



The University of New South Wales

Engineering

1979 Faculty Handbook

How to use this Handbook

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

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

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

Faculty Information.

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

Graduate Study is about higher degrees.

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

Information includes:

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

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

Staff list.



The University of New South Wales

Engineering

1979 Handbook

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*4

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

UNIVERSITY OF NEW SOUTH WALES

Faculty of Engineering

Handbook.

Annual. Kensington.

1962 +

University of New South Wales — Faculty of Engineering — Periodicals.

Printed by John Fisher Pty Ltd 12-14 Garden Street Marrickville



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

Information in this Handbook has been brought up to date as at 11 September 1978, but may be amended without notice by the University Council

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General Information

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

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

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

Now, see the following pages for other general information which may be of value to you.

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

The Deputy Registrar (Student Services), Mr Peter O'Brien and his Administrative Assistant, Mrs Anne Beaumont, are located on the first floor of the Chancellery. They will help students who need advice and who have problems and are not sure whom they should see. As well as dealing with general enquiries they are especially concerned with the problems of physically handicapped and disabled students and those in need of financial assistance. The latter students should see Mrs Beaumont. Enquire at room 148E, phone 2482 (general enquiries) or 3164 (financial assistance).

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

Some people who can help you

Note: All phone numbers below are University extension numbers. If you are outside the University, dial 663 0351 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 your require. Callers using 662 cannot be transferred to any other number. The Officer-in-Charge (Examinations and, Student Records Section) Mr Ross Woodham is located on the ground floor of the Chancellery. For particular inquiries regarding the Student Records Unit, including illness and other matters affecting performance in examinations, academic statements, graduation ceremonies, prizes, release of examination results and variations to enrolment programs, phone 3711. For information regarding examinations, including examination timetables and clash of examinations, phone 2143.

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

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

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

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

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

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

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

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

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.

1979	
Session 1	5 March to 13 May
(14 weeks)	May Recess 14 May to 20 May 21 May to 17 June
Tuesday	Midyear recess.18 June to 22 July
19 June	Examinations begin
Wednesday	• • •
4 July	Examinations end
	n an an a
Session 2	23 July to 26 August
(14 weeks)	August Hecess:27 August to 2 September 3 September to 4 November
	Study Recess: 5 November to 11 November
Monday	· · · · · · · · · · · · · · · · · · ·
12 November Fridov	Examinations begin
1 December	Examinations end
	•
January	
Monday 1	New Year's Day Public Holiday
Friday 5	Last day for application for review of results of <i>annual</i> examinations
Friday 12	Last day for acceptance of applications
	course within the University
Monday 29	Australia Day — Public Holiday
February	
Monday 5	Enrolment period begins for new students
Monday 19	Enrolment period begins for second and

