How to use this Handbook

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

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

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

Faculty Information.

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

Graduate Study is about higher degrees.

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

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

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

Staff list.

For detailed reference, see the list of Contents.
The 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:

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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 10 September 1979, 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. This General Information Section is intended to help you put the Faculty into perspective with the University as a whole, to introduce you to some of the services available to students and to note some of the most important rules and procedures.

For fuller details about the University and its activities you should consult the University Calendar.

Some people who can help you

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

The Deputy Registrar (Student Services), Mr Peter O'Brien, and 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 Assistant Registrar (Admissions and Higher Degrees), Mr Jack Hill, is located on the ground floor of the Chancellery. General enquiries should be directed to 3715.

The Assistant Registrar (Examinations and Student Records), Mr Peter Wildblood is located on the ground floor of the Chancellery. For particular enquiries regarding the Student Records Unit, including illness and other matters affecting

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.
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, contact the Administrative Officer, Mr John Grigg, phone 2143.

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 in 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 Section in the huts at the foot of Basser Steps. For assistance in obtaining suitable lodgings phone 3260.

The Student Health Unit is located in Hut E at the foot of Basser Steps. 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. 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; Greek Orthodox—2683; Lutheran—2683; Uniting Church—2685.

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), 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.

### Calendar of Dates

#### The Academic Year

The academic year is divided into two sessions, each containing 14 weeks for teaching. There is a recess of five weeks between the two session and there are short recesses of one week within each of the sessions. Session 1 commences on the first Monday of March.

#### 1980

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<th>Session 1</th>
<th>3 March to 11 May</th>
</tr>
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<tr>
<td>(14 weeks)</td>
<td>May Recess: 12 May to 18 May</td>
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<tr>
<td></td>
<td>19 May to 15 June</td>
</tr>
<tr>
<td>Tuesday</td>
<td>Midyear Recess: 16 June to 20 July</td>
</tr>
<tr>
<td>17 June</td>
<td>Examinations begin</td>
</tr>
<tr>
<td>Wednesday</td>
<td>Examinations end</td>
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<td>2 July</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Session 2</th>
<th>21 July to 24 August</th>
</tr>
</thead>
<tbody>
<tr>
<td>(14 weeks)</td>
<td>August Recess: 25 August to 31 August</td>
</tr>
<tr>
<td></td>
<td>1 September to 2 November</td>
</tr>
</tbody>
</table>

| Monday    | Examinations begin |
| 10 November |                     |
| Friday    | Examinations end   |
| 29 November |                    |

<table>
<thead>
<tr>
<th>January</th>
<th></th>
</tr>
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<td>Tuesday 1</td>
<td>New Year’s Day — Public Holiday</td>
</tr>
<tr>
<td>Friday 4</td>
<td>Last day for applications for review of results of annual examinations</td>
</tr>
<tr>
<td>Friday 11</td>
<td>Last day for acceptance of applications by Admissions Office for transfer to another undergraduate course within the University</td>
</tr>
<tr>
<td>Monday 28</td>
<td>Australia Day — Public Holiday</td>
</tr>
</tbody>
</table>


February

Monday 4  Enrolment period begins for new undergraduate students and undergraduate students repeating first year
Monday 18  Enrolment period begins for second and later year undergraduate students and graduate students enrolled in formal courses

March

Monday 3  Session 1 commences
Tuesday 4  List of graduands for April/May ceremonies and of 1979 prize-winners published in daily press
Friday 14  Last day for acceptance of enrolment by new undergraduate students (late fee payable)
Friday 28  Last day for acceptance of enrolment by undergraduate students re-enrolling in second and later years (late fee payable)

April

Thursday 3  Confirmation of Enrolment forms despatched to all students
Friday 4 to Monday 7  Easter
Friday 18  Last day for undergraduate students to discontinue without failure subjects which extend over Session 1 only
Friday 25  Anzac Day — Public Holiday

May

Monday 5  Last day for undergraduate students completing requirements for degrees or diplomas at the end of Session 1 to submit Application for Admission to Degree form
Monday 12  May Recess begins
Thursday 15  Publication of provisional timetable for June/July examinations
Sunday 18  May Recess ends
Friday 23  Last day for students to advise of examination timetable clashes

June

Tuesday 3  Publication of timetable for June/July examinations
Sunday 15  Session 1 ends
Monday 16  Queen’s Birthday — Public Holiday
Tuesday 17  Midyear Recess begins

July

Wednesday 2  Examinations end
Tuesday 15  Examination results mailed to students
Wednesday 16  Examination results displayed on University noticeboards
Tuesday 15 to Friday 18  Students to amend enrolment programs following receipt of June examination results
Sunday 20  Midyear Recess ends
Monday 21  Session 2 begins
Thursday 31  Last day for application for review of June examination results

August

Friday 1  Foundation Day (no classes held)
Monday 25  Last day for undergraduate students to discontinue without failure subjects which extend over the whole academic year
Sunday 31  August Recess begins

September

Friday 5  Last day for undergraduate students to discontinue without failure subjects which extend over Session 2 only
Monday 8  Last day for applications from undergraduate students completing requirements for degrees and diplomas at the end of Session 2 to submit Application for Admission to Degree form
Wednesday 10  List of graduands for October graduation ceremonies published in daily press
Friday 12  Last day for students to discontinue without failure subjects which extend over Session 2 only

Confirmation of Enrolment form forwarded to all students
Monday 15  Last day to notify intention of attending
October graduation ceremonies

Monday 22 Last day for applications from
undergraduate students completing
requirements for degrees and diplomas at
the end of Session 2 to submit Application
for Admission to Degree form

Friday 26 Last day for acceptance of corrected
Confirmation of Enrolment forms

October

Wednesday 1 Last day to apply to UCAC for transfer to
another university in New South Wales

Thursday 2 Publication of provisional examination
timetable

Monday 6 Eight Hour Day — Public Holiday

Thursday 9 Graduation ceremonies

Friday 10 Last day for students to advise of
examination timetable clashes

Thursday 21 Publication of timetable for examinations

November

Sunday 2 Session 2 ends

Monday 3 Study Recess begins

Sunday 9 Study Recess ends

Monday 10 Examinations begin

Saturday 29 Examinations end

December

Tuesday 16 Examination results mailed to students

Wednesday 17 Examination results displayed on
University notice boards

Thursday 25 Christmas Day — Public Holiday

Friday 26 Boxing Day — Public Holiday

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
Mullers 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 Univer-
sity has developed. The motto is not an integral part of the
Grant of Arms and could be changed at will; but it was the
opinion of the University Council that the relationship with the
parent institution should in some way be recorded.

The Council

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

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

The Council meets six times per year and its members also
serve on special committees dealing with, for example,
academic matters, finance, buildings and equipment, per-
sonnel 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.

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.

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.

In 1979 the University had 18,466 students and over 3,700
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.

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areas of study and research, the result of their deliberations
being then submitted to the Professorial Board.
General Information

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 and mathematics degree course.

The Schools

Once courses of study have been approved they come under the control of the individual Schools (e.g. 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 Ray Golding and Professor Rex Vowels, together with the Deans and the three heads of the administrative divisions.

General Administration

The administration of general matters within the University comes mainly within the province of the Registrar, Mr 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.

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

Student Representation on Council and Faculties/Boards

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

Students proceeding to a degree or a graduate diploma may elect members for appointment by the Council to their Faculty/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 the faculties have their own rules for the conduct of open meetings.

Award of the University Medal

The University may award a bronze medal to undergraduate students who have achieved highly distinguished merit on completion of their final year.

Identification of Subjects by Numbers

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

Textbook Lists

Textbook lists are no longer published in the Faculty handbooks. Separate lists are issued early in the year 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 main library building (Menzies Library) houses 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:

1. The Water Reference Library situated at Manly Vale (phone 9480261) which is closely associated with the Physical Sciences Library.
2. The library at the Broken Hill Division in the W.S. and L.B. Robinson University College building. Phone Broken Hill (080) 6022.
3. The library at the Royal Military College, Duntroon ACT, serving the Faculty of Military Studies. Phone (062) 73 0427.

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.

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. Fees are payable on a session basis. Conferences are catered for, particularly with Kosher requirements. Rates are available on application. Apply in writing to the Master, Shalom College, The University of New South Wales, PO Box 1, Kensington, NSW 2033.

Warrane College

Warrane College provides accommodation for 200 men and is open to students of all ages, backgrounds and beliefs. 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 Catholic lay association Opus Dei. Apply in writing to the Master, Warrane College, PO Box 123, Kensington, NSW 2033.

Creston Residence

Creston Residence offers accommodation for 25 full-time undergraduate and graduate women students without restriction of denomination or nationality. Non-resident membership provides students with the opportunity to participate in the activities of the Residence and to make use of its facilities. Creston is directed by the Women's Section of Opus Dei, a Catholic lay association. Enquiries should be addressed to 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 Section 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.

Location: The Student Accommodation Service is located in the huts at the foot of Basser Steps. Phone 6630351, extension 3260.

Student Employment and Scholarships

The Student Employment and Scholarships Section 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 and undergraduate and graduates scholarships is also available.

The service is located in 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 2679 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 6989499, or for the Prince of Wales Hospital clinics by telephoning 3990111.

Student Counselling and Research

The Student Counselling and Research Unit provides individual and group counselling for all students—prospective, established and graduate. Self-help programs are also available. Opportunities are provided for parents and others concerned with student progress to see members of the counselling staff.

The service which is free, informal and personal is designed to help students with planning and decision making, and a wide variety of concerns and worries which may be affecting personal, educational and vocational aspects of their lives.

The Unit pursues research into factors affecting student performance, and the published results of its research and experience are helpful in improving University and other counselling services, and the quality of student life.

Counselling appointments may be arranged during sessions and recesses between 9 am and 7 pm. Phone 6630351, extension 3681, 3685 and 2696, or call at the Unit which is located at the foot of Basser Steps. Urgent interviews are possible on a walk-in basis between 9 am and 5 pm. Group counselling programs are offered both day and evening between 9 am and 9 pm by special arrangement. Self-help programs are arranged to suit the student's time and convenience.

Student Amenities and Recreation

In general the Student Amenities and Recreation Section seeks ways to promote the physical, social and educational development of students through their leisure time activities and to provide some services essential to their day-to-day University life.

The Section provides, for example, a recreational program for students and staff at the Physical Education and Recreation Centre; negotiates with the Public Transport Commission of NSW on student travel concessions and supplies concession forms for bus, rail, ferries and planes; assists students with off-campus housing; makes bookings for use of sports facilities; and, in consultation with the Sports Association, assists various recognized clubs.

The Section is located in the huts at the foot of Basser Steps. The various services may be contacted by phone on the following extensions: Recreation Program 3271; Travel 2617; Accommodation 3260; Ground Bookings 2235; Sports Association 2673.
Physical Education and Recreation Centre

The Student Amenities and Recreation Section provides a recreational program for students and staff at the Physical Education and Recreation Centre. The Centre consists of eight squash courts, a 50m heated indoor swimming pool, and a main building, the latter containing a large gymnasium and practice rooms for fencing, table tennis, judo, weight-lifting, karate and jazz ballet, and a physical fitness testing room. The recreational program includes intramurals, teaching/coaching, camping, and fitness testing. The Centre is located on the lower campus adjacent to High Street. The Supervisor at PERC may be contacted on extension 3271.

The Sports Association

The Sports Association caters for a variety of competitive sports for both men and women. Membership is compulsory at $11 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 the huts at the foot of Basser Steps, and the control of the Sports Association is vested in the General Committee. The Sports Association may be contacted on extension 2673.

Student Travel Concessions

The Student Amenities and Recreation Section arranges distribution of bus, rail and ferry concessions. For the peak period during the week preceding and the first week of Session 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 travel concessions, including planes, should enquire at the section (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 $55 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 one year at the University are eligible for election. The President directs the entire administration of the Students' Union and its activities.

Other officers include the Education Vice-President who works towards the implementation of Student 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 $17 per annum for full-time students and $13 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.

The Students' Union is located on the second floor, Stage 3, the Union.

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Chaplaincy Centre

This service is provided for the benefit of students and staff of various religious and spiritual beliefs. Chaplains are in attendance at the University at regular times. A Chapel is also available for use by all denominations. For further details, turn to page 2.

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Other Services and Activities

CASOC All clubs and societies on campus (except sporting clubs) are loosely organized under the umbrella of CASOC, which is a committee of the Students' Union. Some of these clubs are: the Motor Cycle Club; Chess Club; Dramsoc; Opunka; Kite Club and the Jazz Society.

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

University Co-operative Bookshop Limited Membership is open to all students, on initial payment of a fee of $10, refundable when membership is terminated. Members receive an annual rebate on purchases of books.

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

Australian Armed Forces Enquiries should be directed to:
Royal Australian Navy Royal Australian Navy Liaison Officer, Emeritus Professor J.S. Ratcliffe, Commander, RANR (Rtd), International House, Phone extension 3093 or 6630473.

University of New South Wales Regiment The Adjutant, Regimental Depot, Day Avenue (just west of Anzac Parade). Phone 6631212.

Royal Australian Air Force Undergraduates interested in the RAAF Undergraduate Scheme should contact The Recruiting Officer, Defence Forces Recruiting Centre, 323 Castlereagh Street, Sydney. Phone 2121011.

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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 diploma courses
- 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 Commonwealth Department of Education.

1979 Higher School Certificate candidates and tertiary students receiving an allowance are sent forms in January 1980. Other students may obtain forms from the Admissions Section or Student Employment and Scholarships Section, or from the Commonwealth Department of Education, 59 Goulburn Street, Sydney, NSW 2000 (phone 218 8800).

Continuing students should submit applications as soon as examination results are available. New students should do so as soon as they are enrolled. All students should apply by 31 March 1980, 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 appropriate School office.

Further information and advice regarding scholarships is available from the Student Employment and Scholarships Section in the Chancellery.

2. Graduate Awards An honors 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 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. **Deferment of Payment of Fees** Deferments may be granted for a short period, usually one month, without the imposition of a late fee penalty, provided the deferment is requested prior to the due date for fee payments.

2. **Short Term Cash Loans** Donations from 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 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.

The University has also been the recipient of generous donations from the Arthur T. George Foundation, started by Sir Arthur George and his family, for the endowment of a student loan fund.

In all cases assistance is limited to students with reasonable academic records and whose financial circumstances warrant assistance.

Enquiries about all forms of financial assistance should be made at the office of the Deputy Registrar (Student Services), Room 148E, in the Chancellery.

Financial Assistance to Aboriginal Students

Financial assistance is available to help Aboriginal students from the Australian Government's Aboriginal Study Grant Scheme. Furthermore, the University may assist Aboriginal students with loans to meet some essential living expenses.

All enquiries relating to the latter should be made at the office of the Deputy Registrar (Student Services), Room 148E, in the Chancellery.

Fund for Physically Handicapped and Disabled Students

The University has a small fund started by a generous gift from a member of the staff who wishes to remain anonymous available for projects of benefit to handicapped and disabled students. Enquiries should be made at the office of the Deputy Registrar (Student Services), Room 148E, in the Chancellery.

Rules and Procedures

The University, in common with other large organizations, has some agreed ways of doing things in order to operate for the benefit of all members. The rules and procedures listed below will affect you at some time or another. In some cases there are penalties (e.g. fines or exclusion from examinations) for failure to observe these procedures and therefore they should be read with care.

Admission

Where can I get information about admission?

The Admissions Office, located in the Chancellery on the upper campus, provides information for students on admission requirements, undergraduate and graduate courses and enrolment procedures. The Admissions Office is open from 9 am to 5 pm Monday to Friday (excluding the lunch hour 1 pm to 2 pm). During enrolment the office is also open for some part of the evening.

The Office provides information about special admission (including mature age entry), admission with advanced standing and admission on overseas qualifications. The Office also receives applications from students who wish to transfer from one course to another, resume their studies after an absence of twelve months or more, or seek any concession in relation to a course in which they are enrolled. It is essential that the closing dates for lodgment of applications are adhered to. For further details see the sections below on Enrolment and Fees.

Applications for admission to undergraduate courses from students who do not satisfy the requirements for admission (see section on Admission Requirements in the Calendar), from
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 Universities and Colleges Admissions Centre.

How do I qualify 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 the Calendar and in a pamphlet obtainable at the Admissions Office.

Enrolment

How do I enrol?

All students, except those enrolling as graduate research students (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 the course requires this.

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

For details of the locations and hours for enrolment see Enrolment Procedures 1980, a free booklet obtainable from the Admissions Office or from your School or Faculty Office.

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 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) unless the student has permission from the Deputy Registrar (Student Services). Payment may be made through the mail in which case it is important that the student registration number be given accurately. Cash should not be sent through the mail.

New Undergraduate Enrolments

Persons who are applying for entry in 1980 must lodge an application for selection with the Universities and Colleges Admissions Centre, PO Box 7049, GPO, Sydney 2001, by 1 October 1979.

Those who are selected will be required to complete enrolment at a specified time before the start of Session 1. Compulsory fees should be paid on the day. In special circumstances, however, and provided class places are still available, students may be allowed to complete enrolment after the prescribed time.

Application forms and details of the application procedures may be obtained from the 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 Universities and Colleges Admissions Centre, PO Box 7049, GPO, Sydney 2001, by 1 October 1979.

Restrictions Upon Re-enrolling

Students enrolled for the first time in any undergraduate course in the University who failed more than half their program in 1979; 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 Enrolments

Students may be permitted to enrol as miscellaneous students in subjects not counted as part of (ie 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 as miscellaneous students in subjects which may be counted towards courses from which they have been excluded.

Students seeking to enrol as miscellaneous students 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.

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 (14 March 1980) 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 (28 March 1980) 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 (1 August 1980) except with the express approval of the Deputy Registrar (Student Services) and the Heads of Schools concerned.

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 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 Friday 11 January 1980. 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 1979.

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 office controlling your course, from which application forms are available. The Registrar will inform you of the decision. Application to enrol in additional subjects must be submitted by 28 March 1980 for Session 1 only and Whole Year subjects and by 15 August 1980 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. In some cases students will be entitled to fee refunds.

For details see the Calendar.

Subjects

2. Applications to withdraw from subjects may be submitted throughout the year but applications lodged after the following dates will result in students being regarded as having failed the subject concerned, except in exceptional circumstances.

(1) for one session subjects, the end of the seventh week of that session (18 April or 5 September)
(2) for whole year subjects the end of the second week of Session 2 (1 August)

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 of more, then you should apply for admission to the course through the Universities and Colleges Admissions Centre before 1 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-enrol 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, or 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 Calendar.
(3) The Appeal Committee shall determine the appeal after consideration of the student’s academic record, his/her application for special permission to re-enrol, and the stated grounds of appeal. In exceptional circumstances, the Appeal Committee may require the student to appear in person.

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.

(2) A student who is required to show cause under the provisions of Rule 2, 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 any subject he/she has failed twice. Where the subject failed is prescribed as part of the student’s course he/she shall also be excluded from that course. Where the subject failed is prescribed as part of any other course (or courses) he/she shall not be allowed to enrol in any such course(s).

(3) A student excluded from a course or courses under the provisions of Rule 1, or 2, may not enrol as a miscellaneous student in subjects which may be counted towards any such course.

Re-admission after Exclusion

9. (1) An excluded student may apply for re-admission after the period of exclusion has expired.

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

(b) An application for re-admission to a subject should be made to the Registrar before 30 November in the year prior to which re-admission is sought. Such applications will be considered by the relevant Head of School.

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

(4) Applications for re-admission to a course or subject that are unsuccessful (see 9, (2) (a), (b) respectively) will be reconsidered automatically by the Re-enrolment Committee of the Professorial Board. The decision of the Committee will be final.

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

Restrictions and Definitions

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

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

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 (see page 2) and on the Notification of Examination Results. The forms are available from the Office of the Registrar in the north wing of the Chancellory 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.
2. 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’ 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 1980 for students completing at the end of Session 1, and 1 March 1981 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 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 $55
Sports Association, annual subscription $11
Students' Union $11
Students enrolling in full-time courses, annual subscription $17
Students enrolling in part-time courses and miscellaneous subjects, annual subscription $13
Miscellaneous annual fee $25

*This 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 1980 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, 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 1980*, 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. Students enrolled in courses at the W.S. and L.B. Robinson University College and in the faculty of Military Studies are exempt from the fees mentioned above but shall pay such other fees and charges as the Council may from time to time determine.
4. University Union fees and subscriptions may be waived by the Deputy Registrar (Student Services) for students enrolled in graduate courses in which the formal academic requirements are undertaken at a part of the University away from the Kensington Campus.
5. Students who while enrolled at and attending another university (or other tertiary institution as approved by the Vice-Chancellor) in a degree or diploma course are given approval to enrol at the University of New South Wales but only in a miscellaneous subject or subjects to be credited towards the degree or diploma for which they are enrolled elsewhere are exempt from all Student Activities Fees and the University Union entrance fee.
6. Undergraduate students of a recognized university outside Australia who attend the University of New South Wales with the permission of the Dean of the appropriate faculty and of the Head of the appropriate school or department to take part as miscellaneous students in an academic program relevant to their regular studies and approved by the authorities of their own institution are exempt from all Student Activities Fees and the University Union entrance fee.
7. Graduate students not in attendance at the University and who are enrolling in a project only, other than for the first time, are exempt from all Student Activities Fees.

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

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

10. Graduate students who have completed all the work for a qualification at the commencement of Session 1, except for the submission of the relevant thesis or project report, may be exempted from the payment of Student Activities Fees by the Deputy Registrar (Student Services) on production of an appropriate statement signed by the relevant supervisor or Head of School.

Is exemption from membership possible?

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

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

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 after the end of the eighth week of Session 1 (25 April 1980). 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 (29 August 1980).

In special cases the Registrar may grant exemption from disqualifications referred to in preceding paragraphs 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 Whole 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 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 Pass Conceded in a subject will normally allow progression to another subject for which the former subject is a prerequisite. In a particular subject, however, a subject authority may specify that a pass conceded is insufficient to meet a particular subject prerequisite.

**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 Examinations and Student Records Section). Examination results are also posted on School noticeboards and in either the University library or 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 not later than fifteen working days after the issue of the Notification of Results form.

A review of a result is not a detailed assessment of a student's standard of knowledge and understanding of, and skills in, the subject.

**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, unless there are exceptional circumstances.

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, unless there are exceptional circumstances.

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, in the north wing of 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 15 minutes before the time for commencement.

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

4. Candidates shall not be admitted to an examination after 30 minutes from the time of commencement of the examination.

5. Candidates shall not be permitted to leave the examination room before the expiry of 30 minutes from the time the examination commences.

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

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

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

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

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

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 5¢ each from the University Union’s Upper Campus Shop in the Commerce Building.

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.

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.
**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 in the north wing of the Chancellery.

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 Submissions 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 24 April and 12 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, the Chancellery.

**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.

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

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:
Thursday 28 February 1980
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:
Friday 29 February 1980
11 am in the Clancy Auditorium

Part-time Students
Thursday 28 February 1980
6.30 pm in the Clancy Auditorium

Meeting for Parents of New Students
Friday 29 February 1980
7.30 pm in the Clancy Auditorium
Foreword

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

The Faculty consists of six Schools: Civil Engineering, Electrical Engineering, Mechanical and Industrial Engineering, Nuclear Engineering, Surveying, and Transport and Highways. In addition, the Centre for Biomedical Engineering is located in the Faculty.

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

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

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

The School continues to offer the later stages of six year part-time courses leading to the award of the degree of Bachelor of Science (Engineering) in the same four fields as offered for the BE degree course, though no new enrolments into these courses are now accepted.

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.

School of Nuclear Engineering

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 Surveysing consists of three Departments: Geodesy; Photogrammetry, including land studies and cartography; and Surveying, including astronomy and computations. It offers a full-time course of four years duration leading to the degree of Bachelor of Surveying. Alternatively, the course may be taken in a Sandwich form in which a student may, after completing the first year of the course on a full-time basis, alternate his or her studies with periods of employment by taking leaves of absence of up to two consecutive sessions at a time thereafter. The course taken in this form requires a maximum period of seven years. The part-time course is no longer available. 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 a number of terminals to the University's time-shared central computer, a control minicomputer within the School's Image Data Analysis Centre, and several programmable desk calculators. A library of programs is maintained for use with the different computers.

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

The School of Transport and Highways is situated on the Randwick Sub-Campus and offers graduate courses leading to the award of the MEngSc degree and graduate diplomas in Highway Engineering and Transport. It also conducts, each year, practice-oriented special courses in Traffic Planning and Control, and Highway Engineering. The School supervises research degrees in a wide range of topics including urban and regional land use/transport planning, local area transport planning, transport systems design and operation, highway planning, maintenance and operations, and the environmental impact of transport on the community, eg noise, amenity, accidents and pollution.

The Centre was established in 1976 as an interdisciplinary unit to promote and coordinate biomedical engineering studies and research being conducted by various departments within the University and its associated teaching hospitals. Biomedical engineering involves the application of engineering techniques to biomedical problems with particular emphasis on clinical medicine.

The Centre offers graduate programs leading to the award of the degree of Master of Biomedical Engineering and, in association with other schools, the degree of Doctor of Philosophy. The Master's degree is obtained primarily through course work but includes a research project which is supervised in one of the Centre's associated laboratories, either on campus or in affiliated teaching hospitals. The doctorate is primarily a research degree which normally involves some formal course work.
The MBiomedE course is designed to cater for students with either a medical or engineering/science background and involves eighteen months of full-time study. Part-time students are also catered for. Initially, students with a medical background study basic engineering subjects such as mathematics, mechanics, electronics and computing, whilst students with a non-medical background take courses in biology, physiology, anatomy, pathology and biochemistry. At a later stage, students from both backgrounds choose electives from biomechanics, biophysics, biomaterials, medical instrumentation and mass transfer in medicine, as well as undertaking a research project.

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 graduates. Appropriate attitudes and skills for professional engineers operating into the twenty-first century must also be developed. Technology has come under increasing criticism from other sectors of society. It is no longer accepted that advances in technology are necessarily synonymous with the betterment of society, and future engineers must be prepared not only to take account of the ramifications of their work, but also to vindicate them to an increasingly doubtful public.

It is also important for you, as a student, to join in the development of yourself as a professional engineer. Engineering is a co-operative profession where teamwork is very important. Whilst at university you should take as many opportunities as you can to join in the activities which help to develop the whole person. Student clubs and professional institutions provide many opportunities for gaining knowledge and experience which will be valuable in your work as an engineer.
The staff and students collectively create an atmosphere of scholarship and learning. Staff are involved in research as well as in teaching. This research is vital if the quality of teaching is to be kept at a high intellectual standard. In addition the interested student will find a very wide range of research activities. The common thread, however, will be the engineering method which is applied.

Students should take steps to ensure that the staff are fully aware of their problems and attitudes. There are committees in the schools which are concerned with student matters. The faculty has student representation on its education committee, the 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 about subject content and requirements, contact the appropriate school representative listed below:

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

School of Electrical Engineering: Associate Professor C. A. Stapleton, Room G6, or Ms R. C. Horwood, School Office, School of Electrical Engineering

School of Mechanical & Industrial Engineering: Associate Professor J. Y. Harrison, Room 112, or Mr G. Dusan, Room 107, School of Mechanical & Industrial Engineering

School of Nuclear Engineering: Professor J. J. Thompson, Room 324AB, Electrical Engineering Building

School of Surveying: Mr J. V. Fonseka, School Office, Room 529, Geography & Surveying Building

School of Transport & Highways: Professor W. R. Blunden, King Street, Randwick

Centre for Biomedical Engineering: Associate Professor P. C. Farrell, Room 420, Geography & Surveying Building

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

Faculty of Engineering Enrolment Procedures

All students re-enrolling in 1980 or enrolling in graduate courses should obtain a copy of the free booklet Enrolment Procedures 1980 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
Engineering 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

Student Clubs and Societies

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

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

The following societies serve the interests of students in the various courses in the Faculty of Engineering: Biomedical Engineering Society (BioEng Soc); Electrical Engineering Society (ELSOC); Civil Engineering Student Society (CIVSOC); Naval Architecture Student Association (NASA); Surveying Society (SURVSOC); Computing Science Association (CSA); Undergraduate Society of Mechanical & Industrial Engineers (USMIE).

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

Location of Laboratories outside Kensington Campus

Randwick
The 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.

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 and transportation.

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

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

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

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

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.

The Institution of Surveyors, Australia

During their years as undergraduates, students in the surveying course are encouraged to take the first steps in joining in the activities of the professional body which represents surveyors, The Institution of Surveyors. The aims of the Institution are to promote scientific, technical and educational aspects of surveying and to maintain high professional standards of practice and conduct. Student members receive the quarterly journal of the Institution, The Australian Surveyor and The NSW Surveyors' Monthly Bulletin which is published by the New South Wales Division of the Institution. Membership also entitles the student to attend all meetings of the Institution and to attend the annual Congress at a special concessional rate. Membership application forms are available at the office of the School of Surveying and from the Institution office, Third Floor, Guild House, 363 Pitt Street, Sydney.
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 course, which may also be taken in a sandwich form, leading to the degree of Bachelor of Engineering or Bachelor of Science (Engineering). The Schools of Nuclear Engineering and Transport and Highways, and the Centre for Biomedical Engineering offer graduate courses only.

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

First Year Programs

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

General Rules for Progression

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

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

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

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

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

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

Prerequisites and Co-requisites

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

- A co-requisite unit is one which must either be completed successfully before or be studied concurrently with the unit for which it is prescribed.
Full-time 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. Substantial or complete recognition is accorded to these courses by overseas engineering institutions.

