by a Canadian University, be able to support themselves on a full-time basis, and intend to return to Australia. Applications close with Registrar by 31 May.</td>
</tr>
<tr>
<td>Award for Travel to Canada for University</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Graduates</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Commonwealth Scholarship and Fellowship Plan</td>
<td>Varies for each country. Generally covers travel,</td>
<td>Usually 2 years,</td>
<td>Graduates who are Commonwealth citizens or British Protected Persons, and who are not older than 35 years of age. Applications close with Registrar by 1 October.</td>
</tr>
<tr>
<td></td>
<td>living, tuition fees, books and equipment, approved medical expenses. Marriage allowance may be payable.</td>
<td>sometimes 3</td>
<td></td>
</tr>
<tr>
<td>Gower Graduate Research</td>
<td>Maximum $2000 pa</td>
<td>2 years</td>
<td>Applications must be members of the Forces or children of members of the Forces who were on active service during the 1939-45 War.</td>
</tr>
<tr>
<td>Travelling Scholarship</td>
<td></td>
<td></td>
<td>Candidates must be either: 1. Members of the Commonwealth or a State Public Service or semi-government Authority. 2. 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 and be between 21-30 years of age. Applications close 23 July.</td>
</tr>
<tr>
<td>Harkness Fellowships of the Commonwealth Fund</td>
<td>Living and travel allowances, tuition and research</td>
<td>Between 12 to</td>
<td></td>
</tr>
<tr>
<td>of New York*</td>
<td>expenses, book and equipment and other allowances</td>
<td>21 months</td>
<td></td>
</tr>
</tbody>
</table>

*Application forms must be obtained from the Australian representative of the Fund, Mr L. T. Hinde, Reserve Bank of Australia, Box 3947, GPO. Sydney, NSW 2001. These must be submitted to the Registrar by 24 July.
### Engineering Graduate Scholarships (continued)

<table>
<thead>
<tr>
<th>Donor</th>
<th>Value</th>
<th>Year/s of Tenure</th>
<th>Conditions</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>General (continued)</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Frank Knox Memorial Fellowships at Harvard University</td>
<td>Stipend of $3600 plus tuition fees pa</td>
<td>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>Nuffield Foundation Commonwealth Travelling Fellowships†</td>
<td>Living and travel allowances</td>
<td>1 year</td>
<td>Australian citizens usually between 25 and 35 who are graduates preferably with higher degrees and who have at least a year's teaching or research experience at a university. Applications close by February.</td>
</tr>
<tr>
<td>The Rhodes Scholarship**</td>
<td>£3000 stg pa</td>
<td>2 years, may be extended for a third year</td>
<td>Unmarried male and female British subjects, between the ages 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 July each year.</td>
</tr>
<tr>
<td>Rothmans Fellowships Award‡</td>
<td>$12000 pa</td>
<td>Up to 3 years</td>
<td>The field of study is unrestricted. Applications close early September each year.</td>
</tr>
</tbody>
</table>

**Applications to the Secretary, The Nuffield Foundation Australian Advisory Committee, PO Box 783, Canberra City 2601.**

†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>Year/s of Tenure</th>
<th>Conditions</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Engineering (continued)**

Australian Institute of Nuclear Science and Engineering Studentships

- Single students: $4641 pa.
- Dependent spouse allowance: $1632 pa,
- $390 for each dependent child, plus some University expenses.
- 1-3 years

Australian Institute of Nuclear Science and Engineering Research Fellowship†

- $11000-$18000 pa plus certain travel and supporting grants
- Minimum of 2 years. Maximum of 3 years

Shell Scholarship in Science and Engineering

- £1750 stg pa plus travelling expenses
- 2 years

Applications to The Registrar, or AINSE Private Mail Bag, Sutherland 2232.

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.

<table>
<thead>
<tr>
<th>Donor/Name of Prize</th>
<th>Value</th>
<th>Awarded for</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**General**

Sydney Technical College Union Award

- 50.00
- Leadership in the development of student affairs, and academic proficiency throughout the course

University of New South Wales Alumni Association

- Statuette
- Achievement for community benefit — students in their final or graduating year
## Undergraduate University Prizes (continued)