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

Industrial Training Requirements

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

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

Part-time Courses

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

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

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.

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

A student completing the BSc(Eng) degree course and wishing to qualify for the corresponding BE degree may, on the recommendation of the Head of the School, transfer to the corresponding full-time BE course provided he does not take out the BSc(Eng) degree. Further, provided he continues as a registered student on transfer from one course to the other, he may retain any concession granted in the BSc(Eng) degree course.

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

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

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Conditions for the Award of the Degree of Bachelor of Engineering

1. A candidate for the degree of Bachelor of Engineering shall:
   (1) comply with the requirements for admission;
   (2) follow the prescribed course of study in the appropriate School, and satisfy the examiners in the necessary subjects;
   (3) complete an approved program of industrial training for such periods as are prescribed. In general, this training must be completed before 31 January in the year in which the degree is to be awarded.

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

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

4. The degree shall be awarded in the pass or honours grade. Honours may be awarded in the following categories:
   Honours Class I
   Honours Class II, Division I
   Honours Class II, Division II

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Conditions for the Award of the 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 School of Surveying and satisfy the examiners in the necessary subjects;

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

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

4. The 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
The School of Civil Engineering offers a course leading to the degree of Bachelor of Engineering (BE), at pass or honours level, which can be taken on a 4-year full-time basis, a 7-stage part-time basis or any approved combination of full-time and part-time study.

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

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

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**Students are advised to attempt 1.981 Physics CE but if timetabling difficulties arise or other exceptional circumstances prevail permission will be given to attempt 1.001 Physics I or 1.011 Higher Physics I. On successful completion of one of these latter subjects students will be exempted from one technical elective.**

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

***Students who have achieved a certain standard may attempt 10.011 Higher Mathematics I.***
Year 2

<table>
<thead>
<tr>
<th>Course</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 2 1/2 S2 2 1/2</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>
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<tr>
<td>29.441 Surveying for Engineers</td>
<td>S1 6 S2 0</td>
</tr>
<tr>
<td>29.491 Survey Camp†</td>
<td>S1 1 1/2 S2 1 1/2</td>
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<tr>
<td>Two Electives***</td>
<td>S1 3 S2 3</td>
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<td>S1 24 S2 26</td>
</tr>
</tbody>
</table>

**See Electives on following page.
†Students are required to attend a one-week Survey Camp, which is equivalent to 1 1/2 class contact hours per week in each session.

Year 3

<table>
<thead>
<tr>
<th>Course</th>
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<tbody>
<tr>
<td>8.173 Structural Analysis I</td>
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<tr>
<td>8.174 Structural Analysis II</td>
<td>S1 0 S2 3</td>
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<tr>
<td>8.182 Structural Design II</td>
<td>S1 3 S2 3</td>
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<tr>
<td>8.273 Civil Engineering Materials II</td>
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</tr>
<tr>
<td>8.351 Engineering Mathematics</td>
<td>S1 5 S2 0</td>
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<td>8.572 Hydraulics II</td>
<td>S1 3 S2 0</td>
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<td>8.573 Hydraulics III</td>
<td>S1 0 S2 3</td>
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<td>8.581 Water Resources I</td>
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<td>8.582 Water Resources II</td>
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<td>8.672 Planning and Management I</td>
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**See Electives on following page.

Year 4

<table>
<thead>
<tr>
<th>Course</th>
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<tr>
<td>8.001 Industrial Training</td>
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<td>8.191 Structural Engineering</td>
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<td>8.274 Civil Engineering Materials III</td>
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<td>8.583 Water Resources III</td>
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<td>8.674 Planning and Management III</td>
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</tr>
<tr>
<td>8.051 Design Project—Materials</td>
<td>S1 0 S2 1 1/4</td>
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<tr>
<td>8.052 Design Project—Structures</td>
<td>S1 0 S2 1 1/4</td>
</tr>
<tr>
<td>8.053 Design Project—Water</td>
<td>S1 0 S2 1 1/4</td>
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<tr>
<td>8.054 Design Project—Construction</td>
<td>S1 0 S2 1 1/4</td>
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<tr>
<td>Six Electives***</td>
<td>S1 9 S2 9</td>
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<td>S1 21 S2 20</td>
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</table>

**See Electives on following page.

3620 Civil Engineering Part-time Course

Bachelor of Engineering

BE

Stage 1

<table>
<thead>
<tr>
<th>Course</th>
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<tbody>
<tr>
<td>1.001 Physics I*</td>
<td>S1 6 S2 6</td>
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<td>10.001 Mathematics I*</td>
<td>S1 6 S2 6</td>
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<td>S1 12 S2 12</td>
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</tbody>
</table>

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

Stage 2

<table>
<thead>
<tr>
<th>Course</th>
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<tbody>
<tr>
<td>2.981 Chemistry ICE**</td>
<td>S1 6 S2 2</td>
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<tr>
<td>5.0102 Introduction to Engineering Design</td>
<td>S1 0 S2 2</td>
</tr>
<tr>
<td>5.0201 Engineering Dynamics</td>
<td>S1 0 S2 4</td>
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<tr>
<td>5.0301 Engineering Drawing</td>
<td>S1 0 S2 3</td>
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<tr>
<td>8.170 Statics</td>
<td>S1 4 S2 0</td>
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<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>
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<tr>
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<td>S1 13 S2 13</td>
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**See this footnote below Year 1 (previous page).

Stage 3

<table>
<thead>
<tr>
<th>Course</th>
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<tbody>
<tr>
<td>8.172 Mechanics of Solids II</td>
<td>S1 0 S2 4</td>
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<tr>
<td>8.272 Civil Engineering Materials II</td>
<td>S1 4 S2 4</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 6 S2 0</td>
</tr>
<tr>
<td>29.491 Survey Camp†</td>
<td>S1 1 1/2 S2 1 1/2</td>
</tr>
<tr>
<td></td>
<td>S1 15 1/2 S2 13 1/2</td>
</tr>
</tbody>
</table>

*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 1 1/2 class contact hours per week in each session.

Stage 4

<table>
<thead>
<tr>
<th>Course</th>
<th>Hours per week</th>
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<tbody>
<tr>
<td>8.181 Structural Design I</td>
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<tr>
<td>8.273 Civil Engineering Materials II</td>
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<td>8.301 Systems Engineering</td>
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<td>8.571 Hydraulics I</td>
<td>S1 3 S2 0</td>
</tr>
<tr>
<td>8.671 Engineering Construction</td>
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</tr>
<tr>
<td></td>
<td>S1 13 1/2 S2 13 1/2</td>
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</tbody>
</table>

**See Electives on following page.
†One elective for 1978 Stage 1 students, if they have completed an elective.
## Stage 5

<table>
<thead>
<tr>
<th>Course</th>
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<td>Structural Analysis I</td>
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<td>Structural Design II</td>
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<tr>
<td>Engineering Mathematics</td>
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<tr>
<td>Hydraulics II</td>
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<td>Planning &amp; Management I</td>
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<tr>
<td></td>
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***See Electives below.

## Stage 6

<table>
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<th>Course</th>
<th>Hrs</th>
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<tbody>
<tr>
<td>Structural Analysis II</td>
<td>3.0</td>
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<td>Structural Engineering</td>
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<tr>
<td>Civil Engineering Materials III</td>
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<tr>
<td>Hydraulics III</td>
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<tr>
<td>Water Resources I</td>
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***See Electives below.

## Stage 7

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</table>

***See Electives below.

### Electives

Of ten required electives for the BE degree course at least four are in General Studies and at least four are technical electives. Two of the General Studies electives are taken prior to Year 4 or Stage 6.

Approved technical electives for Year 2 are 6.851 Electronics and Instrumentation, 6.832 Industrial Electrical Machinery, 8.039 Computer Programming, 8.040 Advanced Engineering Geology, 36.411 Town Planning, 8.047 History of Civil Engineering.

Approved technical electives for Year 3 include those listed for Year 2 and 8.015 Road Engineering, 8.018 Construction Engineering, 8.021 Environmental Aspects of Civil Engineering, 8.023 Hydrodynamics, 8.027 New Materials I, 8.029 Continuum Mechanics, 8.041 Geological Engineering, 15.501 Introduction to Industrial Relations.

Approved technical electives for Year 4 include those listed for Year 2 and Year 3 and 8.011 Projects, 8.012 Elements of Architecture, 8.013 Bridge Engineering, 8.014 Computer Applications in Civil Engineering, 8.016 Hydraulics, 8.017 Transportation Engineering, 8.019 Railway Engineering, 8.020 Hydrology, 8.024 Foundation and Dam Engineering, 8.025 Structural Failures, 8.026 Systems Methods in Civil Engineering, 8.028 New Materials II, 8.030 Construction Management, 8.031 Construction Project Finance, 8.032 Law for Builders, 8.034 Engineering Economy, 8.038 Special Topics in Reinforced Concrete, 8.042 Water Resources, 8.043 Public Health Engineering, 8.055 Applied Structural Analysis, 8.056 Practical Structural Design, 8.057 Special Topics in Prestressed Concrete, 8.058 Special Topics in Steel Design, 8.059 Structural Vibrations, 8.060 Numerical Methods in Geotechnology, 8.062 Construction Camp.

### 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) with appropriate credit for subjects satisfactorily completed.

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 (3970) within an approved program.

There are six approved programs but additional ones may be approved if they are relevant.
Physical Metallurgy and Chemistry

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

Year 2
2.002A, 2.042C
4.402, 4.502
8.172, 8.181, 8.272
10.022
1 elective†

Year 3
4.403, 4.703
8.173, 8.174, 8.182, 8.351, 8.571
29.441, 29.491
2 electives†

Year 4
2.003A, 2.003C, 2.013C
4.503
8.273, 8.301, 8.572, 8.573, 8.581, 8.582, 8.671, 8.672
1 elective†

Year 5
2 electives†
Choose 2 units from Table 1 in the Sciences Handbook at Level II or higher.
8.001, 8.191, 8.274, 8.583, 8.673, 8.674, 8.051, 8.052, 8.053, 8.054
Note: All material not in italic typeface refers to the BE degree component of this combined degree course.
* * * * † See footnotes below.

Physics with Mathematics

Year 1
1.001 or 1.011
2.981**
5.0102, 5.0201, 5.0301
8.170, 8.171, 8.271, 8.670
10.001***

Year 2
1.012
1.022, 1.032
8.172, 8.171, 8.272
10.1113 or 10.1213,
10.1114 or 10.1214,
10.2111 or 10.2211,
10.2112 or 10.2212
2 electives†
Course Outlines

Year 3
1.023, 1.043, 1.053, 1.323
8.173, 8.174, 8.182, 8.351, 8.571
10.111A or 10.121A
29.441, 29.491
1 elective

Year 3
8.173, 8.174, 8.351, 8.571
29.441, 29.491
2 electives

Year 4
1.033
1.133
8.273, 8.301, 8.572, 8.573, 8.581, 8.671, 8.672
1 elective

Year 4
8.273, 8.301, 8.572, 8.573, 8.581, 8.582, 8.671, 8.672
1 elective

Year 5
8.001, 8.191, 8.274, 8.583, 8.674, 8.675, 8.051, 8.052, 8.053, 8.054
2 electives

Year 5
8.001, 8.191, 8.274, 8.583, 8.674, 8.675, 8.051, 8.052, 8.053, 8.054
2 electives

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
8.172, 8.181, 8.272
10.111A or 10.121A,
10.1113 or 10.1213,
10.1114 or 10.1214,
10.2111 or 10.2211,
10.2112 or 10.2212
1 elective

Year 2
8.172, 8.181, 8.272
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
25.110, 25.120
3 electives

Geology 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
8.172, 8.181, 8.272
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
25.110, 25.120
3 electives

Note: All material not in italic typeface refers to the BE degree component of this combined degree course.
* *** **† See footnotes below.
Engineering

Year 3
2.042C
8.173, 8.174, 8.182, 8.351, 8.571
25.211, 25.221, 25.212
29.441, 29.491
1 elective†

Year 4
8.273, 8.301, 8.572, 8.573, 8.581, 8.582, 8.671, 8.672
29.441, 29.491
1 elective†

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 Sciences Handbook at Level II or higher.

Note: All material not in italic typeface refers to the BE degree component of this combined degree course.
‡Students enrolling in Level III subjects in 1980 should refer to the 1979 Sciences Handbook for subject descriptions.
* • • • • • See footnotes below.

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
8.172, 8.181, 8.272
10.111A or 10.121A,
10.1113 or 10.1213,
10.1114 or 10.1214
2 electives†

* Students are advised to attempt 1.981 Physics 1CE but if time-tableing 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 2.981 Chemistry 1CE (ie 2 unit Science including Physics or Chemistry or 4 unit Science (multistrand) in the percentile range 31-100) are advised to apply to enrol in two acceptable alternative subjects, 2.111 Introductory Chemistry and 2.121 Chemistry 1A.
*** Students who have achieved a certain standard may attempt 10.011 Higher Mathematics I.
† Of the six electives, four must be in General Studies and two must be technical electives. The technical electives are listed after Stage 7 of Course 3620. The choice of the technical electives must be approved by the Head of the School of Civil Engineering.
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 inter-departmental 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 honors), 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.

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.

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

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<tr>
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<td>1.961</td>
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<td>5.030</td>
<td>Engineering C</td>
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<td>6.010</td>
<td>Electrical Engineering I</td>
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<td>10.001</td>
<td>Mathematics I*</td>
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<tr>
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<td>2.131</td>
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<td>or</td>
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<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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<td>Solid State Physics</td>
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<td>10.111A</td>
<td>Pure Mathematics II (Linear Algebra)*</td>
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<td>10.1114</td>
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<td>10.361</td>
<td>Statistics SE</td>
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**Electrical Engineering III**

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**Technical Electives available in 1980**

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A free choice may not be possible. Only one of 6.613 and 6.641 may be taken as a technical elective. Students wishing to do both computing subjects should contact the School.

---

**Prerequisites and Co-requisites**

See Table next page.
## Prerequisites and Co-requisites
### Full-time Bachelor of Engineering Degree Course

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<td>or 6.613, 6.632, 6.642, 6.643</td>
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<td>6.622</td>
<td>6.620 or 6.021D</td>
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<tr>
<td></td>
<td>6.911</td>
<td>(in graduating program only)</td>
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</tr>
</tbody>
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*Two of 10.1113, 10.1114, 10.2111, or 10.2112 may be taken as co-requisites

**At an acceptable level.

†One of 6.021B or 6.021C may be taken as a co-requisite.
3650
Electrical Engineering

Bachelor of Science (Engineering) BSc(Eng)

Stage 1

<table>
<thead>
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<tr>
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Stage 2

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<td>S1</td>
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<tr>
<td>2.121 Chemistry</td>
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<td>6.021A Circuit Theory I</td>
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<tr>
<td>10.1114 Pure Mathematics II — Complex Analysis</td>
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<td></td>
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Stage 3

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<tr>
<td>1.972 Electromagnetism</td>
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<td>1.982 Solid State Physics</td>
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<td>6.021B Power</td>
<td>4</td>
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<td>6.0311 Circuit Theory II</td>
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<td>10.111A Pure Mathematics II — Linear Algebra</td>
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<td>10.2111 Applied Mathematics II — Vector Calculus</td>
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<tr>
<td>10.2112 Applied Mathematics II — Mathematical Methods for Differential Equations</td>
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Stage 4

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<tr>
<td></td>
<td>S1</td>
<td>S2</td>
</tr>
<tr>
<td>1.992 Thermal Physics &amp; Mechanics†</td>
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<tr>
<td>6.056 Mechanical Engineering†</td>
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<tr>
<td>6.021C Electronics I</td>
<td>4</td>
<td>0</td>
</tr>
<tr>
<td>6.021D Computing</td>
<td>4</td>
<td>0</td>
</tr>
<tr>
<td>6.021E Digital Logic &amp; Systems</td>
<td>0</td>
<td>4</td>
</tr>
<tr>
<td>6.0312 Utilization of Electrical Energy</td>
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<td>4</td>
</tr>
<tr>
<td>6.0313 Electronics II</td>
<td>0</td>
<td>4</td>
</tr>
<tr>
<td>One General Studies Elective</td>
<td>1½</td>
<td>1½</td>
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<tr>
<td></td>
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</table>

†Each student takes one of these technical electives.

Stage 5

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<th>Hours per week</th>
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<tr>
<td>6.0314 Systems &amp; Control I</td>
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</tr>
<tr>
<td>6.0315 Electrical Energy</td>
<td>0</td>
<td>4</td>
</tr>
<tr>
<td>6.0316 Electronics III</td>
<td>4</td>
<td>0</td>
</tr>
<tr>
<td>6.0317 Communication Systems I</td>
<td>0</td>
<td>4</td>
</tr>
<tr>
<td>10.361 Statistics SE</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>One General Studies Elective</td>
<td>1½</td>
<td>1½</td>
</tr>
<tr>
<td></td>
<td>11½</td>
<td>11½</td>
</tr>
</tbody>
</table>

Stage 6

Four Professional Electives* | 10 | 10 |
6.902 Industrial Experience | 6.921 Project**

*The list of electives to be offered largely corresponds to those in Electrical Engineering IV list (see the BE degree program). The full range of electives are not offered in the BSc(Eng) degree course; students who can arrange the necessary day attendance may request approval to do other Electrical Engineering IV electives. **6.921 Project: The project involves the design and construction of experimental apparatus together with laboratory tests. Each student is required to present a seminar and submit a written report. The project should represent the equivalent of a minimum 100 hours of directed laboratory work. If facilities are not available for this to be done largely at work, this may require attendance at the University, full-time in final session, or one further part-time session.

Course Rules

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.

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

• Programs and timetables are arranged in preferred Year or Stage groupings. Progression is, however, by subject.

• In addition to the specific subject prerequisites a general understanding of the material in the preceding Year or Stage is assumed. Students are not normally permitted to enrol in subjects spread beyond two Years or Stages.

Re-enrolment

Students must collect enrolment information from the School Office before the end of Session 2 1979. Re-enrolment forms, giving details of students’ proposed 1980 programs must be lodged with the School Office by Friday 4 January 1980. Enrolment at the University will not be authorized until the re-enrolment form has been checked and the program approved.
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 replaced; 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, viz 6.641, or Applied Mathematics in their Year 2 Electrical Engineering program they open up a wider choice of subjects in their Science Year 3. Any subject 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 some professional electives).

Applications for substitution must be made by Friday 1 February 1980.

### 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 completed with all the requirements for prerequisite study and academic attainment (ie 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>Code</th>
<th>Subject</th>
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<tbody>
<tr>
<td>10.001</td>
<td>Mathematics I</td>
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<tr>
<td>10.111A</td>
<td>Pure Mathematics II (Linear Algebra)</td>
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<tr>
<td>10.1113</td>
<td>Pure Mathematics II (Multivariable Calculus)</td>
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<tr>
<td>10.1114</td>
<td>Pure Mathematics II (Complex Analysis)</td>
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<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>
</tbody>
</table>

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

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

The study of the basic sciences — Mathematics, Physics and Chemistry — together with an introduction to Engineering, comprises the first year. Further mathematical studies are undertaken together with a study of the Engineering Sciences — Thermo-dynamics, Fluid Mechanics, Engineering Mechanics, Mechanics of Solids and their application in the field of Design.

The courses of Mechanical, Industrial and Aeronautical Engineering and of Naval Architecture have common subjects for the first two years if taken full-time, and for the first three years if taken part-time. The latter halves of these four courses contain a number of common core subjects together with specific departmental requirements. In the final years, in addition to core subjects and departmental requirements, provision is made for a limited degree of specialization in one or more elective subjects. Students 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 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 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 if taking the course on a full-time basis, and irrespective of their specialization, are strongly recommended to gain as much industrial training as possible between Years 1 and 2.

Students taking the course on a part-time basis must complete a total of eighty working days of approved industrial training in the period following the end of Year 3 up to the beginning of Year 6.

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.

Part-time courses of six years' duration leading to the degree of Bachelor of Science (Engineering) continue to be offered in the same four fields as the full-time courses, though no new enrolments are now accepted for these courses.

Students proceeding to the BSc(Eng) degree whether by a combination of part-time and of full-time study, or 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.)

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School of Mechanical and Industrial Engineering

Head of School
Professor N. L. Svensson

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. They may be taken either on a full-time basis, nominally over four years, or on a part-time basis, nominally over six years, or on a combined full-time/part-time basis, subject to the approval of the Head of School.

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.
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.

The BSc(Eng) degree may be awarded 'With Merit' to students whose performance in the course is superior.

Students currently enrolled in the BSc(Eng) degree course may transfer, should they wish, to the corresponding BE degree course. Such students are given full credit for subjects they have already passed.

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 I and II of the examinations required for admission to the grade of Member. Exemption from Part III (The Engineer in Society) of the examinations may also be granted, depending on the particular General Studies subjects taken. 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 of 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.

An alternative 'science compatible' course which can be undertaken is as follows:

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<th>Course Title</th>
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<td>1.001</td>
<td>Physics I or Higher Physics I</td>
<td>6 6</td>
</tr>
<tr>
<td>1.011</td>
<td>Higher Physics I</td>
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<td>2.121</td>
<td>Chemistry IA</td>
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<td>5.061</td>
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<tr>
<td>10.001</td>
<td>Mathematics I or</td>
<td>6 6</td>
</tr>
<tr>
<td>10.011</td>
<td>Higher Mathematics I</td>
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Year 2

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<td>5.072</td>
<td>Statistics/Computing</td>
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<td>5.122</td>
<td>Mechanical Engineering Design II</td>
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<tr>
<td>5.330</td>
<td>Engineering Dynamics I</td>
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<tr>
<td>5.422</td>
<td>Mechanics of Solids II/Materials</td>
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<tr>
<td>5.622</td>
<td>Fluid Mechanics/Thermodynamics</td>
<td>4 4</td>
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<td>10.022</td>
<td>Engineering Mathematics II</td>
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<td>18.020</td>
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Year 3*

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<td>5.034</td>
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<td>5.043</td>
<td>Industrial Training †</td>
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<td>5.073</td>
<td>Numerical Analysis/Mathematics</td>
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</tr>
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<td>Mechanical Engineering Design III</td>
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</tr>
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<td>5.333</td>
<td>Dynamics of Machines</td>
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<td>5.343</td>
<td>Linear Systems Analysis</td>
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<td>5.423</td>
<td>Mechanics of Solids III</td>
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<td>Two Fluid Mechanics/Thermodynamics Technical Electives</td>
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<tr>
<td>6.854</td>
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<tr>
<td>18.603</td>
<td>Management/Economics</td>
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<tr>
<td></td>
<td>Two General Studies Electives</td>
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</table>

*Not offered in 1980.
†Report to be submitted in Week 1 of Session 1 detailing involvement and experience gained prior to Year 3.
### Year 4

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</tr>
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<td>Thesis</td>
<td>6</td>
<td>6</td>
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<td>Communications</td>
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<td>2</td>
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<tr>
<td>Feedback Control</td>
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<td>12</td>
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<tr>
<td>Technical Electives</td>
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<td>0</td>
</tr>
<tr>
<td>General Studies Elective</td>
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<td>1½</td>
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<tr>
<td><strong>Total</strong></td>
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<td>21½</td>
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**Note 1:** At least six hours per week of Technical Electives must be taken from the Mechanical Engineering Technical Elective list. The remaining Technical Electives may be taken from the Industrial Engineering Technical Elective List or from Years 3 or 4 of other courses in the School or suitable subjects outside the School. Students with good academic records may include some graduate subjects. A counselling service is provided to assist students to choose electives. The selection of certain subjects or combinations of subjects may require the approval of the Head of School.

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

---

### 3680 Mechanical Engineering — Full-time

**(Old Course)**

**Bachelor of Engineering BE**

#### Year 1

<table>
<thead>
<tr>
<th>Course</th>
<th>Hours per week</th>
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<tbody>
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<tr>
<td>Chemistry I (ME)</td>
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</tr>
<tr>
<td>Engineering A</td>
<td>6 0</td>
</tr>
<tr>
<td>Engineering C</td>
<td>6 0</td>
</tr>
<tr>
<td>Engineering D</td>
<td>0 8</td>
</tr>
<tr>
<td>Technical Orientation</td>
<td>2 0</td>
</tr>
<tr>
<td>Mathematics I or Mathematics I</td>
<td>6 6</td>
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### Year 4

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### 3680 Mechanical Engineering — Part-time

**(New Course)**

**Bachelor of Engineering BE**

#### Year 1

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<tr>
<td>Fluid Mechanics/Thermodynamics</td>
<td>4 4</td>
</tr>
<tr>
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<td>Properties of Materials</td>
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*Not offered in 1980.*
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*Not offered in 1980.

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**Note 1:** By the end of Stage Six the equivalent of 10½ hours per week for a year of Technical Electives must have been completed. The equivalent of at least six hours per week of Technical Electives must be taken from the Mechanical Engineering Technical Elective list. The remaining Technical Electives may be taken from the Industrial Engineering Technical Elective List or from Years 3 or 4 of other courses in the School or suitable subjects outside the School. Students with good academic records may include some graduate subjects. A counselling service is provided to assist students to choose electives. The selection of certain subjects or combinations of subjects may require the approval of the Head of School.

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

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**3690**

**Mechanical Engineering — Part-time (Old Course)**

**Bachelor of Science (Engineering)**

**BSc(Eng)**

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

### Stage 1

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*Not offered in 1980.

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### Stage 5

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### Stage 6

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

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

### Mechanical Engineering Technical Elective List

#### Applied Mechanics Technical Electives

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<td>Engineering Noise I</td>
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#### Mechanics of Solids Technical Electives

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#### Mechanical Design Technical Electives

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<td>Turbomachines</td>
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<td>Classical Thermodynamics and Combustion</td>
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<td>Hydraulic Transients</td>
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<td>18.022</td>
<td>Industrial Engineering IIB</td>
<td>3</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>18.431</td>
<td>Design for Production</td>
<td>3</td>
<td>3</td>
<td></td>
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<tr>
<td>18.551</td>
<td>Operations Research</td>
<td>3</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>23.051</td>
<td>Nuclear Power Technology</td>
<td>3</td>
<td>3</td>
<td></td>
</tr>
</tbody>
</table>

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

### 3610 Aeronautical Engineering — Full-time (New Course)

#### Bachelor of Engineering

**BE**

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

### Year 3

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Hours per Week</th>
<th>S1</th>
<th>S2</th>
</tr>
</thead>
<tbody>
<tr>
<td>5.034</td>
<td>Engineering Experimentation</td>
<td>1½</td>
<td>1½</td>
<td></td>
</tr>
<tr>
<td>5.043</td>
<td>Industrial Training I†</td>
<td>0</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td>5.073</td>
<td>Numerical Analysis/Mathematics</td>
<td>3</td>
<td>3</td>
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</tr>
</tbody>
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## Year 3

<table>
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<th>Course Code</th>
<th>Course Title</th>
<th>Hours per week</th>
</tr>
</thead>
<tbody>
<tr>
<td>5.303</td>
<td>Mechanical Vibrations</td>
<td>S1 0, S2 1½</td>
</tr>
<tr>
<td>5.343</td>
<td>Linear Systems Analysis</td>
<td>S1 3, S2 0</td>
</tr>
<tr>
<td>5.423</td>
<td>Mechanics of Solids III</td>
<td>S1 2, S2 0</td>
</tr>
<tr>
<td>5.800</td>
<td>Aircraft Design I</td>
<td>S1 3, S2 3</td>
</tr>
<tr>
<td>5.811</td>
<td>Aerodynamics I</td>
<td>S1 3, S2 3</td>
</tr>
<tr>
<td>5.822</td>
<td>Analysis of Aerospace Structures I</td>
<td>S1 2, S2 2</td>
</tr>
<tr>
<td>6.854</td>
<td>Electrical Engineering</td>
<td>S1 0, S2 4</td>
</tr>
<tr>
<td>18.603</td>
<td>Management/Economics, Two GSE Elects</td>
<td>S1 3, S2 3</td>
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</table>

Total: 24½ hours per week

*Not offered in 1980.