<table>
<thead>
<tr>
<th>Donor/Name of Prize</th>
<th>Value $</th>
<th>Awarded for</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Faculty of Engineering</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, Mechanical and Industrial Engineering, Chemical Engineering, Mining Engineering, Textile Technology (Textile Engineering option only)</td>
</tr>
<tr>
<td>The John Fraser Memorial Award</td>
<td>Advised annually</td>
<td>Excellence in the first year or equivalent part-time years of a bachelor's degree course offered by the Faculty of Engineering</td>
</tr>
<tr>
<td><strong>School of Civil Engineering</strong></td>
<td></td>
<td></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>The Association of Consulting Structural Engineers of New South Wales</td>
<td>20.00 and books to the value of 30.00</td>
<td>General proficiency — Structures in the Bachelor of Engineering degree course in Civil Engineering</td>
</tr>
<tr>
<td></td>
<td>20.00 and books to the value of 30.00</td>
<td>General proficiency — Structures in the Bachelor of Science (Engineering) degree course in Civil Engineering</td>
</tr>
<tr>
<td>BMI Ltd Systems Engineering</td>
<td>50.00</td>
<td>8.301 Systems Engineering</td>
</tr>
<tr>
<td>Chamber of Manufactures of New South Wales</td>
<td>15.00</td>
<td>Subject selected by Head of School</td>
</tr>
<tr>
<td>Crawford Munro Memorial</td>
<td>150.00</td>
<td>Highest proficiency in 8.582 Water Resources II taken for the first time</td>
</tr>
<tr>
<td>Department of Civil Engineering Materials Staff</td>
<td>50.00</td>
<td>Best aggregate marks in the subjects 8.273 Civil Engineering Materials II and 8.274 Civil Engineering Materials III</td>
</tr>
<tr>
<td>Dillingham Corp of Australia Ltd Prize</td>
<td>100.00</td>
<td>Academic and professional excellence shown in the field of Construction Estimating</td>
</tr>
<tr>
<td>Harbin Polytechnical Alumni Association</td>
<td>50.00</td>
<td>Subject selected by Head of School</td>
</tr>
<tr>
<td>James Hardie Co Pty Ltd</td>
<td>100.00</td>
<td>Highest proficiency in 8.571 Hydraulics I taken for the first time</td>
</tr>
<tr>
<td>Hornibrook</td>
<td>100.00</td>
<td>Proficiency in Engineering Construction and Management</td>
</tr>
</tbody>
</table>
### Undergraduate University Prizes (continued)

<table>
<thead>
<tr>
<th>Donor/Name of Prize</th>
<th>School</th>
<th>Value $</th>
<th>Awarded for</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>School Civil Engineering (continued)</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Rural Bank of NSW</td>
<td></td>
<td>50.00</td>
<td>Outstanding performance in 8.673 Planning and Management II</td>
</tr>
<tr>
<td>Water Board Gold Medal</td>
<td></td>
<td>Medal</td>
<td>Public Health Engineering</td>
</tr>
<tr>
<td><strong>School of Electrical Engineering</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Austral Bronze Crane Copper Ltd</td>
<td></td>
<td>25.00</td>
<td>Bachelor of Engineering Course in Electrical Engineering, Year III Power or Control elective</td>
</tr>
<tr>
<td>Chamber of Manufactures of New South Wales</td>
<td></td>
<td>15.00</td>
<td>Subject selected by Head of School</td>
</tr>
<tr>
<td>Electricity Supply Engineers Association of New South Wales</td>
<td></td>
<td>40.00</td>
<td>Overall performance including proficiency in Electric Power Distribution in third year full-time or equivalent part-time course.</td>
</tr>
<tr>
<td>J. Douglas Maclurcan</td>
<td></td>
<td>30.00</td>
<td>Control Systems</td>
</tr>
<tr>
<td>The Wilfred Holmes Memorial Award</td>
<td></td>
<td>120.00</td>
<td>A student eligible to enter the final year of the course and who is deemed to be in necessitous circumstances</td>
</tr>
<tr>
<td><strong>School of Mechanical and Industrial Engineering</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Atlas Copco</td>
<td></td>
<td>75.00</td>
<td>General proficiency in Bachelor of Engineering course in Mechanical Engineering</td>
</tr>
<tr>
<td>Austral Crane Ltd</td>
<td></td>
<td>50.00</td>
<td>Full-time Year III Mechanical Engineering</td>
</tr>
<tr>
<td>Babcock &amp; Wilcox Aust Ltd</td>
<td></td>
<td>21.00</td>
<td>Subject selected by Head of School</td>
</tr>
<tr>
<td>Chamber of Manufactures of New South Wales</td>
<td></td>
<td>15.00</td>
<td></td>
</tr>
<tr>
<td>CSR Limited</td>
<td></td>
<td>50.00</td>
<td>Subject selected by Head of School</td>
</tr>
<tr>
<td>Ford Motor Co of Aust Ltd</td>
<td></td>
<td>20.00</td>
<td></td>
</tr>
<tr>
<td>David Carment Memorial</td>
<td></td>
<td>350.00 Including medal</td>
<td>Highest proficiency in final year of Naval Architecture course</td>
</tr>
<tr>
<td>Harbin Polytechnical Alumni Association</td>
<td></td>
<td>50.00</td>
<td>5.113 Mechanical Engineering Design III</td>
</tr>
<tr>
<td>Jeremy Hirschhorn</td>
<td></td>
<td>20.00</td>
<td>Theory of Machines</td>
</tr>
<tr>
<td>Royal Institution of Naval Architects</td>
<td></td>
<td>40.00</td>
<td>Bachelor of Engineering or Bachelor of Science (Engineering) degree course in Naval Architecture, final year or stage</td>
</tr>
<tr>
<td>Staedtler (Pacific) Pty Ltd</td>
<td></td>
<td>50.00 (order)</td>
<td>General proficiency in Bachelor of Engineering Course in Mechanical Engineering, Year II</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 Ltd</td>
<td>50.00</td>
<td>Bachelor of Engineering degree course in Industrial Engineering, Year III</td>
</tr>
<tr>
<td>Chamber of Manufactures of New South Wales</td>
<td>15.00</td>
<td>Subject selected by Head of School</td>
</tr>
<tr>
<td>R. E. Jefferies Memorial</td>
<td>100.00</td>
<td>Performance in final year/stage of Bachelor of Engineering degree course in Industrial Engineering</td>
</tr>
<tr>
<td>TRW Australia Ltd</td>
<td>20.00</td>
<td>Bachelor of Science (Engineering) degree course in Industrial Engineering, Stage 6</td>
</tr>
</tbody>
</table>

School of Surveying

<table>
<thead>
<tr>
<th>Donor/Name of Prize</th>
<th>Value $</th>
<th>Awarded for</th>
</tr>
</thead>
<tbody>
<tr>
<td>Board of Surveyors Medal</td>
<td>Medal</td>
<td>Bachelor of Surveying degree course, Final Year</td>
</tr>
</tbody>
</table>

Graduate University Prizes

The following table summarizes the graduate prizes awarded by the University.

General

<table>
<thead>
<tr>
<th>Donor/Name of Prize</th>
<th>Value $</th>
<th>Awarded for</th>
</tr>
</thead>
<tbody>
<tr>
<td>The Thistlethwayte Memorial Prize</td>
<td>100.00</td>
<td>Best essay in the field of water — waste water treatment or water quality management, by MEngSc, MAppSc, ME, MSc student</td>
</tr>
</tbody>
</table>

School of Transport and Highways

<table>
<thead>
<tr>
<th>Donor/Name of Prize</th>
<th>Value $</th>
<th>Awarded for</th>
</tr>
</thead>
<tbody>
<tr>
<td>Veteran Motorists of Australia</td>
<td>20.00</td>
<td>Traffic Planning and Control</td>
</tr>
<tr>
<td>Wabco Aust Pty Ltd</td>
<td>300.00</td>
<td>Most distinguished graduate in Highway Engineering course leading to MEngSc degree</td>
</tr>
</tbody>
</table>
Faculty of Engineering

Staff

Comprises Schools of Civil Engineering, Electrical Engineering, Mechanical and Industrial Engineering, Nuclear Engineering, Surveying, and Transport and Highways.

Dean
Professor H. R. Vallentine

Chairman
Professor N. L. Svensson

Administrative Assistant
Margaret Leonard, MA III.

Professor of Civil Engineering and Head of Department of Engineering Construction and Management
Ronald William Woodhead, BE Syd., ME N.S.W., FIEAust, FAIB, MASCE, MAIC, MPMI, MACI, MIQ

Professor of Civil Engineering and Head of Department of Structural Engineering
Robert Falcon Warner, ME N.S.W., PhD Lehigh, MIEAust, MASCE

Professor of Civil Engineering
Harold Rupert Vallentine, BE Syd., MS Iowa, ASTC, FIEAust

Honorary Associates
Lance Aubrey Endersbee, BCE ME Melb., FIEAust, FASCE, MAusIMM
Desmond Ford Glynn, BCE Melb., MIEAust, MASCE
Alexander Wargon, MSc Harv., CE, FIEAust, FASCE, MNZIE

School of Civil Engineering

Professor of Civil Engineering, Head of School and of Department of Civil Engineering Materials
Ian Kenneth Lee, BCE MEngSc PhD Melb., FIEAust, MASCE

Administrative Officer
Robert William Prior
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 Professor and Acting Head of Department
Owen Greame Ingles, BA MSc Tasmania, CEng, CChem, FRIC, MIEAust, MInstMC