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

## Year 4

<table>
<thead>
<tr>
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<th>Course Title</th>
<th>Hours per week</th>
</tr>
</thead>
<tbody>
<tr>
<td>5.033</td>
<td>Experimental Engineering III</td>
<td>S1 1½, S2 1½</td>
</tr>
<tr>
<td>5.043</td>
<td>Industrial Training I†</td>
<td>S1 0, S2 0</td>
</tr>
<tr>
<td>5.071</td>
<td>Engineering Analysis</td>
<td>S1 3½, S2 3½</td>
</tr>
<tr>
<td>5.303</td>
<td>Mechanical Vibrations</td>
<td>S1 1½, S2 0</td>
</tr>
<tr>
<td>5.412</td>
<td>Mechanics of Solids III</td>
<td>S1 2, S2 2</td>
</tr>
<tr>
<td>5.800</td>
<td>Aircraft Design I</td>
<td>S1 0, S2 2½</td>
</tr>
<tr>
<td>5.811</td>
<td>Aerodynamics I</td>
<td>S1 3, S2 3</td>
</tr>
<tr>
<td>5.822</td>
<td>Analysis of Aerospace Structures II</td>
<td>S1 2, S2 2</td>
</tr>
<tr>
<td>6.853</td>
<td>Analogue &amp; Digital Instrumentation*</td>
<td>S1 3 or 3</td>
</tr>
<tr>
<td>18.011</td>
<td>Industrial Engineering IA or</td>
<td>S1 2, S2 2</td>
</tr>
<tr>
<td>18.021</td>
<td>Industrial Engineering IB</td>
<td>S1 3, S2 3</td>
</tr>
</tbody>
</table>

Total: 33 hours per week

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

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

### Plus one of the following technical electives:

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Hours per week</th>
</tr>
</thead>
<tbody>
<tr>
<td>4.913</td>
<td>Materials Science</td>
<td>S1 3, S2 3</td>
</tr>
<tr>
<td>5.324</td>
<td>Automatic Control Engineering</td>
<td>S1 3, S2 3</td>
</tr>
<tr>
<td>8.026</td>
<td>Systems Methods in Civil Engineering</td>
<td>S1 3, S2 3</td>
</tr>
<tr>
<td>18.022</td>
<td>Industrial Engineering IB or</td>
<td>S1 3, S2 3</td>
</tr>
<tr>
<td>18.551</td>
<td>Operations Research</td>
<td>S1 3, S2 3</td>
</tr>
</tbody>
</table>

### 3610 Aeronautical Engineering — Full-time (Old Course)

**Bachelor of Engineering (BE)**

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

### 3610 Aeronautical Engineering — Part-time (New Course)

**Bachelor of Engineering (BE)**

The first three years of this course are identical with the first three years of the part-time new course in Mechanical Engineering.
Year 4*

<table>
<thead>
<tr>
<th>Course</th>
<th>Hours per week</th>
</tr>
</thead>
<tbody>
<tr>
<td>S1</td>
<td>S2</td>
</tr>
<tr>
<td>5.073 Numerical Analysis/Mathematics</td>
<td>3</td>
</tr>
<tr>
<td>5.303 Mechanical Vibrations</td>
<td>0</td>
</tr>
<tr>
<td>5.343 Linear Systems Analysis</td>
<td>3</td>
</tr>
<tr>
<td>5.423 Mechanics of Solids III</td>
<td>2</td>
</tr>
<tr>
<td>5.811 Aerodynamics I</td>
<td>3</td>
</tr>
<tr>
<td>6.854 Electrical Engineering</td>
<td>0</td>
</tr>
<tr>
<td>General Studies Elective</td>
<td>1½</td>
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<td><strong>Total</strong></td>
<td><strong>12½</strong></td>
</tr>
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*Not offered in 1980.

Year 5*

<table>
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<th>Course</th>
<th>Hours per week</th>
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</thead>
<tbody>
<tr>
<td>S1</td>
<td>S2</td>
</tr>
<tr>
<td>5.034 Engineering Experimentation</td>
<td>1½</td>
</tr>
<tr>
<td>5.043 Industrial Training I</td>
<td>0</td>
</tr>
<tr>
<td>5.800 Aircraft Design I</td>
<td>3</td>
</tr>
<tr>
<td>5.822 Analysis of Aerospace Structures I</td>
<td>2</td>
</tr>
<tr>
<td>5.831 Aircraft Propulsion</td>
<td>2</td>
</tr>
<tr>
<td>18.603 Management/Economics</td>
<td>4</td>
</tr>
<tr>
<td>Technical Electives</td>
<td>3</td>
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<td>0</td>
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<tr>
<td><strong>Total</strong></td>
<td><strong>15½</strong></td>
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</table>

*Not offered in 1980.

Year 6*

<table>
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<tr>
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<th>Hours per week</th>
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</thead>
<tbody>
<tr>
<td>S1</td>
<td>S2</td>
</tr>
<tr>
<td>5.044 Industrial Training II</td>
<td>0</td>
</tr>
<tr>
<td>5.051 Thesis</td>
<td>6</td>
</tr>
<tr>
<td>5.062 Communications</td>
<td>2</td>
</tr>
<tr>
<td>5.801 Aircraft Design II</td>
<td>3</td>
</tr>
<tr>
<td>5.812 Aerodynamics II</td>
<td>3</td>
</tr>
<tr>
<td>5.823 Analysis of Aerospace Structures II</td>
<td>2</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>16</strong></td>
</tr>
</tbody>
</table>

*Not offered in 1980.

Note 1: The Technical Electives may be taken from the Mechanical Engineering or Industrial Engineering Technical Electives Lists or from Years 3 or 4 of other courses in the School or suitable subjects outside the School. Students with good academic records may include some graduate subjects. A counselling service is provided to assist students to choose electives. The selection of certain subjects or combinations of subjects may require the approval of the Head of School.

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

3600

**Aeronautical Engineering — Part-time**

(Old 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 old course.

**Stage 5**

<table>
<thead>
<tr>
<th>Course</th>
<th>Hours per week</th>
</tr>
</thead>
<tbody>
<tr>
<td>S1</td>
<td>S2</td>
</tr>
<tr>
<td>5.071 Engineering Analysis</td>
<td>3½</td>
</tr>
<tr>
<td>5.412 Mechanics of Solids III</td>
<td>2</td>
</tr>
<tr>
<td>5.811 Aerodynamics I</td>
<td>3</td>
</tr>
<tr>
<td>5.822 Analysis of Aerospace Structures I</td>
<td>2</td>
</tr>
<tr>
<td>5.303 Mechanical Vibrations</td>
<td>1½</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>12</strong></td>
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</table>

**Stage 6**

<table>
<thead>
<tr>
<th>Course</th>
<th>Hours per week</th>
</tr>
</thead>
<tbody>
<tr>
<td>S1</td>
<td>S2</td>
</tr>
<tr>
<td>5.042 Industrial Experience*</td>
<td>0</td>
</tr>
<tr>
<td>5.801 Aircraft Design</td>
<td>4</td>
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<tr>
<td>5.812 Aerodynamics II</td>
<td>3</td>
</tr>
<tr>
<td>5.823 Analysis of Aerospace Structures II</td>
<td>2</td>
</tr>
<tr>
<td>5.831 Aircraft Propulsion</td>
<td>2</td>
</tr>
<tr>
<td>General Studies Elective</td>
<td>1½</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>12½</strong></td>
</tr>
</tbody>
</table>

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

3700

**Naval Architecture — Full-time**

(New Course)

**Bachelor of Engineering**

BE

The first and second years of this course are identical with the first two years of the full-time new course in Mechanical Engineering. Subject to the Head of the School of Mechanical and Industrial Engineering being satisfied that the present extent of equivalences is maintained, and on his recommendation, Faculty has approved an arrangement by which students who satisfy the requirements of the first two years of the Mechanical Engineering full-time degree course at any other Australian tertiary 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>Course Code</th>
<th>Course Title</th>
<th>Hours per week</th>
</tr>
</thead>
<tbody>
<tr>
<td>5.034</td>
<td>Engineering Experimentation</td>
<td>1½ 1½</td>
</tr>
<tr>
<td>5.043</td>
<td>Industrial Training I†</td>
<td>0 0</td>
</tr>
<tr>
<td>5.073</td>
<td>Numerical Analysis/Mathematics</td>
<td>3 3</td>
</tr>
<tr>
<td>5.303</td>
<td>Mechanical Vibrations</td>
<td>0 1½</td>
</tr>
<tr>
<td>5.423</td>
<td>Mechanics of Solids III</td>
<td>2 2</td>
</tr>
<tr>
<td>5.901</td>
<td>Introduction to Mathematical Modelling and Decision Making</td>
<td>3 0</td>
</tr>
<tr>
<td>5.902</td>
<td>Ship Management Economics</td>
<td>1½ 0</td>
</tr>
<tr>
<td>5.911</td>
<td>Ship Hydrostatics</td>
<td>2 2½</td>
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<tr>
<td>5.921</td>
<td>Ship Structures I</td>
<td>2 2</td>
</tr>
<tr>
<td>5.9311</td>
<td>Principles of Ship Design I</td>
<td>0 3</td>
</tr>
<tr>
<td>5.953</td>
<td>Ship Hydrodynamics</td>
<td>3 2</td>
</tr>
<tr>
<td>6.854</td>
<td>Electrical Engineering</td>
<td>0 4</td>
</tr>
<tr>
<td></td>
<td>Two General Studies Electives</td>
<td>3 3</td>
</tr>
<tr>
<td></td>
<td></td>
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</tr>
<tr>
<td></td>
<td><strong>Total</strong></td>
<td><strong>21½ 24½</strong></td>
</tr>
</tbody>
</table>

*Not offered in 1980.
†Report to be submitted in Week 1 of Session 1 detailing involvement and experience gained prior to Year 3.

## Year 4

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Hours per week</th>
</tr>
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<tbody>
<tr>
<td>5.044</td>
<td>Industrial Training II</td>
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<td>5.051</td>
<td>Thesis</td>
<td>6 6</td>
</tr>
<tr>
<td>5.062</td>
<td>Communications</td>
<td>2 2</td>
</tr>
<tr>
<td>5.922</td>
<td>Ship Structures II</td>
<td>2 2</td>
</tr>
<tr>
<td>5.9321</td>
<td>Principles of Ship Design II</td>
<td>4 2</td>
</tr>
<tr>
<td>5.937</td>
<td>Ship Design Project</td>
<td>3 4</td>
</tr>
<tr>
<td>5.941</td>
<td>Ship Propulsion and Systems</td>
<td>4 4</td>
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<tr>
<td></td>
<td>General Studies Elective</td>
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<tr>
<td></td>
<td><strong>Total</strong></td>
<td><strong>22½ 21½</strong></td>
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</tbody>
</table>

*Not offered in 1980.

## 3700 Naval Architecture — Full-time (Old Course)

### Bachelor of Engineering BE

The first and second years of this course are identical with the first two years of the full-time old course in Mechanical Engineering. Subject to the Head of the School of Mechanical and Industrial Engineering being satisfied that the present extent of equivalences is maintained, and on his recommendation, Faculty has approved an arrangement by which students who satisfy the requirements of the first two years of the Mechanical Engineering full-time degree course at any other Australian tertiary 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>Course Code</th>
<th>Course Title</th>
<th>Hours per week</th>
</tr>
</thead>
<tbody>
<tr>
<td>5.033</td>
<td>Experimental Engineering III</td>
<td>1½ 1½</td>
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<tr>
<td>5.043</td>
<td>Industrial Training I†</td>
<td>0 0</td>
</tr>
<tr>
<td>5.071</td>
<td>Engineering Analysis</td>
<td>3½ 3½</td>
</tr>
<tr>
<td>5.303</td>
<td>Mechanical Vibrations</td>
<td>1½ 0</td>
</tr>
<tr>
<td>5.412</td>
<td>Mechanics of Solids III</td>
<td>2 2</td>
</tr>
<tr>
<td>5.911</td>
<td>Naval Architecture</td>
<td>4 4</td>
</tr>
<tr>
<td>5.921</td>
<td>Ship Structures I</td>
<td>0 4</td>
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<td>5.931</td>
<td>Principles of Ship Design I</td>
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<td>5.932</td>
<td>Principles of Ship Design II</td>
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<td>5.951</td>
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<td>18.021</td>
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<td>General Studies Elective</td>
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<td><strong>22 22</strong></td>
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</table>

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

## Year 4

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Hours per week</th>
</tr>
</thead>
<tbody>
<tr>
<td>5.044</td>
<td>Industrial Training II</td>
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</tr>
<tr>
<td>5.051</td>
<td>Thesis</td>
<td>6 6</td>
</tr>
<tr>
<td>5.062</td>
<td>Communications</td>
<td>2 2</td>
</tr>
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<td>5.933</td>
<td>Principles of Ship Design III</td>
<td>3 3</td>
</tr>
<tr>
<td>5.934</td>
<td>Ship Design Project</td>
<td>3 4½</td>
</tr>
<tr>
<td>5.941</td>
<td>Ship Propulsion and Systems</td>
<td>4 4</td>
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<tr>
<td></td>
<td>General Studies Elective</td>
<td>1½ 1½</td>
</tr>
<tr>
<td>5.922</td>
<td>Ship Structures II</td>
<td>4 0</td>
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**Plus one of the following technical electives:**

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Hours per week</th>
</tr>
</thead>
<tbody>
<tr>
<td>4.913</td>
<td>Materials Science or</td>
<td></td>
</tr>
<tr>
<td>8.026</td>
<td>Systems Methods in Civil Engineering</td>
<td>3 3</td>
</tr>
<tr>
<td>18.022</td>
<td>Industrial Engineering IIB or</td>
<td></td>
</tr>
<tr>
<td>18.551</td>
<td>Operations Research</td>
<td></td>
</tr>
<tr>
<td></td>
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<tr>
<td></td>
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## 3700 Naval Architecture — Part-time (New Course)

### Bachelor of Engineering BE

The first three years of this course are identical with the first three years of the part-time new course in Mechanical Engineering.
### Year 4*

<table>
<thead>
<tr>
<th>Course</th>
<th>Hours per week</th>
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<th>S2</th>
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<tbody>
<tr>
<td>5.073 Numerical Analysis/Mathematics</td>
<td>5.071 Engineering Analysis</td>
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<td>3</td>
</tr>
<tr>
<td>5.423 Mechanics of Solids III</td>
<td>5.303 Mechanical Vibrations</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>5.911 Ship Hydrostatics</td>
<td>5.412 Mechanics of Solids II</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>5.921 Ship Structures I</td>
<td>5.911 Naval Architecture</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>5.953 Ship Hydrodynamics</td>
<td>5.921 Ships Structures I</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>General Studies Elective</td>
<td>5.931 Principles of Ship Design I</td>
<td>2</td>
<td>2</td>
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</tbody>
</table>

*Not offered in 1980.

### Year 5*

<table>
<thead>
<tr>
<th>Course</th>
<th>Hours per week</th>
<th>S1</th>
<th>S2</th>
</tr>
</thead>
<tbody>
<tr>
<td>5.034 Engineering Experimentation</td>
<td>5.042 Industrial Experience*</td>
<td>1½</td>
<td>1½</td>
</tr>
<tr>
<td>5.043 Industrial Training</td>
<td>5.922 Ship Structures II</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>5.901 Introduction to Mathematical Modelling of Decision Makers</td>
<td>5.933 Principles of Ship Design III</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>5.303 Mechanical Vibrations</td>
<td>5.934 Ship Design Project</td>
<td>1½</td>
<td>1½</td>
</tr>
<tr>
<td>5.902 Ship Management Economics</td>
<td>5.941 Ship Propulsion and Systems</td>
<td>3</td>
<td>3</td>
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<tr>
<td>5.922 Ship Structures II</td>
<td>General Studies Elective</td>
<td>2</td>
<td>2</td>
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<tr>
<td>5.931 Principles of Ship Design I</td>
<td>5.932 Principles of Ship Design II</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>5.941 Ship Propulsion and Systems</td>
<td>5.937 Ship Design Project</td>
<td>4</td>
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<tr>
<td>6.854 Electrical Engineering</td>
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</tr>
<tr>
<td>General Studies Elective</td>
<td></td>
<td>3</td>
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</table>

*Not offered in 1980.

### Year 6*

<table>
<thead>
<tr>
<th>Course</th>
<th>Hours per week</th>
<th>S1</th>
<th>S2</th>
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<tbody>
<tr>
<td>5.044 Industrial Training II</td>
<td>5.044 Industrial Training II</td>
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<td>0</td>
</tr>
<tr>
<td>5.051 Thesis</td>
<td>5.051 Thesis</td>
<td>6</td>
<td>6</td>
</tr>
<tr>
<td>5.062 Communications</td>
<td>5.062 Communications</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>5.9321 Principles of Ship Design II</td>
<td>5.9321 Principles of Ship Design II</td>
<td>4</td>
<td>4</td>
</tr>
<tr>
<td>5.937 Ship Design Project</td>
<td>5.937 Ship Design Project</td>
<td>3</td>
<td>3</td>
</tr>
</tbody>
</table>

*Not offered in 1980.

### Department of Industrial Engineering

The Department of Industrial Engineering offers a course in Industrial Engineering leading to the award of the degree of Bachelor of Engineering. This course is designed for students with engineering ability whose interests lie in the planning, developing and control of manufacturing or service operations. It may be taken either on a full-time basis, nominally over four years or on a part-time basis, subject to approval by the Head of School.

The first two years of the degree course, taken full-time, or the first three years taken part-time provide the student with a sound foundation in the basic science and engineering subjects, and this knowledge is used and extended in the later years in the study of the industrial subjects. 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.

3710 Naval Architecture — Part-time (Old 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 old course.
Traditionally 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.

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.

3660
Industrial Engineering — Full-time
(New Course)

Bachelor of Engineering
BE

The first and second years of this course are identical with the first two years of the full-time new course in Mechanical Engineering.
### Year 3*

<table>
<thead>
<tr>
<th>Course</th>
<th>Hours per week</th>
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<tbody>
<tr>
<td>5.043 Industrial Training †</td>
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<tr>
<td>6.854 Electrical Engineering</td>
<td>0 4</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>
</tr>
<tr>
<td>18.003 Numerical Methods/Industrial Experimentation</td>
<td>1½ 2</td>
</tr>
<tr>
<td>18.303 Methods Engineering</td>
<td>2 2</td>
</tr>
<tr>
<td>18.403 Production Design and Technology</td>
<td>4 4</td>
</tr>
<tr>
<td>18.413 Design for Industrial Engineers</td>
<td>2 3</td>
</tr>
<tr>
<td>18.503 Operations Research A</td>
<td>3 3</td>
</tr>
<tr>
<td>18.603 Management/Economics</td>
<td>4 0</td>
</tr>
<tr>
<td>18.803 Optimization</td>
<td>3 0</td>
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<tr>
<td>Two General Studies Electives</td>
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<td><strong>Total</strong></td>
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### Year 4*

<table>
<thead>
<tr>
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<tr>
<td>5.044 Industrial Training II</td>
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<tr>
<td>5.051 Thesis</td>
<td>6 6</td>
</tr>
<tr>
<td>5.062 Communications</td>
<td>2 2</td>
</tr>
<tr>
<td>18.012 Industrial Engineering IIIA</td>
<td>3 3</td>
</tr>
<tr>
<td>18.022 Industrial Engineering IIIB</td>
<td>3 3</td>
</tr>
<tr>
<td>18.431 Design for Production</td>
<td>3 3</td>
</tr>
<tr>
<td>18.551 Operations Research</td>
<td>3 3</td>
</tr>
<tr>
<td>General Studies Elective</td>
<td></td>
</tr>
<tr>
<td><strong>Plus one elective chosen from:</strong></td>
<td></td>
</tr>
<tr>
<td>4.913 Materials Science</td>
<td></td>
</tr>
<tr>
<td>5.324 Automatic Control Engineering</td>
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<tr>
<td>5.332 Dynamics of Machines II</td>
<td>3 3</td>
</tr>
<tr>
<td>5.413 Mechanics of Solids II</td>
<td></td>
</tr>
<tr>
<td>8.026 Systems Methods in Civil Engineering</td>
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</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>24½</strong></td>
</tr>
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</table>

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

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

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**3660 Industrial Engineering — Full-time (Old Course)**

**Bachelor of Engineering BE**

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

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**3660 Industrial Engineering — Part-time (New Course)**

**Bachelor of Engineering BE**

The first three years of this course are identical with the first three years of the part-time new course in Mechanical Engineering.
### Year 4*

<table>
<thead>
<tr>
<th>Course</th>
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<tbody>
<tr>
<td>6.854 Electrical Engineering</td>
<td>S1 0, S2 4</td>
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<tr>
<td>18.003 Numerical Methods/Industrial Experimentation</td>
<td>S1 1½, S2 2</td>
</tr>
<tr>
<td>18.403 Production Design and Technology</td>
<td>S1 4, S2 2</td>
</tr>
<tr>
<td>18.413 Design for Industrial Engineers</td>
<td>S1 2, S2 3</td>
</tr>
<tr>
<td>18.503 Operations Research A</td>
<td>S1 3, S2 3</td>
</tr>
<tr>
<td>18.803 Optimization</td>
<td>S1 3, S2 0</td>
</tr>
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<td><strong>Total</strong> 13½, 16**</td>
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</table>

*Not offered in 1980.

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### Year 5*

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<tr>
<td>5.043 Industrial Training I</td>
<td>S1 0, S2 0</td>
</tr>
<tr>
<td>14.001 Introduction to Accounting A</td>
<td>S1 1½, S2 0</td>
</tr>
<tr>
<td>14.002 Introduction to Accounting B</td>
<td>S1 0, S2 1½</td>
</tr>
<tr>
<td>18.004 Manufacturing Management</td>
<td>S1 2, S2 2</td>
</tr>
<tr>
<td>18.303 Methods Engineering</td>
<td>S1 2, S2 2</td>
</tr>
<tr>
<td>18.603 Management/Economics</td>
<td>S1 4, S2 0</td>
</tr>
<tr>
<td>Technical Electives</td>
<td>S1 5, S2 5</td>
</tr>
<tr>
<td>General Studies Elective</td>
<td>S1 0, S2 3</td>
</tr>
<tr>
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<td><strong>Total</strong> 14½, 13½**</td>
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</table>

*Not offered in 1980.

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### Year 6*

<table>
<thead>
<tr>
<th>Course</th>
<th>Hours per week</th>
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<tbody>
<tr>
<td>5.044 Industrial Training II</td>
<td>S1 0, S2 0</td>
</tr>
<tr>
<td>5.051 Thesis</td>
<td>S1 6, S2 6</td>
</tr>
<tr>
<td>5.062 Communications</td>
<td>S1 2, S2 2</td>
</tr>
<tr>
<td>Technical Electives</td>
<td>S1 5, S2 5</td>
</tr>
<tr>
<td>General Studies Elective</td>
<td>S1 1½, S2 1½</td>
</tr>
<tr>
<td></td>
<td><strong>Total</strong> 15½, 14½**</td>
</tr>
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</table>

*Not offered in 1980.

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### Stage 5

<table>
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<tr>
<th>Course</th>
<th>Hours per week</th>
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<tr>
<td>5.071 Engineering Analysis</td>
<td>S1 3½, S2 3½</td>
</tr>
<tr>
<td>5.112 Mechanical Engineering Design II</td>
<td>S1 3, S2 3</td>
</tr>
<tr>
<td>5.331 Dynamics of Machines I</td>
<td>S1 2, S2 2</td>
</tr>
<tr>
<td>14.001 Introduction to Accounting A</td>
<td>S1 1½, S2 2</td>
</tr>
<tr>
<td>14.002 Introduction to Accounting B</td>
<td>S1 0, S2 1½</td>
</tr>
<tr>
<td>18.011 Industrial Engineering IA</td>
<td>S1 2, S2 2</td>
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<tr>
<td>18.021 Industrial Engineering IB</td>
<td>S1 2, S2 2</td>
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<td><strong>Total</strong> 14, 14**</td>
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### Stage 6

<table>
<thead>
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<tbody>
<tr>
<td>5.042 Industrial Experience*</td>
<td>S1 0, S2 0</td>
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<td>18.022 Industrial Engineering IIB</td>
<td>S1 3, S2 3</td>
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<tr>
<td>18.432 Design of Production Systems</td>
<td>S1 6, S2 6</td>
</tr>
<tr>
<td>18.551 Operations Research</td>
<td>S1 3, S2 3</td>
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<tr>
<td>General Studies Elective</td>
<td>S1 1½, S2 1½</td>
</tr>
<tr>
<td></td>
<td><strong>Total</strong> 13½, 13½**</td>
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</table>

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

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### Industrial Engineering Technical Elective List

#### Production Engineering Technical Electives

<table>
<thead>
<tr>
<th>Course</th>
<th>Hours per week</th>
</tr>
</thead>
<tbody>
<tr>
<td>18.204 Introduction to Automation I</td>
<td>S1 3, S2 3</td>
</tr>
<tr>
<td>18.214 Introduction to Automation II</td>
<td>S1 3, S2 3</td>
</tr>
<tr>
<td>18.224 Numerical Control of Machine Tools</td>
<td>S1 3, S2 3</td>
</tr>
<tr>
<td>18.404 Design for Production</td>
<td>S1 2, S2 2</td>
</tr>
<tr>
<td>18.262G Economics of Machining for Automation</td>
<td>S1 3, S2 3</td>
</tr>
<tr>
<td>18.371G Factory Design and Layout</td>
<td>S1 3, S2 0</td>
</tr>
</tbody>
</table>

---

Note 1: By the end of Stage Six, the equivalent of 10 hours per week for a year of Technical Electives must have been completed. The equivalent of at least 6 hours per week for a year of Technical Electives must be taken from the Industrial Engineering Technical Elective List. The remaining Technical Electives may be taken from the Mechanical Engineering Technical Elective List or from Years 3 or 4 of other courses in the School or suitable subjects outside the School. Students with good academic records may include some graduate subjects. A counseling service is provided to assist students to choose electives. The selection of certain subjects or combinations of subjects may require the approval of the Head of School.

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

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Hours per week</th>
<th>S1</th>
<th>S2</th>
</tr>
</thead>
<tbody>
<tr>
<td>18.671G</td>
<td>Decision Theory</td>
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<tr>
<td>18.764G</td>
<td>Management of Distribution Systems</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>18.765G</td>
<td>Optimization of Networks</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>18.777G</td>
<td>Time Series and Forecasting</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>18.864G</td>
<td>Applied Geometric Programming</td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>18.874G</td>
<td>Dynamic Programming</td>
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<td></td>
<td></td>
</tr>
<tr>
<td>18.878G</td>
<td>Industrial Application of Mathematical Programming</td>
<td></td>
<td>2</td>
<td>2</td>
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</tbody>
</table>

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

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

The Bachelor of Surveying is a well-rounded course with a strong surveying base, aimed at preparing the graduate for a broad range of career opportunities, including land boundary surveying, engineering surveying, 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 and 1979 and 1980 are the transition years in the implementation of the new course.

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

<table>
<thead>
<tr>
<th>Session</th>
<th>Course Code</th>
<th>Course Title</th>
<th>Hours per week</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>1.971</td>
<td>Physics I</td>
<td>6</td>
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<tr>
<td></td>
<td>5.0102</td>
<td>Introduction to Engineering Design</td>
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<tr>
<td></td>
<td>10.001</td>
<td>Mathematics I</td>
<td>6</td>
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<td>29.001</td>
<td>Surveying I</td>
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<td>29.800</td>
<td>Survey Draughting</td>
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<tr>
<td></td>
<td>29.700</td>
<td>Professional Orientation*</td>
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<tr>
<td></td>
<td>29.191</td>
<td>Survey Camp I†</td>
<td>1 ½</td>
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</table>

   24 ½

*Three half-day excursions are an essential part of this subject.
†Students are required to attend a one-week Survey Camp equivalent to 1½ class contact hours per week in each session.
### Year 2

#### Session 1
- 1.962 Physics of Measurement  
- 10.022 Engineering Mathematics II (1st part)  
- 10.341A Statistics I  
- 27.295 Physical Geography for Surveyors†  
- 29.003 Surveying III  
- 29.151 Survey Computations I  
- 29.192 Survey Camp II*  

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

Total of 23½ class contact hours per week.

#### Session 2
- 8.711 Engineering for Surveyors I  
- 10.022 Engineering Mathematics II (2nd part)  
- 10.341B Statistics SU  
- 29.004 Surveying IV  
- 29.801 Cartography I  
- 29.701 Seminar I  
- 29.121 Electronics for Surveyors  
- 29.192 Survey Camp II*  

<table>
<thead>
<tr>
<th>Course</th>
<th>Hpw</th>
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<tbody>
<tr>
<td>8.711 Engineering for Surveyors I</td>
<td>3</td>
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<tr>
<td>10.022 Engineering Mathematics II (2nd part)</td>
<td>4</td>
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<tr>
<td>10.341B Statistics SU</td>
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<tr>
<td>29.004 Surveying IV</td>
<td>4½</td>
</tr>
<tr>
<td>29.801 Cartography I</td>
<td>3</td>
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<tr>
<td>29.701 Seminar I</td>
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</tr>
<tr>
<td>29.121 Electronics for Surveyors</td>
<td>2</td>
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<tr>
<td>29.192 Survey Camp II*</td>
<td>1½</td>
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</table>

Total of 24 class contact hours per week.

### Year 3

#### Session 1
- 8.712 Engineering for Surveyors II  
- 29.005 Surveying V  
- 29.152 Survey Computations II  
- 29.651 Land Development I  
- 29.661 Cadastral Surveying and Land Law I  
- 36.411 Town Planning  
- General Studies Elective  

<table>
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<tr>
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<td>29.005 Surveying V</td>
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<tr>
<td>29.152 Survey Computations II</td>
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<td>29.651 Land Development I</td>
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<tr>
<td>29.661 Cadastral Surveying and Land Law I</td>
<td>2</td>
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<tr>
<td>36.411 Town Planning</td>
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<tr>
<td>General Studies Elective</td>
<td>3</td>
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</tbody>
</table>

Total of 22 class contact hours per week.

### Year 4

#### Session 1
- 29.212 Geodesy II  
- 29.312 Astronomy II  
- 29.512 Photogrammetry II  
- 29.653 Land Development III  
- 29.704 Management I  
- 29.702 Seminar II  
- Electives*  
- 29.196 Survey Camp IV**  

<table>
<thead>
<tr>
<th>Course</th>
<th>Hpw</th>
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</thead>
<tbody>
<tr>
<td>29.212 Geodesy II</td>
<td>3</td>
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<tr>
<td>29.312 Astronomy II</td>
<td>2</td>
</tr>
<tr>
<td>29.512 Photogrammetry II</td>
<td>3</td>
</tr>
<tr>
<td>29.653 Land Development III</td>
<td>3</td>
</tr>
<tr>
<td>29.704 Management I</td>
<td>2</td>
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<tr>
<td>29.702 Seminar II</td>
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<td>Electives*</td>
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<td>29.196 Survey Camp IV**</td>
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Total of 26 class contact hours per week.