Associate Professors
Somasundaram Valliappan, BE Annamalai, MS Northeastern, PhD Wales, MASCE
Geoffrey Baldwin Welch, BE Sydney, ME N.S.W., CEng, MICE, FIEAust

Senior Lecturers
William Henry Cogill, MS Cape Town and Cambridge, PhD N.S.W., FIEAust MICE
David John Cook, BE Western Australia, MSc PhD Calg., MIEAust, AMASCE, APIA
Esco Morelle Kilchan, BE Sydney, MIEAust
Bruce John Francis Patton, BE Sydney, PhD N.S.W., DIC
John Maurice Wheatley, MA PhD Cambridge, CEng, FIM, FAusWI
William Otto Yandell, ME PhD N.S.W., MIEAust

Lecturers
Stephen John Hain, BE Sydney, PhD N.S.W.
Arthur William Manton-Hall, BE MEngSc N.S.W., MIEAust
Harry Taylor, BSc(Eng) Birm., DipNA&AC Sydney
John Maurice Wheatley, MA PhD Cambridge, CEng, FIM, FAusWI,
William Otto Yandell, ME PhD N.S.W., MIEAust

Teaching Fellow
Angelo Cipullo, DrGeoSci Rome

Professional Officers
David Edwin Hattersley, MSc N.S.W., ASTC
Trinh Cao, BE Monash
Ghodratollah Tamaddon, BEng Agri Tehran, DAgSc Gembloux

Department of Structural Engineering


Associate Professors
Horace Joseph Brette, BE Sydney, PhD N.S.W., DIC, ASTC, FIEAust
Kenneth Alan Faulkner, ME N.S.W., MS III, PhD N.S.W., MIEAust
Robert Alexander Frisch-Fay, Dipl Ing Budapest, ME N.S.W., MIEAust
Algol Kabaila, MEngSc PhD N.S.W., FRMTC, MIEAust, MASCE
Rupert Whitfield Trail-Nash, BE Western Australia, PhD Bristol, CEng, MIEAust, MRAeC

Senior Lecturers
Peter Stephen Ballint, Dipl Ing Budapest, ME N.S.W., MIEAust
Donald John Fraser, MEngSc PhD N.S.W., ASTC
Alex Cuthbert Heaney, BE MEngSc Melbourne, PhD Wat., MIEAust, MASCE, AMICE
Jack Lachlan Jenkins, BE Sydney, ME N.S.W., DIC, ASTC, MIEAust
Victor Andrade Pulman, BSCE Philippines, MEng A.I.T. PhD Northwestern
B. Vijaya Rangan, BE Madras, PhD I.I.S.B'lore, MASCE, MIEAust
Ian James Somervaille, BE PhD N.S.W., ASTC

Department of Engineering Construction and Management

Includes Systems Engineering, Engineering Economy, Project Planning and Management.

Associate Professor
Alan Frank Stewart Nettleton, BSc Sydney, ME N.S.W., DIC
Staff

Lecturers
Raymond Ian Gilbert, BE N.S.W.
Peter Walder Kneen, BE Malb., PhD Wat., MIEAust
Raymond Eric Lawther, BE PhD N.S.W.

Teaching Fellows
Henry Edward Ah Cann, BE N.S.W.
Marla Attard, BE N.S.W.
Russell Forester Staley, BSc Leeds

Professional Officers
Kim Small, BSc Syd.
John Wesley Carrick, BE N.S.W.

Department of Water Engineering


Associate Professor and Head of Department
Bernard William Gould, BE Tas., ME N.S.W., MIEAust

Associate Professors
Douglas Neil Foster, BE Syd., MIEAust
David Herbert Pilgrim, BE PhD N.S.W., FIEAust
Keith Kingsford Watson, BE Syd., ME PhD DSc N.S.W., FIEAust

Senior Lecturers
David Barnes, BSc PhD Birm., MIWSE, AMICE
Ian Cordery, ME PhD N.S.W., MIEAust
Colin Raymond Dudgeon, ME N.S.W., MIEAust, MASCE
Trevor Regis Fletz, ME N.S.W.
David Trehewelle Howell, BE Syd., ME N.S.W., MIEAust, MAIAS
John Robert Learmonth, BE Syd., ME N.S.W.
David Lyon Wilkinson, BE Syd., PhD N.S.W., MIEAust

Lecturers
Peter John Bills, BE N.S.W., MSc Lond., DIC, ASTC, MIEAust
Brian Selby Jenkins, BE PhD N.S.W., ASTC, MIEAust, LGE
David Keith Robinson, BSc BE PhD N.S.W., MIEAust, MASCE

Tutor
Roger Benson Tomlinson, BE N.S.W., GradIEAust

Teaching Fellow
Peter Howard Bloomfield, BE N.S.W.