<table>
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<tr>
<td>29.705 Management II</td>
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</tr>
<tr>
<td>29.703 Seminar III</td>
<td>1</td>
</tr>
<tr>
<td>Electives*</td>
<td>15</td>
</tr>
</tbody>
</table>

**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

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

Transitional arrangements in 1980 for students who wish to graduate under the old course.

Part 8† (Old Course)

<table>
<thead>
<tr>
<th>Course Code</th>
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<tbody>
<tr>
<td>29.006</td>
<td>Surveying VI</td>
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<tr>
<td>29.212</td>
<td>Geodesy II</td>
<td>3</td>
</tr>
<tr>
<td>29.312</td>
<td>Astronomy II</td>
<td>2</td>
</tr>
<tr>
<td>29.512</td>
<td>Photogrammetry II</td>
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<tr>
<td>29.653</td>
<td>Land Development III</td>
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<tr>
<td>29.662</td>
<td>Cadastral Surveying and Land Law II</td>
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<tr>
<td>29.704</td>
<td>Management I</td>
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<tr>
<td>29.196</td>
<td>Survey Camp II**</td>
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<td></td>
<td>Two Electives*</td>
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</tbody>
</table>

| Total       |                                  | 25  |

†Offered in Session 1, 1980 only.

**Two weeks of office computations equivalent to 84 class contact hours.

*Electives chosen from:

29.161 Hydrographic Surveying I
29.173 Project
29.514 Principles of Remote Sensing
29.802 Cartography II
29.034 Mine Surveying
Graduate Study

Faculty of Engineering
Enrolment Procedures

All students re-enrolling in 1980 or enrolling in graduate courses should obtain a copy of the free booklet Enrolment Procedures 1980 available from School Offices and the Admissions Office. This booklet provides detailed information on enrolment procedures and fees, enrolment timetables by Faculty and course, enrolment in miscellaneous subjects, locations and hours of Cashiers and late enrolments.

Graduate School of Engineering

In November 1964 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 see brochures prepared by the Schools.

Research Degrees

The Faculty of Engineering provides facilities for well-qualified graduates to engage in advanced studies and research in all six schools, leading to the award of the degrees of Doctor of Philosophy, Master of Engineering, Master of Science or Master of Surveying.

Course Work Degrees

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. A degree may be awarded through formal course work, a combination of formal course work and the completion of a report on a project or a research thesis, or completion of a research thesis only. The number of credits for a project report are 9, and for a research thesis 18 or 36.

Students are encouraged to develop interdisciplinary attitudes and, with the approval of the Heads 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 approval of the Head of School, is able to select a program of studies best suited to his or her needs.

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.

Part-time candidates may be required to attend lectures on one half day per week in addition to the evenings.

The degree of Master of Biomedical Engineering is primarily obtained through course work but includes a research project conducted in either a hospital or other appropriate institution. The program of study, including the preparation of a thesis normally total 60 credit points. Students with advanced standing may be given limited exemption by the Higher Degree Committee of the Faculty of Engineering.

Graduate Diploma

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. 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 specialty, 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 course in Engineering Developments is intended for those who wish to take a more general program in several areas of interest. It 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 Studies are determined after consultation with that school and examination will be through that school.

### Graduate Subjects

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

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

### School of Civil Engineering

<table>
<thead>
<tr>
<th>Code</th>
<th>Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>8.701G</td>
<td>Economic Decision Making in Civil Engineering</td>
<td>3</td>
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<tr>
<td>8.702G</td>
<td>Network Methods in Civil Engineering</td>
<td>3</td>
</tr>
<tr>
<td>8.703G</td>
<td>Optimization Techniques in Civil Engineering</td>
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<td>8.704G</td>
<td>Stochastic Methods in Civil Engineering</td>
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<td>8.705G</td>
<td>Systems Modelling</td>
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<td>8.706G</td>
<td>Experimental Methods in Engineering Research</td>
<td>3</td>
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<tr>
<td>8.710G</td>
<td>Advanced Topics in Optimization in Civil Engineering</td>
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</tr>
<tr>
<td>8.714G</td>
<td>Advanced Topics in Systems Modelling</td>
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<tr>
<td>8.723G</td>
<td>Construction Design</td>
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<tr>
<td>8.724G</td>
<td>Construction Technology</td>
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</tr>
<tr>
<td>8.725G</td>
<td>Construction Accounting and Control</td>
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<tr>
<td>8.726G</td>
<td>Construction Law and Professional Practice</td>
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<td>8.727G</td>
<td>Construction Planning and Estimating</td>
<td>6</td>
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<tr>
<td>8.728G</td>
<td>Design of Construction Operations</td>
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<td>8.748G</td>
<td>Pavement Materials I</td>
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<tr>
<td>8.749G</td>
<td>Pavement Materials II</td>
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<td>8.750G</td>
<td>Pavement Design and Evaluation I</td>
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<td>8.751G</td>
<td>Pavement Design and Evaluation II</td>
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<td>8.752G</td>
<td>Terrain Engineering</td>
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<tr>
<td>8.753G</td>
<td>Soil Engineering</td>
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<tr>
<td>8.754G</td>
<td>Applied Soil Mechanics</td>
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<tr>
<td>8.755G</td>
<td>Materials of Construction (Concrete Technology) I</td>
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<tr>
<td>8.756G</td>
<td>Materials of Construction (Metals and Plastics)</td>
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<tr>
<td>8.758G</td>
<td>Soil Mechanics</td>
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<td>8.759G</td>
<td>Rock Mechanics</td>
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<tr>
<td>8.760G</td>
<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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<tr>
<td>8.766G</td>
<td>Welding in Structural Engineering</td>
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<td>8.771G</td>
<td>Foundation Engineering</td>
<td>6</td>
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<tr>
<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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<tr>
<td>8.802G</td>
<td>Elastic Stability I</td>
<td>3</td>
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<tr>
<td>8.803G</td>
<td>Elastic Stability II</td>
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<td>8.804G</td>
<td>Vibration of Structures I</td>
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<td>8.805G</td>
<td>Vibration of Structures II</td>
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<td>8.806G</td>
<td>Prestressed Concrete I</td>
<td>3</td>
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<tr>
<td>8.807G</td>
<td>Prestressed Concrete II</td>
<td>3</td>
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<tr>
<td>8.808G</td>
<td>Prestressed Concrete II</td>
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<tr>
<td>8.809G</td>
<td>Reinforced Concrete I</td>
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<tr>
<td>8.810G</td>
<td>Reinforced Concrete II</td>
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<tr>
<td>8.811G</td>
<td>Reinforced Concrete III</td>
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<td>8.812G</td>
<td>Plastic Analysis and Design of Steel Structures I</td>
<td>3</td>
</tr>
<tr>
<td>8.813G</td>
<td>Plastic Analysis and Design of Steel Structures II</td>
<td>3</td>
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<tr>
<td>8.814G</td>
<td>Analysis of Plates and Shells</td>
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<td>8.817G</td>
<td>Experimental Structural Analysis I</td>
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<td>8.818G</td>
<td>Bridge Design I</td>
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<tr>
<td>8.819G</td>
<td>Bridge Design II</td>
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<tr>
<td>8.820G</td>
<td>Structural Analysis and Finite Elements I (SAFE I)</td>
<td>3</td>
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</tbody>
</table>
8.821G Structural Analysis and Finite Elements II (SAFE II) 3
8.822G Structural Analysis and Finite Elements III (SAFE III) 3
8.830G Hydromechanics 3
8.831G Closed Conduit Flow 3
8.832G Pipe Networks and Transients 3
8.835G Coastal Engineering I 3
8.836G Coastal Engineering II 3
8.837G Hydrological Processes 3
8.838G Flood Design 3
8.839G Advanced Flood Estimation 3
8.840G Reservoir Design and Yield Determination 3
8.841G Hydrometeorology 3
8.842G Groundwater Hydrology 3
8.843G Groundwater Hydraulics 3
8.844G Soil-Water Hydrology 3
8.847G Water Resources Policy 3
8.848G Water Resources System Design 3
8.849G Irrigation 3
8.850G Drainage of Agricultural Lands 3
8.851G Unit Operations in Public Health Engineering 3
8.852G Water Distribution and Sewage Collection 3
8.853G Public Health Science 6
8.854G Solid and Liquid Waste Management 2
8.855G Water and Wastewater Analysis and Quality Requirements 3
8.856G Water Treatment 3
8.857G Sewage Treatment and Disposal 3
8.858G Water Quality Management 3
8.860G Investigation of Groundwater Resources I 3
8.861G Investigation of Groundwater Resources II 3
8.862G Fluvial Hydraulics 3
8.863G Estuarine Hydraulics 3
8.901G Civil Engineering Elective I 3
8.902G Civil Engineering Elective II 3
8.909G Project 9
8.918G Research Project 18
8.936G Research Project* 36
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
6.169G 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
6.336G Digital Communication Networks
6.337G Sound Broadcast Systems
6.338G Television Systems
6.339G Electroacoustics
6.344G Communication Theory
6.345G Analogue and Digital Filters
6.347G Digital Communications
6.348G Optical Communications
6.349G Radar and Navigation Aids
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
6.379G Solar Cells — Operating Principles, Technology and System Applications
6.380G Data Acquisition and Analysis in Remote Sensing.
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

**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.)

<table>
<thead>
<tr>
<th>Subject</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>6.050G Occasional Elective</td>
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<tr>
<td>6.053G Advanced Mathematics II</td>
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<tr>
<td>6.054G Numerical Computation</td>
<td></td>
</tr>
<tr>
<td>6.071G Electrical Measurements</td>
<td></td>
</tr>
<tr>
<td>6.073G Precise Electrical Measurements</td>
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</tbody>
</table>

* A 36 Credit Research Project is not normally approved in the School of Civil Engineering. The normal program includes a 9 Credit Project.
<table>
<thead>
<tr>
<th>Courses</th>
<th>Credits</th>
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<tbody>
<tr>
<td>6.650G Computer Science Elective</td>
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<tr>
<td>6.651G Digital Electronics</td>
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</tr>
<tr>
<td>6.654G Digital Systems</td>
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</tr>
<tr>
<td>6.655G Computer Organization and Architecture</td>
<td></td>
</tr>
<tr>
<td>6.656G Software Systems A</td>
<td></td>
</tr>
<tr>
<td>6.657G Software Systems B</td>
<td></td>
</tr>
<tr>
<td>10.061G Advanced Mathematics I</td>
<td></td>
</tr>
<tr>
<td>10.361G Statistics</td>
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</tr>
<tr>
<td>6.909G Project</td>
<td>9 credits</td>
</tr>
<tr>
<td>6.918G Research Project</td>
<td>18 credits</td>
</tr>
<tr>
<td>6.936G Research Project</td>
<td>36 credits</td>
</tr>
<tr>
<td>10.361 G Advanced Mathematics I</td>
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<td>10.362 G Statistics</td>
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<tr>
<td>6.909G Project</td>
<td>9 credits</td>
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<tr>
<td>6.918G Research Project</td>
<td>18 credits</td>
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<tr>
<td>6.936G Research Project</td>
<td>36 credits</td>
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</tbody>
</table>

* Candidates wishing to specialize in Refrigeration and Air Conditioning should select these subjects.

†Nine credit projects are not normally approved by the School of Electrical Engineering.

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**School of Mechanical and Industrial Engineering**

<table>
<thead>
<tr>
<th>Courses</th>
<th>Credits</th>
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<tbody>
<tr>
<td>5.045-6-7G Advanced Topics in Mechanical Engineering</td>
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</tr>
<tr>
<td>5.073G Ordinary Differential Equations in Mechanical Engineering</td>
<td>3</td>
</tr>
<tr>
<td>5.075-6G Computation Methods in Mechanical Engineering I, II</td>
<td>2,2</td>
</tr>
<tr>
<td>5.077-8G Analogue Computation in Mechanical Engineering I, II</td>
<td>2,2</td>
</tr>
<tr>
<td>5.086G Digital Logic Fundamentals for Mechanical Engineers</td>
<td>3</td>
</tr>
<tr>
<td>5.087G Microprocessor Fundamentals for Mechanical Engineers</td>
<td>3</td>
</tr>
<tr>
<td>*5.151-2G Refrigeration and Air Conditioning Design I, II</td>
<td>3,3</td>
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<tr>
<td>5.304-5G Advanced Dynamics I, II</td>
<td>2,2</td>
</tr>
<tr>
<td>5.315-6G Mechanisms I, II</td>
<td>2,2</td>
</tr>
<tr>
<td>*5.321-2G Automatic Control I, II</td>
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<tr>
<td>5.328-9G Control and Modelling of Mechanical Systems I, II</td>
<td>2,2</td>
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<tr>
<td>5.335G Vibrations</td>
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<td>5.336G Random Vibrations</td>
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<tr>
<td>5.401G Experimental Stress Analysis</td>
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<tr>
<td>5.415-6G Stress Analysis for Mechanical Engineering Design I, II</td>
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<tr>
<td>5.417G Mechanics of Fracture and Fatigue</td>
<td>3</td>
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<tr>
<td>5.428G Advanced Mechanics of Materials</td>
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<tr>
<td>5.491-2G Biomechanics I, II</td>
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<tr>
<td>5.615G Reciprocating Internal Combustion Engines</td>
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<tr>
<td>5.621-2G Gasdynamics I, II</td>
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<td>5.631-2G Lubrication Theory and Design I, II</td>
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<td>5.653-4G Acoustic Noise I, II</td>
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<td>*5.712-3G Convection Heat Transfer I, II</td>
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<td>5.718G Conduction Heat Transfer</td>
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<tr>
<td>5.719G Radiation Heat Transfer</td>
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<tr>
<td>5.720G Solar Collector Systems</td>
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<tr>
<td>5.725G Statistical Thermodynamics</td>
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<tr>
<td>5.735G Direct Energy Conversion</td>
<td>2</td>
</tr>
<tr>
<td>*5.751-2G Refrigeration, Air Conditioning and Cryogenics I, II</td>
<td>2,2</td>
</tr>
<tr>
<td>*5.758G Refrigeration and Air Conditioning Applications</td>
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**Department of Industrial Engineering**

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<td>*18.370G Design of Work Systems</td>
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<td>*18.371G Factory Design and Layout</td>
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<td>18.763G Variational Methods in Operations Research</td>
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<td>18.764G Management of Distribution Systems</td>
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<td>18.765G Optimization of Networks</td>
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<td>18.770G Stochastic Control</td>
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<td>18.772G Information Processing Systems in Organizations</td>
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<td>18.774G Applied Stochastic Processes</td>
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<td>18.775G Networks and Graphs</td>
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<td>18.776G Production and Inventory Control</td>
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<td>18.777G Time Series and Forecasting</td>
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**School of Nuclear Engineering**

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

Each subject counts as three credits.

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<td>23.015G</td>
<td>Multigroup Reactor Theories</td>
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<td>23.016G</td>
<td>Neutron Kinetics and Reactor Dynamics</td>
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<td>Boiling and Two Phase Flow</td>
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<td>23.027G</td>
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<td>Reactor Accident and Safety Analysis</td>
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<td>23.043G</td>
<td>Nuclear Power Costing and Economics</td>
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School of Transport and Highways

Head of School
Professor W. R. Blunden

24.001G Human Factors in Transport 3
24.002G Transport, Environment, Community Interaction 6
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 I 3
24.011G Highway Engineering Practice Part II 3
24.012G Economics for Transport Studies 3
24.013G Transport Economics 3
24.014G Transport Systems Part I 3
24.015G Transport Systems Part II 3
24.016G Traffic Engineering 6
24.017G Transport and Traffic Flow Theory 6
24.018G Statistics for Transport Studies Part I 3
24.019G Statistics for Transport Studies Part II 3
24.020G Mathematical Techniques for Transport Studies 3
24.021G Law and Administration 3
24.022G Pavement Materials I 3
24.023G Pavement Materials II 3
24.024G Pavement Design and Evaluation I 3
24.025G Pavement Design and Evaluation II 3
24.026G Bridges and Highway Structure Part I 3
24.027G Bridges and Highway Structure Part II 3
24.028G Transport and Highways Elective 3
24.909G Project 9
24.918G Research Project 18
24.936G Research Project 36

*32.500G Computing for Biomedical Engineers 3
32.510G Introductory Biomechanics 3
32.511G Mechanics of the Human Body 4
†32.521G Biomechanics of Physical Rehabilitation 4
†32.531G Mechanical Properties of Biomaterials 4
32.611G Medical Instrumentation 3
32.612G Biological Signal Analysis 3
*32.621G Medical Electronics 3

*For medical graduates only.
†Only one of these subjects is offered.
§Research project may be done concurrently with course work during the other 2/3 sessions. An 18 credit project is the normal requirement.

Graduate Diplomas

In all schools of the Faculty subjects listed above may be included in Graduate Diploma Programs. In addition the following subjects are offered specifically for Graduate Diploma students. Not all electives are necessarily offered in any particular year.

School of Electrical Engineering

6.060G Microprocessor Systems 3
6.167G Propagation and Transmission of Electrical Waves 3
6.340G Communications Electronics 3
6.341G Signal Analysis 3
6.343G Digital and Analogue Communications 3
6.457G Cybernetic Engineering 3
6.481G Biology and Physiology for Engineers 3
6.659G Date Bases and Networks 3
6.660G Programming II 3
6.661G Business Information Systems 3
6.662G Computing Practice 3

Centre for Biomedical Engineering

Director
Associate Professor P. C. Farrell

32.011 Biomedical Statistics 4
32.010G Biomedical Engineering Practice 2
§32.018G Research Project 18
32.020G Radiation Physics 4
§32.030G Research Project 30
32.311G Mass Transfer in Medicine 4
32.321G Fluid Mechanics for Artificial Organs 4
32.331G Biocompatibility 2

School of Mechanical and Industrial Engineering

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

24.101G Characteristics of Transport 6
24.102G Fundamentals of Transport Economics 6
24.103G Introduction to Statistics 6
24.104G Introduction to Traffic Theory 6
24.105G Fundamentals of Transport Planning 6
24.106G Traffic Operation and Control 6
24.107G Soil Mechanics applied to Road Engineering 8
24.108G Road Engineering Practice 8
24.109G Road Location and Design Part I 7
24.110G Road Location and Design Part II 7
24.111G Road Construction 6
24.112G Highway Materials 6
24.113G Transport and the Environment 6

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.

**Projects and Research Projects**

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 defects 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.

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

Electrical Engineering

Communications
Communication theory and system theory. 
Digital communication systems. 
Digital signal processing and filtering. 
Active and adaptive circuits. 
Computer modelling for system design. 
Microprocessor applications. 
Microwave integrated circuits. 
Adaptive antenna arrays. 
Optical communications, optical fibre studies and 
measurements. 
Solid state devices including surface elastic wave devices. 
Acoustics and psychoacoustics. Hearing aid development. 
Electronic music. 
Seismic signal processing.

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 multistorey 
flat plate structures. 
Development and application of finite element techniques. 
Investigation of elastic stability. 
Analysis of dynamic response of highway bridges and 
buildings.
Special Electrical machines.
Power electronics.
Electric vehicles.
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.

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 grills.
Vortex shedding in aeronautical and maritime engineering.
Economic studies relative to ship industry.
Hydrodynamics of planning surfaces.

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.

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.
Ultrasound holography.
Opto-electronic devices.
Periodically parametric systems.

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.
Engineering

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.

Geodesy

Physical geodesy, geoid and gravimetric studies, Earth models.
Satellite geodesy, precise orbit determinations, satellite altimetry analysis.
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 geodetic 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.

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.
Risk assessment.

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.

Surveying

Adjustments and Error Theory

Applications in geodetic surveying and photogrammetry.
Solution of large systems of equations.
Computation systems for desk top computers.

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.

Precise Surveying

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

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.
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.

Biomedical Engineering

Modelling of respiratory function, cardiac function, nervous system, artificial kidney therapy, extracorporeal heart-lung support, endocrine system and other body systems.
Microprocessor control of medical equipment.
Limb and joint dynamics studies.
Development of implantable electrodes.
Development of rehabilitation devices.
Development and evaluation of new hospital equipment and treatment procedures.
Signal analyses of wave forms from medical diagnostic equipment.
Implants for fracture support and joint replacement.
Graduate Study

Conditions for the Award of Higher Degrees

First Degrees

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

For the list of undergraduate courses and degrees offered see Disciplines of the University: Faculty Table (Undergraduate Study) in the Calendar.

Higher Degrees

The following is the list of higher degrees and graduate diplomas of the University, together with the publication in which the conditions for the award appear.

For the list of graduate degrees by research and course work, arranged in faculty order, see Disciplines of the University: Faculty Table (Graduate Study) in the Calendar.

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

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Doctor of Philosophy (PhD)

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 the candidate holds a degree without honours from the University of New South Wales or other approved university, have achieved by subsequent work and study a standard recognized by the higher degree committee of the appropriate faculty or board of studies (hereinafter referred to as the committee) as equivalent to honours; or

   (4) in exceptional cases, submit such other evidence of general and professional qualifications as may be approved by the Professorial Board on the recommendation of the committee.

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

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

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

   (1) a candidate fully engaged in advanced study and research for the degree, who before registration was engaged upon research to the satisfaction of the committee, may be exempted from not more than two academic sessions;

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

   (3) in exceptional cases, the Professorial Board on the recommendation of the committee may grant permission for a candidate to be exempted from not more than two academic sessions.
6. A candidate who is fully engaged in research for the degree shall present for examination not later than ten academic sessions from the date of registration. A candidate not fully engaged in research shall present for examination not later than twelve academic sessions from the date of registration. In special cases an extension of these times may be granted by the committee.

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

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

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

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

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

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

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

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

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

(b) it must be an original and significant contribution to the knowledge of the subject.

(c) 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.

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

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

13. Every candidate shall be required to submit with the thesis a short abstract of the thesis comprising not more than 600 words.

The abstract shall indicate:

(a) the problem investigated;

(b) the procedures followed;

(c) the general results obtained;

(d) the major conclusions reached;

but shall not contain any illustrative matter, such as tables, graphs or charts.

14. A candidate may not submit as the main content of the thesis any work or material which has previously been submitted for a university degree or other similar award.

*Or department where a department is not within a school.
Entry for Examination

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

16. Four copies of the thesis shall be presented in a form which complies with the requirements of the University for the preparation and submission of higher degree theses. The candidate may also submit any work previously published whether or not such work is related to the thesis.

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

18. There shall normally be three examiners of the thesis, appointed by the Professorial Board on the recommendation of the committee, at least two of whom shall be external to the University.

19. At the conclusion of the examination each examiner shall submit to the committee a concise report on the merits of the thesis and shall recommend to the committee that:

(1) The candidate be awarded the degree without further examination; or

(2) the candidate be awarded the degree without further examination subject to minor corrections as listed being made to the satisfaction of the head of the school*; or

(3) the candidate be awarded the degree subject to a further examination on questions posed in the report, performance in this further examination being to the satisfaction of the committee; or

(4) the candidate be not awarded the degree but be permitted to resubmit the thesis in a revised form after a further period of study and/or research; or

(5) the candidate be not awarded the degree and be not permitted to resubmit the thesis.

20. If the performance at the further examination recommended under Rule 19.(3) is not to the satisfaction of the committee the committee may permit the candidate to re-present the same thesis and submit to a further oral, practical or written examination within a period specified by them but not exceeding eighteen months.

21. The committee shall, after consideration of the examiners’ reports and the reports of any oral or written or practical examination, recommend whether or not the candidate may be admitted to the degree.

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

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.

*Or department where a department is not within a School.
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 investigation, or design or engineering development, which in each case is original.

2. (1) An applicant for registration for the degree shall have been admitted to the degree of Bachelor in the University of New South Wales, or other approved University, 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

*Attention is drawn to the conditions for the award of the Degree of Master of Science, Master of Engineering or Master of Surveying without Supervision which appears elsewhere in this section.
(4) Every candidate for the degree shall be required to carry out a program of advanced study to take such examinations and perform such other work as may be prescribed by the Committee which shall include the preparation and submission of a thesis embodying the results of an original investigation. The work shall be carried out under the direction of a supervisor appointed by the Committee or under such conditions as the Committee may determine. At least once a year and at any other time that the Committee sees fit, the candidate’s supervisor shall present to the head of the school in which the candidate is registered, a report on the progress of the candidate. The Committee shall review the report and as a result of its review may cancel registration or take such other action as it considers appropriate.

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

Thesis

4. (1) A candidate for the degree shall be required to submit three copies of the thesis referred to in paragraph 3. (4) which shall be presented in a form which complies with the requirements of the University for the preparation and submission of higher degree theses. The candidate may submit any work 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.

Recommendation for Admission to Degree

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

Fees

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

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

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.

Qualifications

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.
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 the 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 the Committee may determine, to the satisfaction of the Head of School.

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

4. (1) Every candidate who submits a thesis (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.
Master of Science (MSc)

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.

Thesis

4. (1) A candidate for the degree shall be required to submit three copies of the thesis referred to in paragraph 3. (4) which shall be presented in a form which complies with the requirements of the University for the preparation and submission of higher degree theses. The candidate may submit also for examination any work 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 investigation or design or engineering development which in each case is original. 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 who shall be an internal examiner.

   (3) If the thesis reaches the required standard, the candidate shall be required to attend for an oral examination at a time and place nominated by the Committee. The examiners may also arrange at their discretion for the examination of the candidate by written and/or practical examinations on the subject of the thesis and/or subjects related thereto.

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

5. Having considered the examiners' reports the Committee shall recommend whether 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 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 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'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.

Thesis  

4. (1) A candidate for the degree shall be required to submit three copies of the thesis referred to in paragraph 3. (4) which shall be presented in a form which complies with the requirements of the University for the preparation and submission of higher degree theses. The candidate may submit any work 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.

Recommendation for Admission to Degree  

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

Fees  

6. An approved candidate shall pay such fees as may be determined from time to time by the Council.
1. 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 descriptions, in the section entitled Subject Descriptions.

Servicing Subjects are those taught by a School or Department outside 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, ie full year); S1 or S2 (Session 1 or Session 2, ie choice of either session); SS (single session, ie 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 and subsequent HSC Examinations.

Candidates for enrolment who obtained the HSC in previous years or hold other high school matriculation should check with the appropriate School on what matriculation status is required for admission to a subject.
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<td>64 School of Pathology*</td>
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<td>71 Faculty of Medicine</td>
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<td>73 Faculty of Law</td>
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<td>74 Division of Postgraduate Extension Studies*</td>
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</tbody>
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*Offers subjects for courses outlined in this handbook.
Undergraduate Study

The School of Physics has introduced the specialized units 1.951, 1.961, 1.971, 1.981, 1.992 and 1.992 for students in the Faculty of Engineering. The first-year units 1.951, 1.961, 1.971 and 1.981 are not available at night. Part-time students will be catered for by the Science Course unit 1.001.

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

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

Physics Level I Units

1.001 Physics I F L3T3

Prerequisites:

<table>
<thead>
<tr>
<th>HSC Exam Percentile</th>
<th>Required</th>
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<tbody>
<tr>
<td>2 unit Mathematics</td>
<td>71-100</td>
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<td>or</td>
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<tr>
<td>3 unit Mathematics</td>
<td>21-100</td>
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<tr>
<td>or</td>
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<tr>
<td>4 unit Mathematics</td>
<td>1-100</td>
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<td>or</td>
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<tr>
<td>10.021B (for 1.001 only)</td>
<td>31-100</td>
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<tr>
<td>and</td>
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<tr>
<td>2 unit Science (incl. Physics and/or Chem.)</td>
<td>31-100</td>
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<tr>
<td>or</td>
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<tr>
<td>4 unit Science (multistrand)</td>
<td>31-100</td>
</tr>
</tbody>
</table>

Co-requisite: 10.021C or 10.021 or 10.001 or 10.011.


A molecular approach to energy transfer, kinetic theory, gas laws and calorimetry. The wave theories of physics, transfer of energy by waves, properties of waves. Application of wave theories to optical and acoustical phenomena such as interference, diffraction and polarization. Interaction of radiation with matter, photoelectric effect, Compton effect, spectroscopy. Resolution of the wave-particle paradox by means of wave mechanics and the uncertainty principle.

1.011 Higher Physics I F L3T3

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 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 sources and conversion.

1.951 Physics I (Mechanical Engineering) F L2T2

Prerequisites: As for 1.001 Physics I.

A basic course on physics for students in the School of Mechanical Engineering.


1.961 Physics I (Electrical Engineering) F L3T3

Prerequisite: As for 1.001 Physics I.

For students in the School of Electrical Engineering.

Electrostatics in vacuum, electrostatics in dielectrics, steady state currents, magnetostatics in vacuum, ferromagnetism, 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

Prerequisite: As for 1.001 Physics I.

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

Prerequisite: As for 1.001 Physics I.


Physics Level II Units

1.962 Physics of Measurement (Surveying)  S1 L1½T1½

Prerequisite: 1.971.


1.972 Electromagnetism (Electrical Engineering)  S2 L2T2

Prerequisite: 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

Prerequisite: 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)  S1 L3T1

Prerequisite: 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.

Chemistry

Undergraduate Study

2.111 Introductory Chemistry  S1 L2T4

Prerequisite: Nil.

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.

2.121 Chemistry IA†  S1 or S2 L2T4

Prerequisites:

HSC Exam Percentile Range Required

| 2 unit Science (any strands) | 31-100 |
| or 4 unit Science (multistrand) | 31-100 |
| or 2.111 |  |

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. Equilibrium in electrolyte solutions, acid-base equilibria, solubility equilibria and redox equilibria. The rate of a chemical change and chemical kinetics.

†Students who have passed 2.121 may not subsequently enrol in 2.111. Students meeting the 2.121 prerequisite are not permitted to enrol in 2.111 without the permission of the Head of the School of Chemistry. Students who enrol in 2.111 must pass 2.111 before they can proceed to 2.121 or 2.131.
2.131 Chemistry IB  S1 or S2 L2T4

Prerequisite: 2.111 or 2.121.


2.951 Chemistry IME  S2 L3T3

A treatment of chemistry which illustrates the application of the principles of chemistry to problems of concern to mechanical engineers. Topics: Chemistry of materials, thermochemistry, chemical kinetics and equilibrium, radioactivity and nuclear power, electrochemistry and corrosion of metals. Introduction to organic chemistry, structure and properties of polymers, fuels and lubricants. Surface chemistry.

2.981 Chemistry ICE  S1 L3T3 S2 L2

Prerequisites: *

- HSC Exam Percentile Range Required
- 31-100


Metallurgy

Undergraduate Study

4.913 Materials Science  F L2T1


Polymers. 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.

Chemical Engineering

Undergraduate Study

3.302 Fuels and Energy  S2 L3 T1

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.

*Students may also meet the prerequisites for this subject by taking 2.111 Introductory Chemistry as part of their first year program.
Mechanical and Industrial Engineering

Undergraduate Study

5.010 Engineering A§ SS L4T2
Prerequisite: HSC Exam Percentile
Either
- 2 unit Science (Physics) 31-100
- 4 unit Science (multistrand) 11-100
or
- 2 unit Industrial Arts or 31-100
- 3 unit Industrial Arts 11-100


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.

5.0101 Statics SS L2T2
Prerequisites: As for 5.010.


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. Design for Manufacture
   (Mechanical, Industrial and Aeronautical Engineering and Naval Architecture students must take this option.) 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 Chemical Engineering
   (Chemical Engineering students must take this option.) 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.

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

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

§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 may complete for the lack of the prerequisite by work taken in Physics in the first half of the first year.
6. **Introduction to Computing**
(Only available to Electrical Engineering and Surveying students who must take this option.) Introduction to computer program 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.

7. **Introduction to Chemical Technology**

8. **Introduction to Ceramic Engineering**
(Ceramic Engineering students take this option.) The nature of ceramics. Classification of materials. The materials science approach. History of ceramics. The ceramic engineer and society.

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 plane; 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.

5.034 *Engineering Experimentation* F L½T1

Prerequisites: All Year 2 full-time or Year 3 part-time subjects. Co-requisites: 5.073, 6.854.


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* L5TO

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* L5TO

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

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

5.044 *Industrial Training II* L5TO

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

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

5.051 *Thesis* F LOT6

To be taken in year of completion of course.

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

5.061 *Technical Orientation* S1 L2TO

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.


5.072 Statistics/Computing  S1 L1½T1 S2 L2T1

Prerequisites: 10.001 or 10.011.

Statistics: An introduction to probability theory. Random variables and distribution functions; the binomial, Poisson and normal distributions in particular. Standard sampling distributions, including those of $X^2$, $t$ 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.


5.073 Numerical Analysis/Mathematics  F L2T1

Prerequisite: 10.022.

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

5.074 Computing Science for Mechanical Engineers  S1 L2T1

Prerequisite: Computing strand of 5.072.


5.111 Mechanical Engineering Design I  F L1T2

Prerequisites: 5.010, 5.030, 5.040. Co- or prerequisites: 5.330, 5.611, 5.411, 8.298, 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.

5.121 Mechanical Engineering Design I  S1 L4T4 S2L3

Prerequisites: 5.111.

HSC Exam Percentile Range Required

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5.122 Mechanical Engineering Design II  F L1T2

Prerequisites: 5.010 or 5.0101, 5.121, 5.421 or 5.040 or 5.020. Co-requisite: 5.422.

Application of design strategy to creative design projects. Modelling, analysis and design of basic engineering elements and systems with further engineering drawing practice. Review of current available mechanical technology and use of standard equipment items, codes and trade literature.
5.123 Mechanical Engineering Design III  S1 L2T1 S2 L1T2
Prerequisite: 5.122. Co-requisite: 5.423 or 5.412.
Mathematical modelling and decision making in design with applications. More advanced design analyses, component design and drawing with individual and group projects of an interdisciplinary nature.

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

5.1241 Creative Design Project  SS L0T3
Prerequisite: 5.123.
This subject is concerned with the development of a feasible solution to a specified problem. The execution of the project requires attention to problem identification, creative thinking, feasibility analysis and decision making.

5.1242 Design Technology  SS L1½T1½
Prerequisite: 5.123.
Aspects of mechanical engineering technology which form the basis for machinery design. Includes hydraulic power systems; circuits, pumps, motors and other equipment; welding technology; vibration control and isolation; advanced tolerancing; composite materials; fracture mechanics.
Laboratory deals with the evaluation of components for compliance with specification.

5.1243 Machinery Design Project  SS L0T3
Prerequisite: 5.123.
Development of the final design for a solution to a specified problem. Requires attention to design analysis, component selection, decision making, specification and the preparation of engineering drawings.

5.1244 Design Management  SS L1½T1½
Prerequisite: 5.123.
Aspects of design management which are necessary for the successful achievement of design objectives. Includes project scheduling and control, contracts, specifications, use of standards and codes, statutory controls, quality assurance, product liability, patent law, marketing.
Laboratory deals with the evaluation of components for compliance with specification.

5.1245 Computer Based Engineering Design S2 L2T1
Prerequisites: S1 of 5.123, 5.074, 5.423.

5.303 Mechanical Vibrations  S1 L1½
Prerequisites: 5.311 or 5.330, 10.022.

5.324 Automatic Control Engineering  F L2T1
Prerequisite: 10.002.
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 response; 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 couple; work and energy, variational principles; impulse and momentum, impact.

5.331 Dynamics of Machine I  F L1½T½
Prerequisites: 5.330, 10.022.
Mechanical Vibrations: Simple harmonic motion. One degree of freedom systems, free and forced vibration, transmissibility and motion isolation. Whirling of shafts.
5.332 Dynamics of Machines II  
Prerequisite: 5.331. 

5.333 Dynamics of Machines  
Prerequisites: 5.330, 10.022. 

5.334 Engineering Dynamics II  
Prerequisite: 5.343. 
Inertia effects in machinery: analysis of torsional and translational disturbances set up in machines containing one or more reciprocating masses; means of reducing or eliminating undesirable effects. Mechanical vibrations: two degrees of freedom systems; free and forced vibrations, applications; the undamped vibration absorber. Multiple rotor systems; free and forced torsional vibrations. Geared branched systems. Introduction to beam vibrations. Matrix methods.

5.343 Linear Systems Analysis  
Prerequisites: 5.330, 10.022. 
Models of physical systems: differential equations for physical systems including mechanical, electrical, hydraulic, thermal and pneumatic systems; linearization. System analysis techniques: solution by Laplace transform method. Transfer functions and block diagrams. System response: response of first and second order systems to impulse step, ramp, sinusoidal and periodic inputs; higher order system response; system stability, applications.

5.344 Feedback Control  
Prerequisite: 5.343. 

5.3541 Engineering Noise I  
Prerequisites: 5.423, 5.411, 10.022. 
Acoustic plane wave equation, standing waves, energy density, intensity, decibel scales. Transmission between media, absorbing materials, Mufflers. Three dimensional wave equation. Transmission in ducts. Room acoustics.

5.3542 Engineering Noise II  
Prerequisites: 5.330, 5.611 or 5.622. 

5.421 Mechanics of Solids I  
Prerequisites: 5.010 or 5.0101. 

5.422 Mechanics of Solids II/Materials  
Prerequisites: 5.010 or 5.0101, 5.421 or 5.040 or 5.020, 10.001. 

5.423 Mechanics of Solids III  
Prerequisites: 5.422 or 5.411, 10.022. 
Fatigue of biaxial and triaxial systems. Deflections of beams and structures. Statically indeterminate beams and structures. Introduction to theory of elasticity; stress, strain, torsion. Membrane analogy. Finite element stress analysis. Basic concepts; structural stiffness method; truss, triangular, rectangular and brick finite elements; force and displacement methods; development and use of computer programs.

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

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

5.444 Theory of Elasticity  
Prerequisites: 5.423, 5.330, 5.601 or 5.622. 
Mathematical foundations: analysis of stress; deformation and strain; equilibrium, motion and flow; fundamental laws of continuum mechanics; linear elasticity; visoelasticity; applications.
5.454 Theory of Plasticity
Prerequisite: 5.423 or 18.413.
Analysis of stress, strain, strain rate; plastic stress/strain relations with
description of experimental verification. Application of plasticity theory to
a selection of problems including metal working processes such as
extrusion and rolling and metallic friction and wear.

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

5.411 Mechanics of Solids II
Prerequisites: 5.010, 5.040.
Statics of frames and machines. Two-dimensional stress components.
Bending and shear stresses. Stresses due to combined loads. Three-
dimensional stress components. Stress-strain relations. Theories of
static failure. Instability of elastic columns.

5.412 Mechanics of Solids III
Prerequisites: 5.411, 6.259, 10.022.
Fatigue strength, biaxial and triaxial loading. Virtual work-unit load
method for deflections of beams, frames and rings; statically
indeterminate structures; three-moment equation. Introduction to theory
of elasticity; stress, strain, torsion. Membrane analogy. Inelastic
behaviour of bars, beams, shafts and columns. Introduction to theory of
plasticity. Thick curved beams; thick-walled cylinders; rotating discs.

5.413 Mechanics of Solids IV
Prerequisite: 5.412.
Elasticity: Continuum Mechanics: Equilibrium and compatibility. Plates
and shells, design of pressure vessels, rotating discs. Contact stresses.
Thermal stresses.
Use of computer packages.
Plasticity: Laws of plastic deformation. Residual stress. Limit analysis
theorems.

5.612 Fluid Mechanics/Thermodynamics II
Prerequisites: 5.330, 5.611, 10.022.
Dimensional analysis similitude and modelling. Fields. Mass and
momentum equations. Vorticity, deformation, dilatation. Existence
conditions for stream and potential functions. One-dimensional gas
dynamics. Nozzle flows, normal shock wave, constant area flow with
friction and heat addition. Isothermal flow. Non-reactive mixtures.
Refrigeration and air conditioning processes. Design considerations.
Steady and unsteady state conduction heat transfer. Convective heat

5.614 Fluid Mechanics III
Prerequisite: 5.612.
Cartesian tensors. Compressible flows. Navier-Stokes and energy
Forced convection in laminar and turbulent flows. Free convection.
Diffusion. Mass transfer.

5.615 Thermodynamics III
Prerequisite: 5.612.
General thermodynamics relations. Statistical mechanics. Quantum
mechanics. Nonatomic gases and solids. Diatomic and polyatomic
gases. Chemical equilibrium. Statistical mechanics of dependent
particles. Real gases and solids. Irreversible processes. Radial flow and
axial flow turbo-machinery. Design considerations. Cavitation. Matching
of component characteristics.

5.622 Fluid Mechanics/Thermodynamics
Prerequisites: 10.001 or 10.011; 1.951 or 1.001 or 1.011, 5.010 or
5.0101.

5.6221 Introductory Thermofluids
Prerequisites: 5.612.
Work, energy, power. Units. Systems, states and processes. Flow fields;
unsteady and compressible flow. Control mass and volume. Fluid
First law of thermodynamics. Non flow processes: reversible, irrevers-
ible. Flow processes: energy equation, enthalpy, Bernoulli's equation.
Momentum equations: linear and rotational. Ideal flow.

5.6222 Fluid Mechanics
Flow measurement: orifice, nozzle, venturi meters, pitot tubes, other
flow meters. Dimensional analysis: similitude, dimensionless numbers,
methods of analysis. Steady one dimensional flow in ducts; laminar and
turbulent pressure loss, friction factor, losses in bends and fittings.
Equations of fluid motion. Elementary boundary layer flow, skin friction
and decay.

5.6223 Thermodynamics
Ideal processes and cycles, reversibility. The second law of
thermodynamics. Entropy. Isentropic processes. Cycles for engines and
heat pumps. Energy conversion efficiency. Reciprocating pumps,
compressors, engines. Energy equation analysis, P-V diagrams.
5.623 Heat Transfer
SS L2T1
Prerequisite: 5.611 or 5.622, 10.022.

5.624 Refrigeration and Air Conditioning
SS L2T1
Prerequisite: 5.611 or 5.622. Co-requisite: 5.623, 10.022.
Psychrometry and air conditioning calculations, heat load, estimates, vapour compression, absorption and air cycle refrigeration, refrigeration and air conditioning systems and components, cryogenic cycles.

5.633 Turbomachines
SS L2T1
Prerequisites: 5.611 or 5.622, 10.022.
Dimensional analysis and experience charts, cavitation, thermodynamics of a stage, blade element theory of axial machines, thin wing theory, cascade data and design procedures, aerodynamic design of an axial machine, theory of centrifugal machines, design of a centrifugal machine.

5.634 Viscous Flow Theory and Lubrication
SS L2T1
Prerequisite: 5.611 or 5.622, 10.022.

5.643 Thermodynamics and Combustion
SS L2T1
Prerequisite: 5.611 or 5.622, 10.022.
General thermodynamic relations, ideal and non-ideal gases, statistical thermodynamic derivations of internal energy and entropy, ideal gas mixtures. Combustible fuels, combustion equations, internal energy and enthalpy of reaction, First law analysis of combustion, adiabatic flame temperatures. Second law analysis of combustion, chemical equilibrium, chemical kinetics and rate controlled reactions. Application of chemical equilibrium and reaction rate methods to combustion and emission problems. Deflagration, detonation and diffusion flames, mixing controlled reactions.

5.644 Solar Energy
SS L2T1
Prerequisite: 5.611 or 5.622, 10.022. Co-requisite: 5.623.

5.653 Compressible Flow
SS L2T1
Prerequisite: 5.611 or 5.622, 10.022.
Part (a) compulsory for Aeronautical Engineers and forms a component of 5.811 (7 weeks only). 1. One dimensional steady flow: isentropic, channel flow, normal shock waves, supersonic wind tunnels and diffusers, flow visualisation. 2. Two dimensional steady flow: oblique shock waves, Prandtl-Meyer expansions, nozzles, airfoils. 3. One dimensional unsteady flow: moving waves, reflections, explosions in ducts, shock tubes; method of characteristics, internal flows, piston and valve effects.

5.654 Hydraulic Transients
SS L2T1
Prerequisite: 5.611 or 5.622, 10.022.
Mass oscillations in surge systems with various types of surge tanks. Stability of surge systems, comparison with experiment. Alliev's theory of water hammer, fast and slow closures, water hammer in pumping systems, circle diagrams.

5.661 Mechanical Engineering III
F L2T1
Prerequisites: 1.961 or equivalent, 10.221A.

5.663 Potential Flow Theory
SS L2T1
Prerequisite: 5.611 or 5.622, 10.022.

5.664 Multiphase Flow
SS L2T1
Prerequisite: 5.611 or 5.622, 10.022.
5.800 Aircraft Design I  
**Prerequisites:** 5.122 or 5.111, 5.330, 5.422 or 5.411. **Co-requisites:** 5.423 or 5.412 and 8.259.

Session 1: As for 5.123.  
Session 2: Aircraft types, materials, loads, load factors. The design process. Design of members in tension, compression, bending, torsion, riveted, welded and bolted joints. Wing lift distribution, stress analysis, design and drawing of components, fittings.

5.801 Aircraft Design II  
**Prerequisites:** 5.303, 5.412 or 5.423, 5.800 (full-time only), 5.811, 5.822. **Co- or prerequisite:** 5.812, 5.823, 5.831.

A co-ordinated course of lectures in aerodynamics, structures and operations leading to detailed design, calculation and drawing of an original aircraft configuration.

5.811 Aerodynamics I  
**Prerequisites:** 5.330, 5.611 or 5.622, 10.022.
1. Compressible flow: See Part (a) of 5.653 (7 weeks only).  
2. Low speed aerodynamics: boundary layers, drag, industrial aerodynamics, wind tunnels, airfoils for wings, cascades, propellers, fans; potential flow for airfoils; Prandtl lifting lines, vortex induced drag.  

5.812 Aerodynamics II  
**Prerequisites:** 5.073, 5.612 or 5.622, 10.022.  
1. Compressible flow: subsonic, transonic and supersonic two-dimensional flows, viscous boundary layers and heat transfer.  
2. Dynamic stability and control; characteristic solutions for rigid aircraft.  
3. Hypersonic, high enthalpy flows.

5.822 Analysis of Aerospace Structures I  
**Prerequisites:** 5.330, 5.411 or 5.422, 8.259, 10.022. **Co- or prerequisite:** 5.412 or 5.423.

Equilibrium of forces: aerospace applications of plane frames and space structures. Beams; shear and bending stress distribution in thin-webbed beams, tapered beams, beams with variable flange areas. Semi-monocoque structures; ribs and bulkheads. Deflection of structures; matrix (force) method. Statically indeterminate structures; beams, trusses and frames. Flexibility method; elastic centre method; moment distribution method. Aircraft materials; dimensionless stress-strain data.

5.823 Analysis of Aerospace Structure II  
**Prerequisites:** 5.412, 5.423, 5.622.

Structural instability: buckling of perfect and imperfect columns; bending and buckling of thin flat plates; local instability and crippling of thin-walled columns; buckling of monocoque cylinders and curved panels; tension field beams. Stress functions. Shear lag. Warping of thin-walled open and closed section tubes. Torsional buckling. Sandwich construction and analysis. Stresses due to torsion and shear in multi-cell tubes; methods of successive approximation.

5.831 Aircraft Propulsion  
**Prerequisites:** 5.611 or 5.622, Part (a) of 5.653, 5.811.


5.901 Introduction to Mathematical Modelling and Decision Making  
**Prerequisites:** 5.122 or 5.111.

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

First 10 weeks of this course are identical with the first 10 weeks of 5.123.

5.902 Ship Management Economics  
**Prerequisites:** 5.611 or 5.622.  
**Lecture hours:** 82 L1%T0  
**Credits:** 5.902  
Engineering Economy portion of 18.121.

Economic objectives of the firm. Economic measures of performance: net present value, annual equivalent value and the DCF rate of return (including the incremental rate of return) and their application in the selection and replacement of processes and equipment.

5.911 Ship Hydrostatics  
**Prerequisites:** 5.010 or 5.0101.

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

5.921 Ship Structures I  
**Prerequisites:** 5.422 or 5.411, 10.022.


5.922 Ship Structures II  
**Prerequisites:** 5.423 or 5.412, 5.921.

Mathematical modelling and decision theory, as applied to design. Introduction to FORTRAN programming.


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


Prerequisites: 5.901, 5.911, 5.953.

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


Developed of a spar buoy and deriviation of coefficients in equation of motion. Design laboratory.
Graduate Study

5.045G Advanced Topic in Mechanical Engineering

5.046G Advanced Topic in Mechanical Engineering

5.047G Advanced Topic in Mechanical Engineering

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

5.073G Ordinary Differential Equations in Mechanical Engineering

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

5.075G Computational Methods in Mechanical Engineering I


5.076G Computational Methods in Mechanical Engineering II

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

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

Use of digital logic elements; gates, flip-flops, registers, counters and timers. Analog and logic interface and control facilities. Parameter optimization Run function generation. Two-speed operation.

5.086G Digital Logic Fundamentals for Mechanical Engineers

Prerequisite: 5.046G, or equivalent.

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

5.087G Microprocessor Fundamentals for Mechanical Engineers

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

5.151G Refrigeration and Air Conditioning Design I


5.152G Refrigeration and Air Conditioning Design II


5.304G Advanced Dynamics I

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

5.305G Advanced Dynamics II

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

5.315G Mechanisms I

Selected topics from: Analysis of complex planar mechanisms; synthesis of planar mechanisms; spatial linkages; cams.

5.316G Mechanisms II

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

5.321G Automatic Control I

Use of digital logic elements; gates, flip-flops, registers, counters and timers. Analog and logic interface and control facilities. Parameter optimization Run function generation. Two-speed operation.

5.322G Automatic Control II

Analysis of non-linear control system. Describing functions and limit cycle amplitude and frequency determination. Studies of systems in which the following non-linearities dominate the behaviour: backlash,

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


5.336G Random Vibrations C2

Probability, vibration theory review, linear mechanical system response to random vibrations. Statistical characteristics: auto correlation, spatial density, convolution, narrow band processing, consistency, applications.

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 C3

5.416G Stress Analysis for Mechanical Engineering Design II C3


5.417G Mechanics of Fracture and Fatigue C3


5.428G Advanced Mechanics of Materials C2

Plasticity. Creep.

5.491G Biomechanics I C2

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 C2

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.

5.615G Reciprocating Internal Combustion Engines C2

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 C2

5.622G Gasdynamics II C2


5.631G Lubrication Theory and Design I C2

Hydrostatic lubrication, squeeze films, hydrodynamic lubrication, slider bearings, tilting pad thrust bearings, journal bearings, practical journal and thrust bearing design; air bearings; friction, wear; dry boundary lubrication; lubricant, bearing material selection; anti-friction bearings.

5.632G Lubrication Theory and Design II C2


5.653G Acoustic Noise I C2

5.654G  Acoustic Noise II  C2


5.712G  Convection Heat Transfer I  C2

5.713G  Convection Heat Transfer II  C2


5.718G  Conduction Heat Transfer  C2

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  C2

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.

5.720G  Performance, Evaluation and Simulation of Solar Collector Systems  C2

Complete solar system analysis; long term performance prediction including weather, land characteristics. System modelling: energy storage; building characteristics; heating and cooling.

5.725G  Statistical Thermodynamics  C2


5.735G  Direct Energy Conversion  C2

Magneto-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; radiotisotope, solar powered generators; semi-conductors, basic ideas of quantum physics, Fermi level and energy bands. Other modes of direct energy conversion: photovoltaic; thermionic, Nernst effect generator.

5.751G  Refrigeration, Air Conditioning and Cryogenics I  C2

5.752G  Refrigeration, Air Conditioning and Cryogenics II  C2

Thermodynamic principles, diagrams; properties of real fluids, refrigerants. Thermodynamics of change of phase; liquids and dilute solutions; mixtures of liquids; steady flow processes with binary mixtures; rectification of a binary mixture; absorption refrigeration; resorption refrigeration. The vapour compression cycle; multi-pressure systems; analysis of compressor performance; condensers, evaporators and expansion devices; properties of the ideal refrigerant; reversed cycles; analysis and performance characteristics of the complete cycle. Air-cycle, steam-jet refrigeration; application to air conditioning design; cooling towers, mixtures of gases and vapours; psychrometry, evaporative cooling of air; dehumidification of air. Thermoelectric cooling; Seebeck, Jouleau, conduction, Peltier, Thomson effects; thermodynamic analysis; thermoelectric materials. Production of low temperatures; liquefaction and rectification of gases; magnetic cooling; application to research.

5.758G  Refrigeration and Air Conditioning Applications  C4


5.909G  Research Project  C9

5.912G  Naval Hydrodynamics I  C2

5.913G  Naval Hydrodynamics II  C2

Prerequisite: 5.912G, or equivalent.

Advanced treatment of topics selected from: ship waves and ship resistance; ship manoeuvrability; ship motion and seakeeping; hydrofoil and propeller theory; aero and hydrodynamics of surface effect machines.

5.918G  Research Thesis  C18

5.936G  Research Thesis  C36
Electrical Engineering

Undergraduate Study

6.010 Electrical Engineering I S1 or S2 L2T4
Prerequisite: 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.

6.021A Circuit Theory I S1 or S2 L2T2
Prerequisite: 1.961 or equivalent, 6.010, 10.001.


6.021B Introduction to Electromagnetic Energy Conversion S1 or S2 L2T2
Prerequisite: 6.021A attempted.

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 electromagnetic energy conversion.

6.021C Electronics I SS L2T2
Prerequisite: 1.982, 6.021A.

A unified treatment of the fundamental principles of bipolar and field-effect transistors and the operation of simple circuits at low frequencies and room temperature in the static approximation (ie 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 (ie switching, amplification, high or low input impedance, etc.). An introduction to the Operational Amplifier and its uses.

6.021D Computing S1 or S2 L2T2
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 program 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 S1 or S2 L2T2
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 circuits, digital systems and PDP 11 assembler programming.

6.022 Electrical Engineering Materials SS L3T1
Prerequisites: 1.961 or equivalent, 2.121.

Not offered in 1980.

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 S1 or S2 L2T2
Prerequisites: 6.021A, 10.111A, 10.1113, 10.1114, 10.2111, 10.2112, (Two of 10.1113, 10.1114, 10.2111 or 10.2112 may be taken as co-requisites), 6.021B, 6.021C (one of 6.021B or 6.021C may be taken as a co-requisite).

Basic circuit concepts followed by basic system ideas such as order, state, linearity and typical system waveforms.

Typical linear time invariant systems modelled and described by differential equations leading to use of Laplace transforms. Partial fractions, poles, zero and stability. Transfer functions and circuit responses both in time and frequency domain. Distributed circuits and transmission lines. Telegraphist'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 S1 L2T2

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 Electronics II**


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

**6.0314 Systems and Control I**

Prerequisite: 6.0311.


**6.0315 Electrical Energy**

Prerequisite: 6.0312 attempted.

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

**6.0316 Electronics III**

Prerequisite: 6.0313. Co-requisites: 6.0311, 6.021E.

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

**6.0317 Communication Systems I**


Overview of information acquisition, transmission and processing. Aims to enable 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: 6.0311, 6.0313.

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

**6.042 Digital and Analogue Signals**

Prerequisites: 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**

Prerequisite: 10.361.

The design and development of reliable, high-quality hard-ware, 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.

**6.056 Mechanical Engineering**

Prerequisites: 1.961 or equivalent, 10.2111, 10.2112.

Topics: selected from 5.661 Mechanical Engineering III.

**6.202 Power Engineering—Systems I**

Prerequisites: 6.0312, 6.0315.

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

**6.203 Power Engineering—Systems II**


A subject emphasizing interconnected system operation, performance and control; synchronous machines, power system analysis, operation and stability; distribution systems.

**6.212 Power Engineering—Utilization**

Prerequisites: 6.0312, 6.0315.

Topics include: Machines and electrical drives, applications and control, in particular using power rectifiers and thyristors; industrial heating; frequency changing; illumination. A program of experimental projects and design applications will accompany the lectures.
6.222 High Voltage and High Current Technology  
Prerequisite: 6.0315.

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.

6.303 High Frequency Circuits and Electronics I  
Prerequisite: 6.0311, 6.0316, 6.0317.

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

6.313 High Frequency Circuits and Electronics II  
Prerequisite: 6.303.

The material extends 6.303 High Frequency Circuits and Electronics I into further areas of high frequency and microwave circuits and electronics: Plane wave propagation and application to terrestrial communications. Waveguide theory and aperture antennas. Parametric amplifiers. Microwave sources, with emphasis on Gunn and impact diodes.

6.322 Electronics IV  
Prerequisite: 6.0313, 6.0316.

Theory and applications of some electronic devices and systems with an associated laboratory-design program. Analogue or digital integrated circuits introduced as appropriate. Topics may include: active filters, switched transistor application, phase locked loops, optical lines, charge coupled devices, power electronics, design factors of large electronic systems.

6.323 Communication Systems IIA  
Prerequisite: 6.0317, 10.033, 10.361.

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 telecommunications systems.

6.333 Communication Systems IIB  
Prerequisite: 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.

6.412 Systems and Control II  
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 non-linearities present in the system and the synthesis of non-linearities into the system to improve dynamic performance.

6.413 Modern Systems Engineering  
Prerequisite: 6.412.

The design and analysis of control systems using system identification techniques, optimal control and multivariable control methods. The design is carried out on a simulated industrial boiler system using computer aided design programs. Other examples include: chemical plant, communication systems and biological systems.

6.432 Computer Control and Instrumentation  
Prerequisites: 6.021D, 6.021E, 6.0314, 6.0316.


6.483 Biomedical Engineering  
Prerequisites: 6.0311, 6.0313, 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.

6.512 Advanced Semiconductor Device Theory  
Prerequisite: 6.0313.

Principles of operation and circuit characteristics of a range of semiconductor devices including bipolar diodes and transistors, MOS devices and circuits, charge-coupled devices, solar cells, light-emitting diodes, and semiconductor lasers. The lectures are supplemented by experimental work with these devices.
6.522 Transistor and Integrated Circuit Design
Prerequisites: 6.0313, 6.0316.
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 suggests.

6.600 Introduction to Computers
Excluded: 6.620, 6.021D, 6.601A.
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 (e.g. inquiry, statistics, linear programming and text formatting packages).

6.606 Computing Science Honours

6.607A Computing Hardware Architecture
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
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
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
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
Prerequisite: 10.001. Excluded: 6.600, 6.021D, 6.601A.
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 computer organization: simple machine architecture. Introduction to dynamic data structures, elementary logic. Introduction to operating systems and computing machinery.