Professional Officers
David George Doran, BE DipCompSc Qld., MEngSc N.S.W.
Kenneth Brian Higgs, MSc Aston, MAIP

School of Electrical Engineering

Professor of Computer Science and Head of School
Murray William Allen, BE Adel., PhD Syd., CEng, FIREE, MIEE, MIEEE

Professor of Electrical Engineering—Communications
Antoni Emil Karbowiak, DSc(Eng) Lond., CEng, FIEAust, FTS, FIREE, MIEEE

Professor of Electrical Engineering—Systems and Control
Neville Waller Rees, BSc PhD Wales, FIEAust

Tyree Professor of Electrical Engineering—Electric Power Engineering
Frederic John Evans, BSc BE Syd., CEng, FIEE, FIEAust

Visiting Professor—Solid State Electronics
Louis Walter Davies, AO, BSc Syd., DPhil Oxford, SMIEEE, FInstP, FAIP, FIREE, FTS, FAA

Professor of Electrical Engineering—Electronics
Vacant

Professor of Electrical Engineering
Rex Eugene Vowels, ME Adel., SMIEEE, CEng, FIEAust, MIEE

Executive Assistant to Head of School
Colin Arthur Stapleton, BSc BE Syd., CEng, MIEAust, MIEEE, MIEEE

Senior Administrative Officer
Halsey George Phillips

Administrative Assistant
Robyn Horwood, BA DipEd N.S.W.

Senior Tutor
Geoffrey Nicholas Horton Westley, BEng Llv., MIEEE
Tutors
Stuart William Britton, BE N.S.W.
David Athol Carrington, BSc N.S.W.
Brian Louis Cohen, BSc N.S.W.
Harvey Albert Dillon, BE N.S.W.
Douglas James Follett, BE N.S.W.
Peter Garde, BE MEngSc Monash
Gregory Charles Hurst, BSc BE N.S.W.
Graham Reginald Hellestrand, BSc N.S.W.
Douglas James Follett, BE N.S.W.
Peter Garde, BE MEngSc Monash
Gregory Charles Hurst, BSc BE N.S.W.
Graham Reginald Hellestrand, BSc N.S.W.
Douglas James Follett, BE N.S.W.
Peter Garde, BE MEngSc Monash
Gregory Charles Hurst, BSc BE N.S.W.
Graham Reginald Hellestrand, BSc N.S.W.
Douglas James Follett, BE N.S.W.

Teaching Fellow
Sui Cheong Albert Poon, BE N’cle.(N.S.W.), HDip H.K.Poly

Professional Officer
Jeffrey Stanley Skebe, BS Case W.R.

Department of Computer Science

Associate Professor
Alan Dunworth, BSc PhD Manch., SMIEEE, FIREE

Senior Lecturers
John Lions, BSc Syd., PhD Camb.
Graham Barry McMahon, BSc Syd., PhD N.S.W.
Peter Clive Maxwell, MSc Auck., PhD A.N.U., MIEEE

Lecturers
Paul William Baker, BE PhD N.S.W.
Ian James Hayes, BSc N.S.W.
Leslie Charles Hill, BE N.S.W., MIEAust
Kenneth Arthur Robinson, BSc BE Syd.

Professional Officers
Serge Poplavsky, Dipllng Bratislava, ME N.S.W.
Keith William Titmuss, BSc(Tech) MEngSc N.S.W.

Department of Communications

Associate Professors
Warwick Harvey Holmes, BSc BE MEngSc Syd., PhD Camb., MIEEE, MIEEE
The Bao Vu, BE PhD Adel., SMIEEE

Senior Lecturers
Pak Lim Chu, ME PhD N.S.W., MIEEE
Edward Henry Fooks, BSc PhD Lond., CEng, MIEEE, MIEEE
Thomas Leslie Hooper, BSc Syd., MSc N.S.W., CEng, MIEEE, MIEEE
Israel Korn, MSc DSc Technion, Haifa
Geoffrey John Parker, BSc BE Syd., ME N.S.W., MIEAust, MIEEE
Christopher John Elliott Phillips, BSc BE PhD Syd., MIEEE, MIEEE
Robert Radzyner, BE Melb., MEngSc PhD N.S.W., MIEEE, MIEEE
Ramutis Anthony Zakarevicius, BSc BE MEngSc PhD Syd., MIEAust, MIEEE, MIEEE

Lecturers
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