6.622 Computing Application and Software
Prerequisites: 6.620 or 6.600 (C) or 6.021D.
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 queuing theory; applications of mathematical programming; statistical calculations; critical path methods; computer graphics; artificial intelligence.

6.631 Assembler Programming and Digital Logic
Prerequisites: 6.620 or 6.600 (C) or 6.021D. Exclusions: 6.602A, 6.021E, 6.031D.
Assembler programming: programming in a low level machine oriented language in order to illustrate the mapping of higher level language constructs onto a typical machine and the interaction between operating systems and devices. Digital logic design: register transfer design of a tutorial computer, switching algebra, minimization, combinational logic design, integrated circuits, registers, counters, and other medium scale integration (m.s.i.) devices, clocked sequential circuits, computer arithmetic.

6.632 Operating Systems
Prerequisites: 6.631 or 6.021E, 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.
6.641 Programming I
S2 L3T2
Prerequisite: 6.620 or 6.600 (C) or 6.021D.
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. 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
Prerequisite: 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 analyzers or recursive descent. Bottom-up compilation for simple- and weak precedence and LR(k) grammars. 4. Semantic analysis: program translation and code generation. 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
Prerequisite: 6.620 or 6.600 (C) or 6.021D. Excluded 6.602C, 6.622.
The use of computers for solving problems with a substantial mathematical and operational research content: includes use of some standard software packages. Topics selected from: discrete event simulation; the SIMULA programming language; pseudo random number generation; simple queueing theory; applications of mathematical programming; statistical calculations; critical path methods; computer graphics, artificial intelligence.

6.647 Business Information Systems
S1 L3T2

6.649 Computer Practice*
S2 L3T2
Not offered in 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.

6.801 Electrical Engineering
F L1T2
Consists of 6.851 and 6.852.

6.831 Chemical Instrumentation
S1 L1T2
Prerequisite: 1.001.
Not offered in 1980.
A user-oriented introduction to the electronic principles which form the basis of electronic instrumentation as used in the applied sciences. Provides a bases of circuit theory and elementary electronics and then considers analog computers, amplifier and instrumention systems.

6.832 Industrial Electrical Machinery
S2 L1T2
Prerequisite: 1.001 or equivalent.
An applications-oriented introduction to the usage of electrical machinery in industry. Provides a basis of circuit theory then considers the characteristics and selection of electrical machinery, their interface with the prime power supply, protection and electrical safety. Included in the course is a project illustrating the application of electrical engineering to other disciplines.

*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 treat 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.

6.852  Electrical Machinery and Supply  S2 L1T2
Prerequisite: 6.851.

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

6.853  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.

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.

6.060G  Microprocessor Systems  S1 or S2  C3

Prerequisites: 6.021D or 6.620 and 6.021E or 6.631 (or equivalent).

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

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  S1  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 — Digital Signal Processing  S2  C3

Fundamental principles and techniques of digital signal processing with applications in telecommunications, sonar, speech and seismology. Topics include: review of discrete-time signals and systems; discrete Fourier transform; z-transform and chirp-z transform. Digital processing of analogue signals, spectral analysis and data smoothing. Fundamentals of digital filter design techniques. Deconvolution. Errors due to quantization and finite word length. Implementation in hardware and software. Examples of applications.

*Subjects which do not have a session notation are not offered in 1980.
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- and 3-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 S2 C3
Co-requisite: 6.167G or similar.

6.167G Propagation and Transmission of Electromagnetic Waves S1 C3


6.169G Microwave Circuits: Theory and Techniques S2 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 S2 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 S1 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 S2 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.

6.227G Assessment of Insulation Performance in Electrical Plant C3
Selection from: design test requirements. Forms of high voltage works test: alternating, impulse, switching surge and direct. Non destructive tests: dielectric loss angle, dispersion, partial discharge and insulation resistance. Methods of determining material condition: moisture content, gas in oil, impurities, electron microscopy including determination of aging and long life. Commissioning and site tests.

Demonstrations and projects to support the lecture material.

6.228G Power System Equipment C3
Includes study of the operating characteristics and major design features of the items comprising a power system, including alternators, power transformers, voltage and current instrumentation equipment, oil and gas insulated circuit breakers, isolators, overhead lines and components. Lightning arresters and protection for lines and substations. Power and line coupling capacitors, bus bars, connectors, cables and bushings. Line carrier systems.

6.234G Power System Protection S1 C3
The theory and application of protective devices and systems, related to the protection of transmission lines, transformers, busbars and generators.

6.244G Power Systems I C3
An advanced course dealing with topics such as economic despatch, load flow and stability in large power systems.
6.246G Power System Operation and Control C3


6.247G Power System Analysis C3


6.248G Power System Planning C3

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 (bref treatment only). Industrial system planning. Power system reliability.

6.249G Dynamic Performance of Power Systems S2 C3

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 C3

As for 6.050G.

6.251G Power Elective II C3

As for 6.050G.

6.254G Electrical Machines I C3

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

6.255G Electrical Machines II C3

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 C3

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.

6.246G Power System Operation and Control C3

Prerequisites: 6.343G or similar. Some familiarity with probability, random processes, queuing theory and Markov processes is an advantage.

Provides an up-to-date coverage of key techniques and their underlying principles in two important areas of digital communications, namely: Computer Communication Networks including capacity assignment, time delay versus cost trade-offs, information flow control, queuring theory, concentration and buffering in store-and-forward networks, message and packet switching algorithms, protocols, routing and network topology. Random Access Techniques including time-division multiple access, ALOHA systems, spread spectrum systems, direct sequence systems, interference rejection, jamming margin, error correction techniques using block and convolutional codes.

6.337G Sound Broadcast Systems C3

Prerequisites: 6.167G, 6.341G or similar.

The 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 C3

Prerequisites: 6.167G, 6.341G or similar.


6.339G Electroacoustics C3

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 S1 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 S1 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 noise through linear systems and non-linear devices. Poisson and Gaussian random processes. Estimation and measurement of power density spectra.


6.343G Digital and Analogue Communications S1 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 parasitics, equalizer design, adaptive and/or nonlinear equalization, mechanical filters, other digital signal processing techniques.

6.347G Digital Communications S2 C3

Prerequisite: 6.343G or similar.

Advanced and unified treatment of digital transmission systems. Principal topics are: Baseband ASK digital communication Systems including inter-symbol interference, eye patterns, power spectral density, probability of error estimates and bounds, Nyquist criterion partial response signals (eg simple and modified duobinary). Digital Modulation including various types of shift keying modulation such as amplitude, amplitude and phase, offset amplitude and phase, frequency and minimum shift keying (ASK, APSK, OAPS, PSK, FSK and MSK), power spectral density, probability of error, signal constellations and system comparison. Line Coding including linear codes, alphabetic codes, non-alphabetic codes and their comparison. Equalization including linear, non-linear, adaptive and automatic equalization and Viterbi decoders.

6.348G Optical Communications 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 S2 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.

6.350G Solid State Electronics Elective—Reliability Engineering II S2 C3

Prerequisite: 6.044 or 6.376G.

Reliability and availability analysis by Markov states. R & A analysis for non-exponential failure and repair time distributions. Reliability
6.373G Semiconductor Devices S1 C3
Theory and characteristics of semiconductor devices, notably bipolar transistors, field effect transistors, and thyristors. The course discards many of the simplifications and generalizations made in the undergraduate treatment of transistors.

6.375G Integrated Circuit Technology S2 C3
An account of the modern planar technology of semiconductor device and integrated circuit fabrication.

6.376G Reliability Engineering S1 C3
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 S1 C3
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 C3

Prerequisites: 6.0313 or equivalent.
Harnessing of sunlight by using solar cells to convert it directly to electricity. The properties of sunlight and of the semiconductors used in solar cells are reviewed and their interaction described. Factors important in the design of solar cells and the current technology used to produce cells. Likely future developments in this technology. System applications ranging from systems which are currently viable economically to residential and central power systems which may be a possibility for the future.

6.380G Data Acquisition and Analysis in Remote Sensing S2 C3
Prerequisites: 10.361 or similar.
Techniques for extracting and analysing features in remotely sensed data, with emphasis on data acquired by the LANDSAT series. Topics are taken from the following list.

Nature and characteristics of Earth monitoring space platforms including LANDSAT, SKYLAB and the GMS weather satellites and their data acquisition methods. Sensor types and characteristics. Satellite data formats and availability. Techniques for image reconstruction, enhancement and display including: histogram transformation, grey-scale transformation, detection and characterisation of texture, edge and line detection, filtering. Techniques for feature classification including: clustering and related statistical techniques such as maximum likelihood estimation, decision tree structures, decision theoretic techniques. Techniques for detection of particular static features, such as agricultural data, geological data, water, etc. It is expected that this aspect of the syllabus would be modified by the particular interests of the participants. Procedures for handling multitemporal (time-varying) data such as found in crop discrimination, resource monitoring, large-scale fires and inland floods.

6.452G Principles of Feedback Control S1 C3
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 S1 C3
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 S2 C3
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 (online estimation).

6.456G General Concepts In Formal System Theories C3
Provides fundamental concepts common to many formal abstract system theories reflecting different aspects of the physical systems, which are their bases.
6.457G Cybernetic Engineering S1 C3
The fundamentals of cybernetic engineering, the genesis of cybernetics, machines modelled on life and the evolution to present day robots. Includes: biological information transmission (biochemical coding and control, genetic and neural), pattern recognition learning systems and perceptions, sub-systems of the human brain, and 'functional' descriptions for a 'Cybernetic Brain', an introduction to industrial manipulators and third generation robots; self-organizing control for manipulators and robots and the social consequences of flexible automation with industrial robots.

6.458G Decision and Syntactic Systems for Digital Pattern Recognition C3
Concepts and techniques in decision-theoretic pattern recognition systems with an in-depth study of both non-parametric and parametric methods. Includes: pattern, feature and classification spaces, feature selection, linear discriminant functions and training algorithms; piecewise linear, discriminant functions, decision rules; the Bayes framework, approximation of probability densities; clustering and dimensionality reduction. Structural pattern recognition, including such topics as formal linguistics, primitives, grammar and syntax analysis as a recognition procedure.

6.459G Control Computing S1 C3
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 S2 C3
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.

6.461G Applied Optimal Estimation and Prediction C3
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-lag; 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
Many control problems result from interaction between key variables and can only be solved by a multivariable analysis. This can be approached in the time domain, eg the linear quadratic regulator, or the frequency domain, eg the inverse Nyquist array. Methods available, their limitations and strengths, and integration and comparison of the time and frequency approach. Laboratory work using interactive programs on the Department's Varian computer. Topics include: time domain methods, pole shifting, state decoupling, optimal control; frequency domain methods, inverse and direct Nyquist methods, characteristic locus.

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

6.468G Computer Display Systems and Interactive Instrumentation 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 S1 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 S2 C3

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

6.50G Computer Science Elective C3

As for 6.05G Occasional Elective.

6.651G Digital Electronics C3

Prerequisite: 6.021E and 6.0313.

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

6.654G Digital Systems S1 C3

Prerequisite: 6.021E.

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 S2 C3

Prerequisite: 6.546G.

Basic principles of computer architecture. A comparative study of the architectural features of a number of significant computer systems.

6.656G Software Systems A S1 C3

Prerequisite: 6.641.

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

6.657G Software Systems B S2 C3

Prerequisite: 6.631 and 6.641.

Overview of operating systems, sequential processes, concurrent processes, processor management, store management, scheduling algorithms, resource protection, data communication case studies.

6.659G Data Bases and Networks S2 C3


Data management, compression techniques, redundancy coding; indexing; hashing encryption and decryption. Data base management systems; data description languages; data manipulation languages; integrity and recovery. The relational view of data. Computer networks; digital data transmission; communication protocols; circuit switching; packet switching; packet routing, network performance. Current international standards and practice. Distributed data bases.

6.660G Programming II S1 C3


6.661G Business Information Systems S1 C3


6.662G Computing Practice S2 C3


For students majoring in Computer Science who seek a programming career in government or commercial industry. Topics, related to current computing practice include: Comparative study of computer hardware in current popular use: comparative study of the “popular” programming languages, eg COBOL, RPG, BASIC, FORTRAN, PL/1, APL. Job control 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.

6.909G Project C9

6.918G Research Project C18

6.936G Research Project C36
Civil Engineering

Undergraduate Study

8.001 Industrial Training
Prerequisite: 8.670. Requirement for the Bachelor of Engineering Degree.

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

8.002 Industrial Experience
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 on enrolment in the final year evidence from their employers confirming completion of the prescribed period of industrial training.

8.011 Special Projects
Equal to one technical elective.

A minor thesis or research project on any approved topic.

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

8.013 Bridge Engineering
Prerequisite: 8.182.

An introductory subject in the design of road and railway bridges. Types of bridges, economic spans and proportions. Design loads and codes. Aspects of the design of steel, reinforced concrete, prestressed concrete, and composite bridges by empirical, elastic and limit state methods.

8.014 Computer Applications in Civil Engineering
Prerequisite: 8.273, 8.351.

Revision of fundamentals of FORTRAN; programming and some advanced techniques such as the use of tapes, discs, and plotters. Instructions in another language such as PASCAL. Applications of finite difference and finite element methods to structural analysis, geotechnology and flow problems.

8.015 Road Engineering


8.016 Hydraulics
Prerequisite: 8.573.

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

8.017 Transportation Engineering

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

8.020 Hydrology
Prerequisite: 8.582.

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

8.021 Environmental Aspects of Civil Engineering
Prerequisite: 8.301.

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  SS L2T1
Prerequisite: 8.572.
Equations of continuity, motion and vorticity; and functions. Laplace equation, standard flow patterns; practical applications.

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.

8.024 Foundation and Dam Engineering  S1 L2T1
Prerequisite: 8.273.

8.030 Construction Management  SS L2T1
Co-requisite: 8.672.
Civil Engineering Construction organization, management and control.

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.

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

8.026 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.

8.032 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.

8.027 New Materials I  SS L2T1

8.033 Industrial Law and Arbitration  SS L2T1
Prerequisites: 8.672, 8.032.

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

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

8.038 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.
8.039 Computer Programming  SS L2T1
Introduction to FORTRAN Programming, use of WATFIV compilers, flow charts and simple problems.

8.040 Advanced Engineering Geology  SS L2T1

8.041 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  SS L2T1
Final year design project in the field of civil engineering materials.

8.052 Design Project — Structures  SS L2T1
Prerequisite: 8.191.*
Final year design project in the field of structural engineering.

8.053 Design Project — Water  SS L2T1
Prerequisite: 8.573 or 8.582 or 8.581.
Final year design project in the field of hydraulics and water resources.

8.054 Design Project — Engineering Construction  SS L2T1
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.

*Students who have failed this subject may apply for permission to enrol simultaneously in this subject and the subsequent subject.
8.060 Numerical Methods in Geotechnology

Prerequisite: 8.273.

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.

8.062 Construction Camp

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

8.113 Civil Engineering for Electrical Engineers

Includes an introduction to the various branches of civil engineering, the
nature and organization of the profession. Relationship between clients
and design consultants. The historical development of Civil Engineering.

Theory of beams and trusses, resultant forces, structural action, stress
and strain. Relation between load, shear force and bending moments,
geometric properties of sections, deflection of beams. Properties of
materials used in structures: various steels, concrete (plain, reinforced
and prestressed), aluminum and timber. Brittle fracture. Introduction to
buckling. Engineering failures. Introduction to design of transmission
lines and towers.

8.170 Statics

Equilibrium equations, internal actions, bending moment and shear
force. Simple beams and trusses.

8.171 Mechanics of Solids I

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

Prerequisite: 8.171.

Structural statics. Bending moments, shear force and torsion. Stresses
due to shear force in solid and thin-walled sections; shear centre.

8.173 Structural Analysis I

Prerequisite: 8.172.

The analysis of pin-jointed trusses. The principle of work applied to
trusses; forces in, and deformation of, statically determinate trusses;
statically indeterminate trusses (force method); displacement method of
analysis; variational theorems; non-linear analysis.

8.174 Structural Analysis II

Prerequisite: 8.173.

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

8.181 Structural Design I

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

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.

Reinforced Concrete: continuous beams and frames; two-way slabs and
flat slabs; footings; members subjected to combined axial force and
bending moment.

Prestressed Concrete: pre- and post-tensioning; simple beams, design
for working loads and ultimate flexural strength; design of end blocks.

Steel: plate girders; moment connections and splices; residual stresses;
columns with elastic and restraints; plastic and elastic design of
continuous beams and frames.

2. Timber design. Emphasis on special properties of timber affecting the design of timber structures. Introduction to design of steel structures. Application to continuous beams and portal frames.

8.272 Civil Engineering Materials I

Co-requisite: 8.271.


8.274 Civil Engineering Materials III

Prerequisite: 8.272. Co-requisite: 8.182.


8.273 Civil Engineering Materials II

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.

8.351 Engineering Mathematics

Prerequisite: 10.022.


8.572 Hydraulics II

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

Prerequisite: 8.572.


*Students who have failed this subject may apply for permission to enroll simultaneously in this subject and the subsequent subject.
A prior knowledge of elementary hydraulics is assumed.


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.

Prerequisites: 8.572, 8.582.

Hydraulics of groundwater systems, application to regional problems. Water resources planning, systems approach, applied aspects of water engineering.

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

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.

Project definition, documents, estimating, planning and scheduling models. Project finance and cost control methods. Field project management and reporting systems.

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.

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.


Municipal Engineering. Soil Mechanics: Soil forming processes; pedological classification; engineering classification of soils; pavement design based on engineering classification; effective stress concept for saturated and unsaturated soils, shear strength, flow of water through soils, consolidation; slope stability and earth pressures. Public Utilities: Relationship between urban development and each of water supply, wastewater and stormwater drainage, transport.

Servicing Subjects

Graduate Study

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.

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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.

8.705G System Modelling C3
The development of system models for specific problem areas and decision positions. Problem environment, goals, objectives, and definition established by field contact and team discussion, information flow requirements and the design of user-oriented decision processes. Class size is limited to selected students.

8.706G Experimental Methods in Engineering Research C3
Purposes of experimentation in engineering research. Design of experiments: factorial and other designs; replication. Analysis of experimental data: analysis of variance and covariance; spectral analysis; other statistical methods. Decision theory.

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, cofferdams, ground anchors, floating plant, formwork and falsework, bridge centring, well-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.

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 surfacing; 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**  
Pavement types for road, rail, airfield and other works: Stress distribution in pavements, theoretical and actual: sub-grade conditions and traffic loadings: design principles methods, and criteria for flexible pavements: design principles, methods and criteria for rigid and semi-rigid pavements, including stabilized soil and multilayer pavements: design principles, methods and criteria for design of railtracks. Design of special-duty and temporary pavements.

8.751G  **Pavement Design and Evaluation II**  

8.752G  **Terrain Engineering**  
Basic geology, geological processes and geomorphology as they affect the planning of engineering works and construction. Specific civil engineering applications for highways, water storages, buildings, civil and military transport operations, etc. Photo interpretation, ground surveying, terrain mapping, information storage and retrieval.

8.753G  **Soil Engineering**  

8.754G  **Applied Soil Mechanics**  
A detailed study of rigid and flexible retaining structures, and of slope stability using both traditional and recent analytical methods. Applications of plasticity theory, refined failure surface analysis and the finite element method.

8.755G  **Materials of Construction (Concrete Technology) I**  
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)**  

8.758G  **Soil Mechanics**  
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.

8.759G  **Rock Mechanics**  

8.760G  **Materials of Construction (Concrete Technology) II**  
Concrete as a structural material, with special application to marine structures. Volume changes, shrinkage and thermal stresses; creep; predicated and design values. Cracking of plain and reinforced concrete, fracture toughness and extensibility; cracking problems caused by volume changes and creep effects in mass and offshore-type structures. Bond and impact strengths. Durability and fatigue of reinforced and prestressed concrete. Types of durability breakdown, sea water attack, FIP and other design recommendations and current research for marine structures. Special concretes.

8.764G  **Composites in Civil Engineering**  
History; relationship between structure and mechanical and physical properties. Elastomers, adhesives, reinforced plastics natural composites. Applications and case studies.

8.766G  **Welding in Structural Engineering**  
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 C3
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 C3

8.802G Elastic Stability I C3
Euler strut; uniform and non-uniform cross sections. Eccentric loading; stressing beyond the elastic limit. Struts continuous over several supports. Stability of frames.

8.803G Elastic Stability II C3
Energy methods of formation of stability problems. Approximate methods. Thin-walled open section struts; lateral buckling of beams; bending and buckling of thin plates.

8.804G Vibration of Structures I C3
Review of basic aspects. Analysis of lumped mass systems with various degrees of freedom. Vibration in beams and other continuous structures.

8.805G Vibration of Structures II C3

8.806G Prestressed Concrete I C3
Historical development. Methods of prestressing. Elastic analysis and design. Flexural capacity and shear capacity of prestressed elements.

8.807G Prestressed Concrete II C3

8.808G Prestressed Concrete III C3

8.809G Reinforced Concrete I C3
Historical development. Methods of analysis and design, including limit state concepts. Analysis and design for bending, compression and combined bending and compression. Shear and torsion. Serviceability requirements.

8.810G Reinforced Concrete II C3

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

8.819G Bridge Design II

8.820G Structural Analysis and Finite Elements I

8.821G Structural Analysis and Finite Elements II

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

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

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

8.832G Pipe Network and Transients

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

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

8.836G Coastal Engineering II
Wave forces on structures, shore processes and beach erosion. Estuarine hydraulics, wave and tide models.

8.837G Hydrological Processes
Hydrological 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
Introduction to flood estimation, design rainfall data, hydrograph analysis, storm runoff, loss rates, rational methods, unit hydrographs, introduction to urban drainage design, flood frequency.

8.839G Advanced Flood Estimation
Flood routing, catchment characteristics, runoff routing, synthetic unit hydrographs, urban runoff, regional empirical flood estimation methods, advanced unit hydrograph theory.

8.840G Reservoir Design and Yield Determination
Storage-yield analysis, extension of runoff records, deterministic catchment models, stochastic hydrology, storage probability studies, spillway capacity and reservoir flood routing.

8.841G Hydrometeorology
Water and energy balances, atmospheric moisture, precipitation, evaporation and transpiration, snow and snowmelt, extreme precipitation.

8.842G Groundwater Hydrology
Confined and unconfined aquifers, analogue and digital models of aquifer systems, water movement in the unsaturated zone, recharge, groundwater quality, sea water intrusion.
8.843G Groundwater Hydraulics C3
Mechanics of flow in saturated porous materials, steady and unsteady flow to wells, leaky aquifers, partial penetration, multiple aquifer boundaries, delayed yield from storage, regional studies.

8.844G Soil-Water Hydrology C3
Hydrologic characteristics of unsaturated media, hysteresis, theory of infiltration, drainage and redistribution studies, laboratory and field instrumentation, applications to field problems.

8.847G Water Resources Policy C3
Resource economics, water supply, water demand, multiple objective planning, multiple purpose projects, water law, water administration, case studies.

8.848G Water Resource System Design C3
Principles of the optimal design and operation of multiple purpose, multiple component, water resource systems; evaluation of cost and benefits in complex and simple systems.

8.849G Irrigation C3
Soils, soil-water relationships, plants, climate, crop requirements; water budgets, sources, quality, measurement; irrigation efficiency. Design of irrigation systems, appurtenant works, distribution.

8.850G Drainage of Agricultural Land C3
Characteristics of drainage systems, steady and unsteady state drainage formulae, conformal transformations solutions, soil characteristics, field measurement of hydraulic conductivity and soil water pressure, significance of unsaturated zone, practical aspects.

8.851G Unit Operations in Public Health Engineering C3
Theory of physical, chemical, biological, and hydraulic processes used in both water and wastewater treatment. Applications where these are common to both water and wastewater treatment.

8.852G Water Distribution and Sewage Collection C3
Water collection, transmission and distribution systems — layout design and analysis, reservoirs, pumping. Sewage collection system design and analysis — capacities, corrosion, pumping.

8.853G Public Health Science C6
Not offered in 1979.
Science in public health engineering; environmental factors. Applications of chemistry, physics, biology and biochemistry to water and wastewater technology. Control of disease and industrial hygiene; community health and epidemiology. Food technology. Air pollution and solid wastes. Radioactivity and radioactive wastes.

8.854G Solid and Liquid Waste Management C2
Sources and nature of refuse-collection and transportation-disposal: sanitary landfill, incineration, pyrolysis, resource recovery, composting. Collection, treatment and disposal of strong liquid wastes.

8.855G Water and Wastewater Analysis and Quality Requirements C3
The effects of impurities in water and wastewater on its suitability for various beneficial uses, and methods used for detecting impurities. Analytical methods used in water and wastewater treatment for monitoring and process control.

8.856G Water Treatment C3
Application of processes and process variations used to upgrade the quality of water for specified uses, with particular reference to the treatment of water for municipal use.

8.857G Sewage Treatment and Disposal C3
Application of processes and process variations used to improve the quality of sewage effluent, and the disposal of the effluent. Re-use of effluents where applicable. Sludge treatment and disposal.

8.858G Water Quality Management C3
Fundamental concepts; systems approach to quality aspects of water resource systems; quality interchange systems; quality changes in estuarine, surface, and ground water. Quality management by engineered systems. Economic criteria relating to water use and re-use systems.

8.860G Investigation of Groundwater Resources I C3
Occurrence and extraction of groundwater, investigation and drilling methods, systems approach, optimization techniques, conjunctive use studies, quality of groundwater.

8.861G Investigation of Groundwater Resources II C3
Geophysical methods, remote sensing, photointerpretation, arid-environment studies, analog models, case studies.

8.862G Fluvial Hydraulics C3
Unsteady and varied flow in non-uniform channels, secondary currents, sediment transport, channel morphology, scour and shoaling, river control works, modelling of fluvial processes.
8.863G Estuarine Hydraulics

8.901G Civil Engineering Elective I
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
A Session 2 occasional elective on a civil engineering topic, selected according to current demand and availability of local and visiting specialists.

8.909G Project

8.918G Research Project

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**Mathematics**

**Undergraduate Study**

10.001 Mathematics I
Prerequisites:
HSC Exam Percentile Range Required
2 unit Mathematics 71-100
or 3 unit Mathematics 21-100
or 4 unit Mathematics 1-100

Excluded: 10.011, 10.021A, 10.021B, 10.021C.

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

10.011 Higher Mathematics I
Prerequisite:
HSC Exam Percentile Range Required
3 unit Mathematics 71-100
or 4 unit Mathematics 11-100

Excluded: 10.001, 10.021A, 10.021B, 10.021C.

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

10.022 Engineering Mathematics II
Prerequisite: 10.001 or 10.011.

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

10.031 Mathematics
Prerequisite: 10.001 or 10.011 or 10.021C(Cr).

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

10.033 Electrical Engineering Mathematics III
Prerequisites: 10.111A, 10.1113, 10.1114, 10.2111, 10.2112.


Optimization.

10.111A Pure Mathematics II — Linear Algebra
Prerequisite: 10.001 or 10.011.

10.1113 Pure Mathematics II — Multivariable Calculus  
Prerequisite: 10.001 or 10.011.  
Multiple integrals, partial differentiation. Analysis of real valued functions of one and several variables.

10.361 Statistics SE 
Prerequisite: 10.001 or 10.011.  
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-squared and t. Estimation by moments and maximum likelihood; confidence interval estimation. The standard tests of significance based on the above distribution with a discussion of power where appropriate.  

10.341A Statistics SU (Part A) 
Prerequisite: 10.001 or 10.011.  
An introduction to probability theory, random variables and distribution functions. Sampling distributions, including those of chi-squared and t. Estimation methods, including an introduction to Least Squares and confidence interval estimation.

10.2112 Applied Mathematics II — Mathematical Methods for Differential Equations  
Prerequisites: 10.001 or 10.011.  

10.341B Statistics SU (Part B)  
Prerequisite: 10.341A.  
Further least squares and interval estimation procedures (including the use of the F distribution), with applications.

10.371G Statistics  
Revision of probability and distribution theory, including estimation of hypothesis testing. Extension of this to include topics such as more complex probabilistic modelling, analyses of modified data (censored, truncated and missing observations), general statistical inference (decision theory), acceptance testing, and reliability analysis (hazard functions).
Accountancy

Undergraduate Study

14.001 Introduction to Accounting A S1 L2T0

14.002 Introduction to Accounting B S2 L2T0
Prerequisite: 14.001.
An introduction for non-commerce students to managerial accounting. Long-range planning, budgeting and responsibility accounting; cost determination, cost control and relevant cost analyses.

Graduate Study

14.042G Industrial Law C2
The elements of the law of contract and tort as applied to industrial law; the New South Wales and Commonwealth industrial arbitration systems, including award making and interpretation, and industrial disputes; workers’ compensation.

14.062G Accounting for Engineers C3
Problems related to industrial situations, and their relevance in decision-making. Manufacturing and cost accounts, budgeting and budgetary control, cost analysis and control and profit planning.

Economics

Industrial Relations

Undergraduate Study

15.501 Introduction to Industrial Relations S1 or S2 L2T1½
For students enrolled in Faculties other than Commerce and Arts. Designed to provide a practical introduction to important industrial relations concepts, issues and procedures. Includes: the origins, evolution and operation of the Australian system of industrial relations; the structure and role of trade unions and employer bodies; the function of industrial tribunals such as the Australian Conciliation and Arbitration Commission and the NSW Industrial Commission; wages structure and determination; employment, unemployment and retraining; the nature and causes of strikes and other forms of industrial conflict; the processes and procedures for conflict resolution.

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

Industrial Engineering*

Undergraduate Study

18.003 Numerical Methods/Industrial Experimentation S1 L1T½ S2 L1½T½
Prerequisites: 5.072, 10.001, 10.022.

*Industrial Engineering is a Department within the School of Mechanical and Industrial Engineering.
18.004 Manufacturing Management  F L1T1
Prerequisites: 18.503, 18.603, 14.001, 14.002.

18.011 Industrial Engineering IA  F L1\textsuperscript{T}4T\textsuperscript{4}
Prerequisite: 10.022. Co- or prerequisite: 5.071, 5.111 or 5.122.

18.012 Industrial Engineering IIA  F L2T1
Prerequisites: 5.112 or 5.123, 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, eg personnel, purchasing, quality control, industrial engineering, accounting; new forms of organization. Industrial legislation, industrial relations, safe practices. Employer expectations of the trainee engineer, requirements for the Industrial Training Report. Introduction to the specialist streams of the Years 3 and 4.

18.021 Industrial Engineering IB  F L1\textsuperscript{T}3T\textsuperscript{3}
Prerequisite: 10.022. Co- or prerequisite: 5.071.

18.022 Industrial Engineering IIB  F L2T1
Prerequisites: 5.071, 18.021.
Design of Manufacturing Facilities: Product and objectsives, 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.


18.204 Introduction to Automation I  S1 or S2 L2T1
Overview of automation; comparison of mechanical, electronic and fluidic logic circuits; automation devices, eg feeders, manipulators, conveyors; introduction to digital logic and number systems as they affect automation design; systems design.

18.214 Introduction to Automation II  S1 or S2 L2T1
Prerequisite: 18.204.
Introduction to the use of specific logic devices with particular reference to electronic integrated circuits; the use of microprocessors as logic devices; comparison of hardware and software logic; detailed design of simple automation systems.

18.224 Numerical Control of Machine Tools  S1 or S2 L2T1
Overview of numerical control systems; machine specification and selection; manual part programming; production and operator aspects including selection of operating conditions, work holding devices and tooling; introduction to computer assisted programming.

18.303 Methods Engineering  F L1T1
Prerequisites: 5.072, 18.020.
Aims: Historical development, measurement of productivity.

Methods study: motion economy, ergonomics, man-machine relationships.
18.403 Production Design and Technology  F L2T2
Prerequisites: 5.072, 5.422 or 5.411 and 8.259.

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

18.404 Design for Production  F L1T1
Prerequisite: 18.413.

Overview of design for production and its relation to overall design process; selection, specification and interpretation of tolerances; process selection; analysis of various production processes; jig, fixture and gauge design.

18.413 Design for Industrial Engineers  S1 L1T1 S2 L1T2
Prerequisites: 5.122 or 5.123, 5.422 or 5.411 and 8.259.

Session 1: Industrial design. Tooling design. Production aids. Fluid power systems. Introduction to fatigue in design.

Session 2: (Common with Session 2 in 5.123 Mechanical Engineering Design III.) More advanced design analyses, component design and drawing with individual and group projects of an interdisciplinary nature.

18.431 Design for Production  F L1T2
Prerequisite: 5.112.


18.432 Design of Production Systems  F L2T4 (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.

18.503 Operations Research A  F L2T1
Prerequisites: 5.072, 10.022. Co-requisite: 18.803.

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

18.511 Operations Research  F L2T1
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, 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.

18.603 Management/Economics  F L1T1
Prerequisites: 5.072, 18.020.

Introduction: objectives of a company, measures of performance, need for economic decisions.

Cost information: sources of costs, fixed and variable, overheads, break-even analysis.


18.03 Optimization

Prerequisite: 10.022. Co-requisite: 18.503.


Servicing Subjects

18.121 Production Management
18.131 Operations Research

Graduate Study

18.061G Industrial Experimentation I

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.

18.062G Industrial Experimentation II

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

The application of ergonomics to work and industry. Applied anatomy and kinesiology leading to work place arrangements. Anthropometry and work place dimensions, seating, individual differences. Physiological and psychological aspects of work and fatigue. Environmental considerations; thermal, noise lighting. Perception, displays and machine controls. Safety considerations.

18.074G Industrial Management

Technical aspects: objectives of an enterprise or organisation, measures of overall performance, interfirm comparisons; monitoring performance, feedback and control, use of quality and inventory control, work study, accounting reports; corporate planning, use of forecasts, market surveys, operations research.

Organisational aspects: organisational structures, defining authority and responsibility; communication in organisations, information systems; the personnel function, selection, training and development, appraisal.

Human aspects: changing management styles, influences of ownership, technology, social attitudes, composition of the workforce, company size, organised labour; psychological factors, motivation, conflict situations, job satisfaction, leadership, adapting to change; industrial relations, trade unions and arbitration system structures, problems and cases; industrial democracy, participation in ownership and management.

18.080G Organization and Administration

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

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


18.171G Inspection and Quality Control

Economics of measurement; advanced measuring and inspection methods; non-destructive testing; quality control systems; sampling by attributes and variables; standardization; case studies; process capability and variability; machine tools acceptance testing; alignment procedures.

18.260G Computer Aided Programming for Numerical Control

Brief review of N.C. systems and manual programming. Requirements of a high level language designed specifically for programming N.C. machine tools. Languages available and their use on mainframe, min or
micro computers, eg APT, ADAPT, FANAPT, UNIAPT, MICRO APT, etc.

Detailed study of the structure and use of "Automatic Programmed Tools" (APT) language including overview of language, basic APT grammar, part program structure, geometry statements, motion statements, macro commands, postprocessors, diagnostics.

**18.261G Computer Automation**  
C3

Computer architecture including central processor, random-access memory, read only memory, input/output ports, peripherals, and the relationships between each. A systematic study of the requirements for interfacing computers to the real world. Machine code, assembly language, and high level languages such as BASIC or FORTRAN with a comparison of each for particular applications. Development of small computer system for machine tool control, automated inspection, supervision, stock control, etc.

**18.262G Economics of Machining for Automation**  
C3

Estimation of power consumption in turning, milling, contouring, etc. Economics of machining including the following cases: 1. constant feed no constraint; 2. machining with power and feed constraint; 3. estimating costs to allow for variability; 4. influence of tool and plant costs; 5. selection of production rate to suit various criteria. Introduction to tool materials and tooling, tool materials — selection and grading, throwaway tooling, preset tooling, tool setting devices, principles of tool design.

**18.271G Theory of Machine and Forming Processes**  
C3


**18.272G Technology of Machining and Forming Processes**  
C3

Selected topics from: Machine tool vibration; designs 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.

**18.370G Design of Work Systems**  
C3

Historical review: Selection and organisation of workforces throughout history, effects of technology, use of deprived groups, characteristics and aspirations of the modern workforce. The physical workplace: Applications of ergonomics to workplace and hand tool design. Control of the environment, safety and health considerations, legislation and other influences. Planning work loads: Estimating times for tasks, allocation of work among groups, assembly work by fixed position or by production line. Production line balancing. Group technology systems. Avoiding or allowing for fatigue. Interaction with machines: Machine-controlled processes, machine interference, queuing, optimisation of the man-machine system. Interaction with others: Co-ordination of work within groups, critical path scheduling; workplace arrangements to foster communication and avoid isolation. Quality of work life: Job enrichment and job enlargement. Worker participation in planning. Autonomous work groups and socio-technical systems. Trends towards industrial democracy.

**18.371G Factory Design and Layout**  
C3

Production Requirements: Processes, machines and storage; optimum factory size, multiple factories. Plant Location: Single and multiple factories and warehouses; location models and economic analysis. Factory Design: Function; appearance; economic factors; environmental factors. Materials Handling Systems: Influence on layout; economic choice between alternatives; long-distance transport. Layout Design: By product; types of production line, means of line balancing, queuing theory applications. By process: travel charts and computer programs for optimization. Practical aspects; provision of services and amenities; layout visualization methods. A project forms a substantial proportion of the assessment for this subject.

**18.380G Methods Engineering**  
C4


**18.461G Design for Production**  
C4

Influence of manufacturing processes on design; design simplification and standardization; value engineering; economics of process selection; case studies.

**18.462G Industrial Design**  
C2

Economic considerations; fundamentals of design; influence of processes; case studies.

**18.463G Tool Design**  
C4

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.

**18.464G Value Analysis/Engineering**  
C3

Cost reduction through value analysis/engineering illustrated by case studies. Selection of projects to be studied, collection of information, creative problem solving, development of alternatives, functional analysis system technique, functional evaluation, cost-function relationship, decision making, communication and implementation of the proposal. Applications to engineering design and services.
18.471G Design Communication
Communication systems 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, queuing theory, inventory models, replacement and reliability models and simulation. These techniques are applied to situations drawn from industrial fields, for example, production planning and control. Practical problems of data collection, problem formulation and analysis.

18.574G 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, queuing theory, inventory models, replacement and reliability models; simulation. These techniques applied to situations drawn from industrial fields, e.g. production planning and inventory control. Practical problems of data collection, problem formulation and analysis.

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

18.675G Economic Decisions in Industrial Management
General aspects: the economic objective, the single-period investor's model, economic criteria, the mathematics of finance. Deterministic models: project evaluation using discounted cash flow analysis; capital structure; debt and equity financing; cost of capital and the minimum acceptable rate of return; taxation; inflation and its effects. Probabilistic models: multiple objectives and multi-attribute value systems based on means and variances of cash flows. Particular applications of economic decision-making: venture and risk analysis, risk management, static and dynamic replacement models, rent-or-buy decisions, break-even analysis, expansion and economic package concepts, analysis of projects with public financing.

18.680G Decision Making under Uncertainty
The structure of decisions: payoff matrices, decision trees. Principles of choice; utility of risky choice; subjective probability. Analysis of decisions under risk; certainty equivalents; value of imperfect information. Bayesian criteria of choice of 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, e.g. 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 and natural resource utilization.

18.764G Management of Distribution Systems
Prerequisite: 18.503.
The distribution system: single depot location, multi-depot location, vehicle scheduling, vehicle loading, fleet size, case studies.


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. Application packages with emphasis on systems for production and inventory control. Major problems in information processing systems.

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.

Examples of stochastic processes, basic concepts and Markov chains. Renewal theory. Applications to queues, inventory replacement, risk, business and marketing. Markov decision processes.

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.

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.


Corporate objectives and organization. The production environment. The detailed mechanics of control of jobbing production and its extension to repetition batch and continuous production. Manufacturing organization and controls, functions, inter-relationship and information flow. Relevance to computerized control. Introduction to inventory control, and the analysis of some typical engineering planning decisions.


Optimization concepts developed for function of polynomial form. Solution techniques for such problems. Sensitivity of solution. Applications of geometric programming to problems from engineering and operations research.

18.874G 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 C2

18.878G Industrial Applications of Mathematical Programming C2
Problem formulation: profitability criteria, operating constraints. Conventions for large-scale matrix construction; list and table-processing, error-checking. Use of commercial systems: data organization, interpretation of output, ranging procedures. Examples from actual industrial studies.

18.879G Mathematical Programming Analysis C3
Co-requisites: 18.871G; Linear Programming section of 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 C9
18.918G Research Project C18
18.936G Research Project C36

18.960G Seminar (Production Engineering) C0
18.967G Advanced Topic in Production Engineering* C2
18.968G Advanced Topic in Production Engineering* C2
18.969G Advanced Topic in Production Engineering* C2
18.970G Seminar (Operations Research) C0
18.977G Advanced Topic in Operations Research* C2
18.978G Advanced Topic in Operations Research* C2
18.979G Advanced Topic in Operations Research* C2

Nuclear Engineering

Undergraduate Study

23.051 Nuclear Power Technology F L2¾T½
Atomic nuclei, radioactivity, neutron reactions, fissile and fertile materials, nuclear conversion and breeding cycles, plutonium. Criticality requirements, heat removal, control and safety of nuclear reactors. The thermal, hydraulic and structural aspects of gas and liquid cooled thermal reactors and liquid metal cooled fast breeder reactors. The status of fusion research and development. The technology, safety, economics and environmental impact of nuclear fuel cycles, from mining, through enrichment, fabrication and burnup to waste disposal. Comparative assessment of nuclear, fossil and alternative energy systems in local and global contexts.

*Subjects which allow the presentation of special topics, particularly by visiting academics.
Graduate Study

Not all subjects are available in any one year.

23.026G Reactor Systems Analysis S2 L2\(\frac{1}{2}\) T\(\frac{1}{2}\) 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 L2\(\frac{1}{2}\) T\(\frac{1}{2}\)
The special problems associated with the dynamics and stability of fluid cooled reactors under boiling conditions.

23.028G Reactor Accident and Safety Analysis S2 L2\(\frac{1}{2}\) T\(\frac{1}{2}\) 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.

23.013G Neutron Transport and Diffusion S2 L2\(\frac{1}{2}\) T\(\frac{1}{2}\) C3
Neutron and nuclear reactions, the formation of neutron spectra in infinite multiplying media, transport and diffusion theories, and their application to the analysis of heterogeneous reactor lattices.

23.014G Fewgroup Reactor Theories S2 L2\(\frac{1}{2}\) T\(\frac{1}{2}\) 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 L2\(\frac{1}{2}\) T\(\frac{1}{2}\) 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 L2\(\frac{1}{2}\) T\(\frac{1}{2}\) 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.

23.017G Reactor Structural Mechanics S1 L2\(\frac{1}{2}\) T\(\frac{1}{2}\) C3
A study of theoretical models and numerical techniques required for the analysis of mechanical and thermal stress, deformation, and failure modes of reactor core components and containment structures under high temperature, neutron and gamma irradiation.

23.018G Reactor Thermal Performance S1 L2\(\frac{1}{2}\) T\(\frac{1}{2}\) 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.

23.019G Reactor Accident and Safety Analysis S2 L2\(\frac{1}{2}\) T\(\frac{1}{2}\) 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.

23.020G Random Processes and Reactor Noise S2 L2\(\frac{1}{2}\) T\(\frac{1}{2}\) 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.

23.021G Nuclear Fuel and Energy Cycles S1 L2\(\frac{1}{2}\) T\(\frac{1}{2}\) C3
The utilization of nuclear energy, the thermodynamics of nuclear power systems and applications, and the study of nuclear fuel cycles.

23.022G Nuclear Power Costing and Economics S2 L2\(\frac{1}{2}\) T\(\frac{1}{2}\) C3
The principles of nuclear power cost estimation for various reactor types and applications, the comparative evaluation of nuclear power systems, and the problem of reactor strategy.
Subject Descriptions

23.044G Nuclear Engineering Optimization  S2 L2½T½ C3
The theory and application of function and functional minimization techniques to problems of design, control and operation of nuclear reactors and associated nuclear fuel supply complexes.

23.045G Uranium Enrichment Technology  S1 L2½T½ C3
The theory and technology of uranium enrichment by the diffusion, ultracentrifuge and nozzle processes; the economics of enrichment within the nuclear reactor fuel cycle, in relation to optimal reactor strategy and resources utilization.

24.002G Transport, Environment, Community  F C6

24.003G Theory of Land Use/Transport Interaction  S1 C3
Theoretical aspects of land use transport planning. Basic concepts, data collection methods, systems models and equation of state (functional, behavioural, optimizing). Introduction to land use-transport 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  S1 C3
Application of theoretical methods to local area planning. Local government planning and engineering: pedestrian planning, frontage land use problems, analysis of residential areas, industrial estates, shopping centres and recreational facilities, accessibility studies, environmental studies, parking studies.

24.005G Urban Transport Planning Practice  SS C3

24.006G Regional Transport Planning  S2 C3
The role of transport in economic and social development in regions including Third World countries; historical and contemporary analysis. Analytical techniques for regional planning. Planning practice, feasibility studies, evaluation methods. Case studies.

24.007G Transport System Design (Non-Urban)  S1 C3
Process of location of road, railway and airport facilities. Data collection, alternative routes, public discussion, methods, techniques, aids, plans and diagrams produced. Geometric form: differences between road, railway and airport carriageway layout. Optical guidance, design models, landscape, provision for surface-water signposting, fencing and posts.

24.008G Transport System Design (Urban)  S2 C3
Types of urban transport facilities. Distributors, streets, bicycle routes, walk-oriented areas, bus lanes and rapid transit lanes, stops and change

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.

All subjects will normally involve three hours per week total attendance at lectures and tutorials for either one session (3 credit subjects) or for two sessions (6 credit subjects).

24.001G Human Factors in Transport  SS C3
Human capabilities, ergonomic principles, attitudes to new concepts, planning, the law; application to transport planning, design and implementation. The human as a processor of information, influence on design of transport facilities particularly information displays; signals, signs and lighting.
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 SS 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, signposting. Computer use. Safety measures during maintenance.

24.010G Highway Engineering Practice Part I S1 C3

24.011G Highway Engineering Practice Part II S2 C3

24.012G Economics for Transport Studies S1 C3

24.013G Transport Economics S2 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 I S1 C3

24.015G Transport Systems Part II S2 C3
Historical introduction to transport systems and development of various transport modes; road (vehicles, pedestrians, cycles), conveyor, rail, sea and air. Analysis of the operational characteristics of vehicles in the transport modes of road, rail and air. Analysis of the requirements of the rights of way for each transport mode. Development of optimum criteria for the distribution of cargo and passenger traffic. Terminals and mode transfer facilities. Development of system operational models. Energy consideration, new systems.

24.016G Traffic Engineering F C6

24.017G Transport and Traffic Flow Theory F C6
Analysis of deterministic and stochastic models of the traffic stream. Topics covered include the following: Definition and measurement of traffic stream parameters. Space and time distribution of speed. Overtaking models and the moving-observer method. Fundamental diagram of traffic. Car-following theory. Headway and counting distributions. Introduction to queuing theory. Simulation techniques. Signalized and unsignalized intersections.

24.018G Statistics for Transport Studies Part I S1 C3

24.019G Statistics for Transport Studies Part II S2 C3

24.020G Mathematical Techniques for Transport Studies SS 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 SS 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.
<table>
<thead>
<tr>
<th>Subject Code</th>
<th>Subject Title</th>
<th>Semester</th>
<th>Coursel</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>24.023G</td>
<td>Pavement Materials II</td>
<td>S2</td>
<td>C3</td>
<td>As for 8.749G Pavement Materials II.</td>
</tr>
<tr>
<td>24.024G</td>
<td>Pavement Design and Evaluation I</td>
<td>S1</td>
<td>C3</td>
<td>As for 8.750G Pavement Design and Evaluation I.</td>
</tr>
<tr>
<td>24.025G</td>
<td>Pavement Design and Evaluation II</td>
<td>S2</td>
<td>C3</td>
<td>As for 8.751G Pavement Design and Evaluation II.</td>
</tr>
<tr>
<td>24.026G</td>
<td>Bridges and Highway Structures Part I</td>
<td>S1</td>
<td>C3</td>
<td>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.</td>
</tr>
<tr>
<td>24.027G</td>
<td>Bridges and Highway Structure Part II</td>
<td>S2</td>
<td>C3</td>
<td>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.</td>
</tr>
<tr>
<td>24.028G</td>
<td>Transport and Highway Elective</td>
<td>SS</td>
<td>C3</td>
<td>An occasional offering in a specialized Transport and Highways topic selected according to current demand and/or availability of a local or visiting specialist.</td>
</tr>
<tr>
<td>24.028G</td>
<td>Transport and Highway Elective</td>
<td>SS</td>
<td>C3</td>
<td>An occasional offering in a specialized Transport and Highways topic selected according to current demand and/or availability of a local or visiting specialist.</td>
</tr>
</tbody>
</table>
Construction planning: Critical Path and PERT applications to the planning of road construction. Introduction to the use of the computer in project planning and control.

24.109G Road Location and Design — Part I F 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 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 F C7

24.111G Road Construction F 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 F 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 primeseals, design of bituminous mixes, wearing courses, full depth asphalt pavements, manufacture of bituminous concrete, maintenance procedures.

Types of aggregates and their application, laboratory tests, relevance of tests to pavement performance, crushing, screening, grading of aggregates, durability of aggregates, blending procedures, quarrying and use of explosives, selection and testing of gravels.

Types of cement, additives, design of concrete mixes, transport and placing of concrete, compaction and curing, laboratory and in situ tests, quality control.

24.113G Transport and the Environment F C6
Impact of transport technology on public health and the environment. Accidents, noise, pollution, intrusion, depletion of non renewable resources; extent and measurement. Remedial measures by change, modification and improvement of technology, and by optimizing of transport activity. Role of government and community in policy formulation, implementation and monitoring.

Geography

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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 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.

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Types of aggregates and their application, laboratory tests, relevance of tests to pavement performance, crushing, screening, grading of aggregates, durability of aggregates, blending procedures, quarrying and use of explosives, selection and testing of gravels.

Types of cement, additives, design of concrete mixes, transport and placing of concrete, compaction and curing, laboratory and in situ tests, quality control.

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Impact of transport technology on public health and the environment. Accidents, noise, pollution, intrusion, depletion of non renewable resources; extent and measurement. Remedial measures by change, modification and improvement of technology, and by optimizing of transport activity. Role of government and community in policy formulation, implementation and monitoring.

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

Graduate Study

27.901G Geomorphology for Hydrologists S2 L1½T1½

Surveying

Undergraduate Study

Note: Electronic Calculators.

Students enrolled in the BSurv Course are required to equip themselves with an electronic calculator. Details of the features required are available from the School.
29.001 Surveying I  S1 L3T1½


29.002 Surveying II  S2 L2T3

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  S1 L2½T2½

Prerequisite: 29.002.


29.004 Surveying IV  S2 L2T2¼

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  S1 L3T2

Prerequisites: 29.121, 29.003.

Electronic distance measurement principles, applications and instruments, propagation of electromagnetic waves, meteorological and geometric corrections, field procedures, instrumental errors and their calibration. Calibration of linear scales. Precise angle measurement, observations and reduction procedures, sources of error and their testing.

29.006 Surveying VI*  S2 L2T1

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.

29.031 Electronic Distance Measurement  S2 L2T1

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  S2 L2T1

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 toile, special equipment and techniques, auto-collimation, laser interferometry.

29.033 Characteristics of Modern Theodolites and Levels  S2 L2T1

Prerequisites: 29.006.

Construction features, sources of error and methods of testing modern optical surveying instruments. Topics selected from: circle and micrometer graduation errors, coded circles, calibration and behaviour of bubbles, automatic compensator systems, axis wobble, temperature effects.

29.034 Mine Surveying  S1 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.

*Also offered in Session 1, 1980.
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, inking in. Static display of other equipment. Lectures on nature of seabed, wind waves, the survey report. Discussions on practical surveying tasks or topics of current interest. A harmonic analysis of 12 days of tidal data.

29.173 Project  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.

29.191 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.

29.195 Survey Camp III
Prerequisites: 29.006, 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.
Historical development of geodesy. Goals of contemporary geodesy. The nature of the earth's interior. The earth's gravity field. Natural, geodetic, rectangular, and plane co-ordinates. Definition of and

29.212 Geodesy II
Prerequisite: 29.211.


29.213 Geodesy III
Prerequisite: 29.212.


29.231 Geophysics for Surveyors
Prerequisite: 29.311.


29.232 Atmospheric Effects on Geodetic Measurements
Prerequisite: 29.212.


29.312 Astronomy II
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
Prerequisite: 29.312.

Topics selected from: geodetic astronomical methods, daylight star observations, meridian and equal altitude methods, variation in star coordinates, sun dials, celestial methods in navigation.

29.441 Surveying for Engineers
Prerequisite: 29.212.


29.491 Survey Camp
A one-week field camp.

29.511 Photogrammetry I
Prerequisite: 29.151.


29.512 Photogrammetry II
Prerequisite: 29.511.


29.513 Photogrammetry III
Prerequisite: 29.512.

Review of inner, relative and absolute orientation. Aerial triangulation: analogue continuous strip methods, method of independent models, analytical methods, block adjustments, accuracies, error propagation.

29.514 Principles of Remote Sensing S1 L2T1


29.631 Land Inventory I S2 L1T1

Prerequisite: 27.295.


29.632 Land Inventory II S2 L2T1

Prerequisite: 29.631.


29.651 Land Development I S1 L2T1


29.652 Land Development II S2 L2T1

Prerequisite: 29.661.


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 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 L1½T½

Prerequisite: 29.661.

The legal system in NSW as it affects the land surveyor. Forms of titles: Old System titles, Torrens titles and Crown lands titles. Land law: legislation, real and personal property, interests and estates in land, riparian rights and conveyancing. The status of roads in NSW. Maritime law. The operation of the cadastral in NSW: an historical introduction, the role of the boundary surveyor and boundary control.

29.662 Cadastral Surveying and Land Law II S1 or S2 L2T1

Prerequisite: 29.661.

Practical and legal aspects of cadastral surveying in NSW including: survey and title searching; survey investigation; redetermination 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. Introduction to geodesy and position fixing from celestial bodies. Maps projections and co-ordinates. Introduction to the use of aerial photographs. Maps and aerial photographs and their application to resource surveys. Role of consulting surveyor. Brief introduction to cadastral, engineering and land development surveys. Mining and hydrographic surveys. Includes a visit to several surveying establishments.

29.701 Seminar I  S2 LOT1
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 LOT1
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 L½T½
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  S1 L2T0

29.705 Management II  S2 L2T0
Prerequisite: 29.704.

29.800 Survey Draughting  S1 L½T2½
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  S2 L1½T1½

29.802 Cartography II  S1 L1½T1½
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  S2 L1½T1½
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.

Servicing Subjects

29.411 Surveying for Architects and Builders  S1 L1T1½
29.431 Surveying and Cartography  S1 L2T1½

Graduate Study

29.101G Aspects of Electromagnetic Distance Measurement  SS L2T1 C3
29.102G Characteristics of Optical Surveying Instrumentation SS L2T1 C3
Sources of error in modern optical surveying instruments. Methods of testing and calibration. Observational techniques for reducing effects of errors. Developments in circle reading and level sensing systems. Design of instrument testing facilities.

29.103G Precise Engineering Surveys SS L2T1 C3
Techniques and instrumentation for precise surveys. Applications in industry and engineering: deformation and settlement surveys; surveys for large constructions, optical tooling, special measurement problems.

29.106G Special Topic in Surveying A C3
A special subject to be lectured on by visiting professors or other visiting staff. Details of syllabus and lecturer to be communicated to the Higher Degree Committee on each occasion when the subject runs.

29.107G Special Topic in Surveying B C3
A special subject taken by an individual student or a small group of students by private study in conjunction with tutorial sessions with the member(s) of staff in charge of the subject.

29.151G Adjustment of Observations SS L2T1 C3

29.171G Mathematical Methods I — Numerical Analysis SS L2T1 C3
Topics from real analysis, computational error theory, curve fitting by orthogonal polynomials, trigonometrical and exponential series, time series and quadrature.

29.172G Mathematical Methods II — Statistical Theory of Survey Observations SS L2T1 C3
Advanced application to survey observations of frequency distributions, moments, minimum variance, unbiased estimation, central limit theorem, analysis of variance and statistical testing. Outlying observations.

29.173G Mathematical Methods III — Spherical Harmonics SS L2T1 C3
Two dimensional Fourier Series. Theorems of vector field theory. The solution of Laplace's equation in spherical coordinates. Spherical harmonics.

29.174G Mathematical Methods IV — Theory of Survey Adjustment SS L2T1 C3
Matrices, multivariate normal, distribution of quadratic forms, five standard problems of Tienstra, geometrical interpretation of least squares adjustment, free net adjustment and generalised matrix algebra. Solution of large sets of equations. Confidence ellipses.

29.175G Mathematical Methods V — Collocation SS L2T1 C3
Fundamental assumptions. The covariance function and its modelling. The solution and theoretical accuracy. Interpolation, filtering, prediction and transformation by collocation. Applications in physical geodesy.

29.201G Geodetic Methods SS L2T1 C3

29.202G Solid Earth, Ocean, Lunar and Planetary Geodesy SS L2T1 C3

29.203G Gravimetric Geodesy SS L2T1 C3

29.204G Geodetic Refraction SS L2T1 C3
29.205G Geodetic Analysis Techniques

Orbital motion of earth's satellites, analysis of satellite orbits for low-degree harmonics of earth's gravitational field. Principles of data reduction of Doppler position systems, satellite laser ranging, long baseline interferometry and satellite altimetry.

SS L2T1 C3

29.206G Advanced Geodetic Instrumentation


SS L2T1 C3

29.207G Doppler Positioning

Introduction to Doppler positioning using the NNSS satellite system. The use of point positioning, translocation and short arc techniques. Review of available hardware. Majority voting; general and specialised reduction techniques. Computing techniques associated with the integration of Doppler positions into terrestrial network. Introduction to the Global Positioning System (GPS).

SS L2T1 C3

29.314G Geodetic Astronomy


SS L3T3 C6

29.516G Mathematical Model of the Imaging Process


SS L3T0 C3

29.517G Stereophotogrammetry


SS L2T1 C3

29.518G Analytical Photogrammetric Orientation

Prerequisite: Prior knowledge of FORTRAN computer programming is assumed.


SS L3T0 C3

29.519G Photogrammetric Instrumentation


SS L2T1 C3

29.520G Photogrammetric Production Processes


SS L1½T1½ C3

29.521G Control Extension A

Prerequisite: 29.517G or consent of the instructor.


SS L3T0 C3

29.522G Control Extension B

Prerequisite: 29.518G.


SS L3T0 C3

29.601G Remote Sensing Principles and Procedures

29.602G  Mass Appraisal Methods  SS L2T1 C3

Property and property value. Early rent theory. Location theory. The interrelationship between land use and value. Traditional methods of appraisal. Appraisal methods using multivariate analysis. Comparison of methods. Recent studies on the determinants of property value. Multiple regression analysis, general linear models, trend surface analysis, factor and discriminant theory and application. Collection and coding of property data. Examination of temporal variation and trends. Graphic output of data isovai maps. Value as one component of an urban information system.

29.603G  Statutory Controls of Land Development  SS L2T1 C3

Detailed examination of the subdivision and development process in N.S.W., with particular emphasis on the statutory procedures and controls at the local government level. The Local Government Appeals Tribunal and its major relevant decisions. Local Government and land development law. Case studies in land development.

29.604G  Land Information Systems  SS L2T1 C3

Land information as maps and records. Methods of data collection. Integrated surveys and coordinate systems. Legal boundaries. Land tenure, identifiers. Computerisation of land information. Data input methods. Data storage methods. Data processing and manipulation, including management, searching, existing data base languages, and interactive data editing. Data output, including computer graphics, line printer maps, and digital plotters.

29.706G  Survey Management  SS L2T1 C3

Introduction to management accounting. Information systems and accounting, balance sheets, income statements, accounting reports, costing, budgets and capital investment decisions.

29.707G  Quantitative Management Methods  SS L2T1 C3

Detailed analysis of operations research methods and discounted cash flow techniques as they apply to mapping, surveying and development projects. Various case studies and their solutions will be examined.

29.909G  Project  C9

See Section on Graduate Study earlier in this book for details of research areas in the School.

29.918G  Research Project  C18

See section on Graduate Study earlier in this book for details on research areas in the School.

29.936G  Research Project  C36

See section on Graduate Study earlier in this book for details of research areas in the School.

Biomedical Engineering

Undergraduate Study

32.011  Biomedical Statistics  S1 L2T2 C4

An intense, practical overview of statistics emphasising the logic of experimental design, and the use computers to handle statistical and mass patient data. Emphasis is on statistics to assist biomedical engineers in patient diagnosis and treatment. No prior knowledge of statistics or computers assumed.

Graduate Study

32.010G  Biomedical Engineering Practice  S1 L2½ C2

Introduction to clinical situations in hospitals. Presentation of guest lectures by eminent people working in this field. Lecture topics include cardiology, neurology, orthopaedics, rehabilitation, etc. Visits to various biomedical engineering units.

32.018G  Research Project  C18

32.020G  Radiation Physics  S2 L2T2 C4

Sources, effects and uses of various types of radiation on human tissues. Ultrasonic, X-ray and nuclear radiations are included together with ultraviolet, infrared, laser, microwave and longer wavelength electromagnetic effects. Precautions in using these radiations are stressed.
32.030G Research Project C30

32.311G Mass Transfer in Medicine S2 L3T1 C4
Material and energy balances, modelling of intrabody mass transfer, elementary treatment of diffusion, convection, hydraulic permeability and osmosis in biological and synthetic membranes. Applications to hemodialysis, blood oxygenators and artificial livers.

32.321G Fluid Mechanics for Artificial Organs S2 L3T1 C4
An appreciation subject dealing with the fundamentals of fluid flow and the governing equations. Friction and viscosity, streamline and turbulent flow, flow of gases and liquids in the body and in artificial organs.

32.331G Biocompatibility S1 L2 C2
Interaction of biological fluids with foreign surfaces, in vitro tests to assess biocompatibility and thrombogenicity, hemofiltration, current status of biocompatible materials as applied to hemodialysis, membrane oxygenation and prosthetic devices.

32.500G Computing for Biomedical Engineers Using Fortran S1 L2T1½ C3
Introduction to computing facilities, getting information in and out of the computer, program development, logic statements and loops, precision and accuracy, subroutines and functions, debugging, matrices, declarations, program design and documentation, printer plotting, computer graphics, editing (XEDIT/MODIFY), KCL and procedure files. Overview of computers in biomedical engineering, including an introduction to aspects of automated patient monitoring and laboratory testing. Microprocessors and their capabilities. Data storage and information retrieval. Assessment of hospital computing requirements and evaluation of computer packages.

32.510G Introductory Biomechanics S1 L2T1 C3
Replaces 5.490G.
The principles of the mechanics of solid bodies: force systems; kinematics and kinetics of rigid bodies; stress-strain relationships; stress analysis of simple elements.

32.511G Mechanics of the Human Body S2 L2T2 C4
Prerequisite: 32.510G or equivalent.
Replaces 5.493G.
Statics and dynamics of the musculoskeletal system: mathematical modelling and computer simulation, analysis of pathological situations.

32.521G Biomechanics of Physical Rehabilitation S1 L2T2 C4
Prerequisite: 32.510G or equivalent.
Replaces 5.495G.
The application of biomechanics principles to the areas of: performance testing and assessment, physical therapy, design of rehabilitation equipment, design of internal and external prostheses and orthoses.

32.531G Mechanical Properties of Biomaterials S1 L2T2 C4
Prerequisite: 32.510G or equivalent.
Replaces 5.494G.
The physical properties of materials having significance to biomedical engineering: human tissues; skin; soft tissues; bone; metals; polymers and ceramics: the effects of degradation and corrosion.

32.611G Medical Instrumentation S2 L3 C3
Refer to 6.485G.

32.612G Medical Electronics S1 L3 C3
Electrode systems and amplifier requirements; biotelemetry; digital systems, computers and microprocessors, and their use in medical instruments and hospital systems.

32.621G Biological Signal Analysis S1 L3 C3
Refer to 6.484G.

Town Planning

Undergraduate Study

36.411 Town Planning S1 L2T0
Biological Technology

Graduate Study

42.211G Principles of Biology S1 L3 C3
Characteristics of living systems, including a functional treatment of cytology, metabolism, bioenergetics; structure and characteristics of single and multicellular systems; growth, cell division, reproduction, heredity and evolution.

42.212G Principles of Biochemistry S1 L3 C3
A condensed treatment of biochemistry comprising the following aspects: the elemental and molecular composition of living organisms; the chemistry and roles of the biological elements and molecules; the thermodynamics and enzymatic catalysis of metabolism; catabolic, anabolic, amphibolic and anaplerotic processes, with emphasis on hydrolysis and synthesis of polymers, glycolysis and gluconeogenesis of glucose, β-oxidation and synthesis of fatty acids, deamination and decarboxylation of amino acids, the tricarboxylic acid cycle, electron transport and oxidative phosphorylation; metabolic regulation and integration.

Pathology

Undergraduate Study

72.401 Principles of Disease Processes S1 L2 C2
Prerequisite: 73.111 or equivalent. Pre- or co-requisite: 70.011C or equivalent.
For MBiomedE students only.
The reaction of cells to injury, the inflammatory reaction; necrosis-vascular changes and infarction; reparative processes; fracture healing; neoplasia; reaction to implants; specific processes requiring prosthetic assistance.

Anatomy

Physiology and Pharmacology

Undergraduate Study

70.011C Introductory Anatomy S1 L2T4 C6
Introduction to gross anatomy, based on a study of prosected specimens. Musculoskeletal, cardiovascular, respiratory, gastrointestinal, genito-urinary and nervous systems. General topographical and surface anatomy. Normal variations including those related to sex and age (childhood, adolescence, maturity and senescence).

70.012A Musculoskeletal Anatomy S1 L2T4 C6
Prerequisites: 70.011A and 70.011B.
The topographical anatomy of the limbs and the musculoskeletal framework of the trunk. Distribution of nerves and vessels. Living and radiological anatomy.

73.111 Physiology 1A F L2T4 C12
Introduction to fundamental physiological principles — basic cellular function in terms of chemical and physical principles, and operation of the various specialized systems in the body; for example, the cardiovascular system, the respiratory system, the gastrointestinal system, the kidney, the endocrine system and the nervous system.
Graduate Study

97.001G Linguistics and Written and Spoken Communication  S1 L2 T1 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 dispute; eg the statistics of the phoneme; experimental and instrumental research; eg spectrographic examination 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 L1 T2 C6


97.003G Human Transformation  C6

Review of transfer functions, feedback and statistical tests. Measurement of information and coding, entropy, codes and relevant coding theorems. Human information source and sink characteristics. Language, Markov and Zipf, transinformation models of ear and eye. The channel, Bayes' theorem, entropy and equivocation in human context. Multivariate systems in the human group context, stochastic model in the time domain.

97.004G The Psychology of Communication  S1 L2 T1 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 L2 T2 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; meter 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 L1 T2 C3


97.008G The Body in Communication  S2 L1 T2 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; Implied 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.

97.012G Project  S2 T5 C5

97.013G Presentation of Information  S1 L1 T2 C3


97.031G Linguistics and Written and Spoken Communication  C1

As for 97.001G (lectures only).
97.032G Basic Information Theory C1
As for 97.002G (lectures only).

97.034G Psychology of Communication C2
As for 97.004G (lectures only).

97.035G Audio Video Equipment C2
As for 97.0075 (lectures only).

97.037G Audio Video Signals in Communication C1
As for 9.007G (lectures only).

97.038G The Body in Communication C1
As for 97.008G (lectures only).

97.043G Presentation of Information C1
As for 97.013G (lectures only).

97.345G Active and Adaptive Circuits C3
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>
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<tbody>
<tr>
<td>General</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>
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</tbody>
</table>

*Apply to The Secretary, Bursary Endowment Board, Box 460, PO, North Sydney 2060 immediately after sitting for HSC.
### General (continued)

<table>
<thead>
<tr>
<th>Donor</th>
<th>Value</th>
<th>Year/s of Tenure</th>
<th>Conditions</th>
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<tbody>
<tr>
<td>Sam Cracknell Memorial</td>
<td>Up to $3000 pa</td>
<td>1 year</td>
<td>Prior completion of at least 2 years of a degree or diploma course and enrolment in a full-time course during the year of application; academic merit; participation in sport both directly and administratively; and financial need.</td>
</tr>
<tr>
<td>Girls’ Realm Guild</td>
<td>Up to $1500 pa</td>
<td>1 year renewable</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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<td>payable in fortnightly</td>
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<td>instalments</td>
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### Engineering

**Electrical Engineering**

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<th>Donor</th>
<th>Value</th>
<th>Year/s of Tenure</th>
<th>Conditions</th>
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<tbody>
<tr>
<td>The Tyree Electrical Company Pty Ltd</td>
<td>Up to $4000 over</td>
<td>1 year renewable</td>
<td>Eligibility for admission to the full-time degree course in Electrical Engineering.</td>
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<td>4 years</td>
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**Mechanical Engineering**

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<th>Donor</th>
<th>Value</th>
<th>Year/s of Tenure</th>
<th>Conditions</th>
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<tbody>
<tr>
<td>The Fox Manufacturing Company</td>
<td>Up to $1500 pa</td>
<td>1 year renewable</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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**Surveying**

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<th>Donor</th>
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<th>Year/s of Tenure</th>
<th>Conditions</th>
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<tbody>
<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>
</tr>
</tbody>
</table>
Graduate Scholarships

Application forms and further information are available from the Student Employment and Scholarships Unit, located on the Ground Floor of the Chancellery. This unit 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 the schools within the faculty.

<table>
<thead>
<tr>
<th>Donor</th>
<th>Value</th>
<th>Year/s of Tenure</th>
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<tbody>
<tr>
<td><strong>University of New South Wales</strong></td>
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<td><strong>Research Awards</strong></td>
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<td></td>
<td><strong>Commonwealth Postgraduate Research Awards</strong></td>
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<tr>
<td></td>
<td></td>
<td>Living allowance of $4200 pa. Other allowances may also be paid.</td>
<td><strong>Commonwealth Postgraduate Course Awards</strong></td>
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<td></td>
<td></td>
<td><strong>Australian-American Educational Foundation Travel Grant</strong></td>
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<td></td>
<td>Amount varies, depending on award</td>
<td>Up to 1 year</td>
<td><strong>Australian Federation of University Women</strong></td>
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</table>

*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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<th>Donor</th>
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<tr>
<td><strong>General (continued)</strong></td>
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<tr>
<td>The British Council Commonwealth University Interchange Scheme</td>
<td>Cost of travel to UK or other Commonwealth country university</td>
<td></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 in December for visits to commence during ensuing 1 April to 31 March.</td>
</tr>
<tr>
<td>The Caltex Woman Graduate of the Year</td>
<td>$5000 pa for further studies in USA, UK, Northern Europe or in special cases Australia. There are no special allowances for travel or accommodation for married graduates.</td>
<td>2 years</td>
<td>Applicants must be female graduates who will have completed a University degree or diploma this year and who are Australian citizens or have resided in Australia for at least seven years. Selection is based on scholastic and literary achievements, demonstrable qualities of character, and accomplishments in cultural and/or sporting/recreational activities.</td>
</tr>
<tr>
<td>Commonwealth Scholarship and Fellowship Plan</td>
<td>Varies for each country. Generally covers travel, living, tuition fees, books and equipment, approved medical expenses. Marriage allowance may be payable.</td>
<td>Usually 2 years, sometimes 3</td>
<td>Applicants must be graduates who are 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>Sam Cracknell Memorial</td>
<td>Up to $3000 pa payable in fortnightly instalments</td>
<td>1 year</td>
<td>Prior completion of at least 2 years of a degree or diploma course and enrolment in a full-time course during the year of application; academic merit; participation in sport both directly and administratively; and financial need.</td>
</tr>
<tr>
<td>Ruth A. Cumming (ESU)</td>
<td>$500-$2000</td>
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<td>Applicants must be residents of NSW or ACT. Awarded to young graduates to further their studies outside Australia.</td>
</tr>
<tr>
<td>Gowrie Graduate Research</td>
<td>Maximum $2000 pa in Australia, and $2750 if tenable overseas</td>
<td>2 years</td>
<td>Applicants must be members of the Forces or children of members of the Forces who were on active service during the 1939-45 War.</td>
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### Graduate Scholarships (continued)

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<tr>
<td>Harkness Fellowships of the Commonwealth Fund of New York*</td>
<td>Living and travel allowances, tuition and research expenses, health insurance, book and equipment and other allowances for travel and study in the USA</td>
<td>Between 12 to 21 months</td>
<td>Candidates must be either: 1. Members of the Australian 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 or equivalent, or an outstanding record of achievement, and be not more than 30 years of age. Applications close July.</td>
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<tr>
<td>Frank Knox Memorial Fellowships at Harvard University</td>
<td>Stipend of $3800 pa plus tuition fees</td>
<td>1, sometimes 2 years</td>
<td>Applicants must be British subjects and Australian citizens, who are graduates or near graduates of an Australian University.</td>
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<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>
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<tr>
<td>The Rhodes Scholarship**</td>
<td>Approximately £3300-£3600 stg pa</td>
<td>2 years, may be extended for a third year</td>
<td>Unmarried male and female Australian citizens, 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>
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<tr>
<td>Rothmans Fellowships Award‡</td>
<td>$14000 pa</td>
<td>1 year, renewable up to 3 years</td>
<td>The field of study is unrestricted. Applications close early September each year.</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.**Applications to Mr H. McCredie, Secretary of the NSW Committee, University of Sydney, NSW 2006.†Applications to the Secretary, The Nuffield Foundation Australian Advisory Committee, PO Box 783, Canberra City 2601.‡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><strong>Engineering</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Harold G. Conde Memorial Fellowship</td>
<td>$4700</td>
<td>1 year. Renewable up to 3 years</td>
<td>Candidate should be honours graduate permanently domiciled in Australia. The Fellowship is for graduate study or research in a field related to the electricity industry.</td>
</tr>
<tr>
<td>University Fellowships in Highway Engineering</td>
<td></td>
<td>Course Work: 1 year. Research: 1 year, renewable</td>
<td>The Fellowship enables scholars to complete a Master of Engineering Science Course in Highway Engineering, or alternatively undertake research leading to a Master of Engineering or PhD degree.</td>
</tr>
<tr>
<td>Kenneth W. Craig Memorial Fellowship</td>
<td>$4200 pa plus allowances</td>
<td>1 year</td>
<td>The Fellowship enables scholars to undertake the degree of Master of Engineering Science in the School of Nuclear Engineering.</td>
</tr>
<tr>
<td>Australian Institute of Nuclear Science and Engineering Studentships</td>
<td></td>
<td>1-3 years</td>
<td>Applicants must be graduates in Nuclear Science or Engineering. At least one quarter of the period of tenure must be spent at the Institute at Lucas Heights, NSW.</td>
</tr>
<tr>
<td>Australian Institute of Nuclear Science and Engineering Research Fellowship†</td>
<td>$12000-$16000 pa plus certain travel and supporting grants</td>
<td>Minimum of 2 years. Maximum of 3 years</td>
<td>To enable graduates holding a PhD or similar qualification to undertake graduate work in Nuclear Science and Engineering.</td>
</tr>
<tr>
<td>Shell Scholarship in Science and Engineering</td>
<td>Approximately £3600 stg pa plus travelling expenses</td>
<td>2 years, sometimes 3</td>
<td>Applicants must be unmarried, male, Australian citizens, under 25 years of age, with at least 5 years domicile in Australia and who are graduates with at least 1 year’s research experience. The successful candidate will undertake 2 years’ graduate research leading to the MSc or PhD degree, at a British university.</td>
</tr>
</tbody>
</table>

†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><strong>General</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sydney Technical College Union Award</td>
<td>50.00 and medal</td>
<td>Leadership in the development of student affairs, and academic proficiency throughout the course.</td>
</tr>
<tr>
<td>University of New South Wales Alumni Association</td>
<td>Statuette</td>
<td>Achievement for community benefit — students in their final or graduating year.</td>
</tr>
<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 (Engineering option only)</td>
</tr>
<tr>
<td>The John Fraser Memorial Award</td>
<td>130.00</td>
<td>Excellence in the first year or equivalent part-time years of a bachelor's degree course offered by the Faculty of Engineering</td>
</tr>
</tbody>
</table>
### Undergraduate University Prizes (continued)

<table>
<thead>
<tr>
<th>Donor/Name of Prize</th>
<th>Value $</th>
<th>Awarded for</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>School of 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>100.00</td>
<td>General proficiency — Structures in the Bachelor of Engineering degree course in Civil Engineering</td>
</tr>
<tr>
<td></td>
<td>100.00</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 Manufacturers 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 Australia Pty Ltd</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>Value $</th>
<th>Awarded for</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rural Bank of NSW</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>Medal</td>
<td>Public Health Engineering</td>
</tr>
</tbody>
</table>

### School of Civil Engineering (continued)

- **Austral Crane**
  - Value: 25.00
  - Awarded for: Bachelor of Engineering Course in Electrical Engineering, Year III, Power or Control elective

- **Chamber of Manufacturers of New South Wales**
  - Value: 15.00
  - Awarded for: Subject selected by Head of School

- **Electricity Supply Engineers Association of New South Wales**
  - Value: 40.00
  - Awarded for: Overall performance including proficiency in Electric Power Distribution in third year full-time or equivalent part-time course.

- **J. Douglas Maclurcan**
  - Value: 30.00
  - Awarded for: Control Systems

- **The Wilfred Holmes Memorial Award**
  - Value: 120.00
  - Awarded for: A student eligible to enter the final year of the course and who is deemed to be in necessitous circumstances

### School of Electrical Engineering

- **School of Mechanical and Industrial Engineering**
  - **Atlas Copco**
    - Value: 75.00
    - Awarded for: General proficiency in Bachelor of Engineering course in Mechanical Engineering
### Undergraduate University Prizes (continued)

<table>
<thead>
<tr>
<th>Donor/Name of Prize</th>
<th>Value $</th>
<th>Awarded for</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>School of Mechanical and Industrial Engineering (continued)</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Austral Crane</td>
<td>50.00</td>
<td>Full-time Year III Mechanical Engineering</td>
</tr>
<tr>
<td>Babcock &amp; Wiirx Aust Ltd</td>
<td>30.00</td>
<td></td>
</tr>
<tr>
<td>Chamber of Manufacturers of New South Wales</td>
<td>15.00</td>
<td>Subject selected by Head of School</td>
</tr>
<tr>
<td>CSR Limited</td>
<td>50.00</td>
<td></td>
</tr>
<tr>
<td>Ford Motor Co of Aust Ltd</td>
<td>25.00</td>
<td></td>
</tr>
<tr>
<td>David Carment Memorial</td>
<td>350.00</td>
<td>Highest proficiency in final year of Naval Architecture course and medal</td>
</tr>
<tr>
<td>Harbin Polytechnical Alumni Association</td>
<td>50.00</td>
<td>Subject selected by Head of School</td>
</tr>
<tr>
<td>Jeremy Hirschhorn</td>
<td>20.00</td>
<td>Theory of Machines</td>
</tr>
<tr>
<td>Royal Institution of Naval Architects</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>50.00</td>
<td>General proficiency in Bachelor of Engineering Course in Mechanical Engineering, Year II (order)</td>
</tr>
<tr>
<td><strong>Department of Industrial Engineering</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Austral Crane</td>
<td>50.00</td>
<td>Bachelor of Engineering degree course in Industrial Engineering, Year III</td>
</tr>
<tr>
<td>Chamber of Manufacturers of New South Wales</td>
<td>15.00</td>
<td>Subject selected by Head of School</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>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.

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>400.00</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; and Centre for Biomedical Engineering.

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 Structural Engineering
Vacant

Professor of Civil Engineering
Harold Rupert Vallentine, BE Syd., MS Iowa, ASTC, FIEAust

Honorary Visiting Professor
James Macquarie Antill, BE Syd., ME N.S.W., FIEAust, FI Arb, FIArbA, AMAusIMM

Honorary Associates
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Desmond Ford Glynn, BCE Melb., MIEAust, MASCE
Alexander Wargon, MSc Harv., CE, FIEAust, FASCE, MNZIE

Senior Administrative Officer
Robert William Prior

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

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, MAACE

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 Graeme Ingles, BA MSc Tas., CEng, CChem, FRIC, MIEAust, MInstF
Associate Professors
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Geoffrey Baldwin Welch, BE Syd., ME N.S.W., CEng, MICE, FIEAust

Senior Lecturers
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David John Cook, BE W.Aust., MSc PhD Calg., MIEAust
Esca Morrice Kitchen, BE Syd., MIEAust
Bruce John Francis Patten, BE Syd., PhD N.S.W., DIC
John Maurice Wheatley, MA PhD Camb., CEng, FIM, FAusWI, MAusIM, MWeld(Lond), AFAIM
William Otho Yandell, ME PhD N.S.W., MIEAust

Lecturers
Stephen John Hain, BE Syd., PhD N.S.W., MIEAust
Arthur William Manion-Hall, BE MEngSc N.S.W., MIEAust
Harry Taylor, BSc(Eng) Birm., DipNA&AC Syd.
Weeks White, BSc BE Syd., MIEAust
Stephen Ross Yeomans, BSc PhD N.S.W., CEng, MIM

Teaching Fellow
Angelo Cipullo, DrGeoISci Rome

Professional Officers
David Edwin Hattersley, MSc N.S.W., ASTC
Trinh Cao, BE Monash
Ghodratollah Tamaddoni, BEngAg Tehran, DAgSc Gembloux

Department of Structural Engineering

Associate Professors
Horace Joseph Brettle, BE Syd., PhD N.S.W., DIC, ASTC, FIEAust
Kenneth Alan Faulkes, ME N.S.W., MS Ill., PhD N.S.W., MIEAust
Robert Alexander Frisch-Fay, DiplEng Bud., ME N.S.W., MIEAust
Aigis Kabaila, MEngSc PhD N.S.W., FRMTC, MIEAust, MASCE
Victor Andrada Pulmano, BSCE Philippines, MEng A.I.T. Northwestern
Ian James Somervaille, BE PhD N.S.W., ASTC

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Donald John Fraser, MEngSc PhD N.S.W., ASTC
Alex Cuthbert Heaney, BE MEngSc Melb., PhD Wat., MIEAust, MASCE, AMICE
Victor Andrade Pulmano, BSCE Philippines, MEng A.I.T. Northwestern
Ian James Somervaille, BE PhD N.S.W., ASTC

Lecturers
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Peter Walder Kneen, BE Melb., PhD Wat., MIEAust, IASS
Raymond Eric Lawther, BE PhD N.S.W.

Teaching Fellows
Henry Edward Ah Cann, BE N.S.W.
Mario Attard, BE N.S.W.

Professional Officer
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 Trehella Howell, BE Syd., ME N.S.W., MIEAust, MAIAS
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 Fietz, ME N.S.W.
John Robert Learmonth, BE Syd., ME N.S.W.
David Lyon Wilkinson, BE Syd., PhD N.S.W., MIEAust

Lecturers
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Brian Selby Jenkins, BE PhD N.S.W., ASTC, MIEAust, LGE
David Keith Robinson, BSc BE PhD N.S.W., MIEAust, MASCE

Tutor
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Professional Officers
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Kenneth Brian Higgs, MSc Aston, MAIP

Professor of Electrical Engineering—Communications
Antoni Emil Karbowiak, DSc(Eng) Lond., CEng, FIEAust, FTS, FIREE, SMIEEE

Professor of Electrical Engineering—Systems and Control
Neville Walter 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
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Professor of Electrical Engineering—Electronics
Vacant

Professor of Electrical Engineering
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Executive Assistant to Head of School
Colin Arthur Stapleton, BSc BE Syd., CEng, MIEAust, MIEEE, MIEEE

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Administrative Assistant
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Senior Tutor
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Tutors
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Peter William Cook, BE James Cook
Douglas James Follett, BE N.S.W.
Ria Maren Follett, BSc Syd.
Peter Garde, BE MEngSc Monash
Kevin Frank Hill, BE N.S.W.
Gregory Charles Hurst, BSc BE N.S.W.
Fuad Assia Jilwan, BE N.S.W.

School of Electrical Engineering

Professor of Computer Science and Head of School
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Professional Officer
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Department of Communications

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The Bao Vu, BE PhD Adel., SMIEEE

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Israel Korn, MSc DSc Technion, Haifa, MIEEE
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Ramutis Anthony Zakarevicius, BSc BE MEngSc PhD Syd., MIEAust, MIEEE, MIEEE

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Harold Leslie Humphries, BSc BE BEc Syd., MIEAust, MIEEE

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Trevor Wayne Whitbread, BE N.S.W.

Department of Electric Power Engineering

Associate Professors
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Ian James Hayes, BSc N.S.W.
Graham Reginald Hellestrand, BSc N.S.W.
Leslie Charles Hill, BE N.S.W., MIEAust
Kenneth Arthur Robinson, BSc BE Syd.

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Richard Vaughan, BSc BE PhD Syd.

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Reginald Frederick Brown, BEng Liv., PhD N.S.W., CEng, MIEE
Felix Lewin, BSc BE Syd.
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Lecturer
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Johan Herman Sieuwerts, BE N.S.W., ASTC

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See Seng Leong, BE N.S.W.
Lyle John McLean, BSc(Eng) MEngSc N.S.W., GradlEAust
Nan Hung Pan, BE N.S.W.

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Walter Dollar, ASTC
Thomas Done, BA Macq.
Joseph Yuk Ming Fung, BE MEngSc Syd., GradlEAust
Anthony Gordon Harris, BSc Exe.
Khoi Hoang, BE Saigon, PhD N.S.W.
Alexander Litvak, Dipling Odessa, MIEAust
Barrie Clifford Motson, BE N.S.W., ASTC, MIEAust
Colin Barrington Smith, BE MEngSc N.S.W., ASTC, MAIRAH, GradlEAust

School of Mechanical and Industrial Engineering

Professor of Mechanical Engineering, Head of School and of Departments of Applied Mechanics and Agricultural Engineering
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Nuffield Professor of Mechanical Engineering and Head of Department of Fluid Mechanics/Thermodynamics
Raymond Alfred Arthur Bryant, ME N.S.W., ASTC, CEng, FI MechE, FIEAust, MRAeS

Professor of Mechanical Engineering (on leave)
Peter Thomas Fink, CBE, BE Syd., CEng, FTS, FIEAust, FIMechE, FRAeS, FRINA, MAIAA

Department of Agricultural Engineering

Senior Lecturer
Harold Glenn Bowditch, ME N.S.W., ASTC, MIEAust

Lecturer
Ronald Arthur Dennis, MSc Nott., CEng, MIMechE
Department of Applied Mechanics

Associate Professor
John Young Harrison, BE Syd., PhD N.S.W., MIEAust

Senior Lecturers
John Edward Baker, MScSyd., BE MEngSc PhD N.S.W.
Kerry Patrick Byrne, BE MEngSc QLD., BScMelb., PhD S’ton
Jacob Alexander Bruce Cartmel, MSc Cran.f.T., PhD N.S.W., CEng, FI MechE, FIEAust, MASME, MIEEE
Donald Jabez Stephen Mudge, BSc Lond., DipEd N.S.W., CEng, MI MechE, MIEAust, WhSc
Alexander Eric Churches, BE PhD N.S.W., ASTC
Eric Joseph Hahn, BE BSc PhD N.S.W., MASME
Edward Colvyn Hind, ME N.S.W., ASTC, MIEAust, MI MechE, MInstMC

Lecturers
Raymond Albert Vincent Byron, BE Syd., CEng, MRAeS, MAIAA
George Crawford, BE BSc N.S.W., ASTC, CEng, FIEAust, ARACI
Robin Arthur Julian Ford, BScEng PhD Lond., ACGI
Richard Butler Frost, BE N.S.W., MIEAust
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