General Information

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March	ション・ション なため かたずみたいめ	Tuesday 17 to	Students to amend enrolment programs
Monday 5	Session 1 commences and a set of the set	Friday 20	following receipt of June examination
Tuesday 6	List of graduands for April/May ceremon-	an an an Alperia	results
	ies published in daily press	Sunday 22	Midyear Recess ends
Friday 30	Last day for acceptance of enrolment by	Monday 23	Session 2 begins
	students re-enrolling in second and later		🛫 Last day for application for review of June 👸
	years (late fee payable)		examination results
	Last day for students other than those	1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	
1	attending the University for the first time		이 집에 있는 것이 같은 것은 것은 것을 받았다.
	to discontinue without failure subjects	112 A. C. H.	
1.	which extend over Session 1 only	August	
		Thursday 2	Foundation Day (No classes held)
100 July 100	and the second	Friday 3	Last day for students attending the
			University for the first time to discontinue
Anril	이 이 것이 같아요. 이 가슴 눈 눈 눈을 넣었다. 한다.		without failure subjects which extend over
Friday 6	Confirmation of Enrolment forms		the whole academic year
Filuayo	despatched to all students	Friday 17	Last day for students other than those
Friday 12 to		· · · · · · · · · · · · · · · · · · ·	attending University for the first time to
Filled ISto			discontinue without failure subjects which
Monday 16	Easter	ele constante de la constante d	extend over Session 2 only
Friday 20	Last day for acceptance of corrected	Monday 27	August Decase bagine
· · ·	Contirmation of Enrolment forms	wonuay 21	vnänsi uaraos načius
Wednesday 25	Anzac Day — Public Holiday	ya da wala	
Friday 27	Last day for students attending the		
	University for the first time to	Santambar	
	discontinue without failure subjects	Supday 2	August Boosse ands
1	which extend over Session 1 only	Sunday 2	August necess ends
A STATE OF A STATE		Monday 10	Last day for applications from students
1. A.			completing requirements for degrees and
			diplomas at the end of Session 2 to submit
Mav	이번 것 같이 많이 많이 집 것 같아요?		Applications for Admission to Degree
Monday 7	Last day for students completing require-	Wednesday 12	List of graduands for October graduation
	ments for degrees or diniomas at the end		ceremony published in daily press
	of Session 1 to submit Application for	Friday 14	Last day for students attending the Alignee of the students attending the Alignee of the students attending the Alignee of the students attending the students a
	Admission to Degree		University for the first time to discontinue
Monday 14	May Recess begins		without failure subjects which extend over
Thursday 17	Publication of provisional timetable for	and a set of the set o	Session 2 only
mulsuay 17	fune/.luly examinations		Confirmation of Enrolment form forwarded
Eridou 10	i ant day for students other than these		to all students in the shape of the state of
Fludy to	attending the University for the first time	Monday 17	Last day to notify intention of attending
n an	to discontinue without foilure subjects		October graduation ceremony
	to discontinue without failure subjects	4-91 (A. 1997)	
Ounday 00	Which exterio over the whole academic year	[N_A) : 여러 하는 ·	
Sunday 20	may recess ends	October	
Friday 25	Last day for students to advise of examin-	Monday 1	Last day to apply to MUAC for transfer to 👘 🔅
and the second second	ation timetable clashes		🔆 another University in New South Wales
			Eight Hour Day - Public Holiday
			Last day to return corrected Confirmation
			of Enrolment forms
June		Thursday 4	Publication of provisional examination
Tuesday 5	Publication of timetable for June/July		timetable
يربع المراجع الم	examinations	Thursday 11	Graduation ceremony
Sunday 17	Session 1 ends	Friday 12	Last day for students to odvice of events
Monday 18	Queen's Birthday - Public Holiday	r nuay 12	ation timetable clashes
	Midvear Recess begins		auvii unicialie Ciastica
Tuesday 19	Examinations begin	Tuesday 23	Publication of timetable for
1 uuduu y 10	Examinationo bogin	1 ucouay 20	
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an a		November	
July	- 26 (a)	Sunday	Consign 9 and a
Wednesday 4 🐇	Examinations end	Sunday 4	Seasion 2 ends
Friday 13	Examination results mailed to students	Monday 5	Study Recess begins
Monday 16	Examination results displayed on Uni-	Sunday 11	Study Recess ends
	versity notice boards	Monday 12	Examinations begin

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December	
Saturday 1	Examinations end
Tuesday 18	Examination results mailed to students
Wednesday 19	Examination results displayed on
	University notice boards
Tuesday 25	Christmas Day - Public Holiday
Wednesday 26	Boxing Day - Public Holiday

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Session 1

Tuesdav

17 June

2 July

Wednesday

Session 2

Monday 10 November

Saturday 29 November

January

Friday 4

Friday 11

Tuesday 1

3 March to 11 May May Recess: 12 May to 18 May 19 May to 15 June Examinations begin

Examinations end Midyear Recess:16 June to 20 July 21 July to 24 August August Recess 25 August to 30 August 1 September to 2 November Study Recess 3 November to 9 November Examinations begin

Examinations end

Public Holiday Last date for application for review of results of annual examinations Last day for acceptance of applications by Admissions Office for transfer to another course within the University Monday 28 Australia Day - Public Holiday

February Monday 4

Enrolment period begins

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 1978 the University had 18,562 students and over 4,000 staff who worked in more than eighty buildings. These figures include staff and students at Broken Hill (W.S. and L.B. Robinson University College), Duntroon (the Faculty of Military Studies) and Jervis Bay.

Arms of the University of New South Wales

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

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

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

The Council

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

The Council consists of 43 members from the State Parliament, industry and commerce, agriculture, the trade unions, professional bodies, the staff, the students and the graduates of the University.

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

The Chairman of the Council is the Chancellor, the Hon. Mr. Justice Samuels, and the Deputy Chancellor is Dr F.M. Mathews.

The Professorial Board

The Professorial Board is one of the two chief academic units within the University and includes all the professors from the various faculties. It deliberates on all questions such as matriculation requirements, the content of courses, the arrangement of syllabuses, the appointment of examiners and the conditions for graduate degrees. Its recommendations on these and similar matters are presented to Council for its consideration and adoption.

The Faculties/Boards of Study

The Dean, who is also a professor, is the executive head of the Faculty or Board of Study. Members of each Faculty or Board meet regularly to consider matters pertaining to their own areas of study and research, the result of their deliberations being then submitted to the Professorial Board.

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

The eleven Faculties are Applied Science, Architecture, Arts, Biological Sciences, Commerce, Engineering, Law, Medicine, Military Studies, Professional Studies and Science together with the Australian Graduate School of Management. In addition, the Board of Studies in General Education fulfils a function similar to that of the faculties. The Board of Studies in Science and Mathematics, which was established to facilitate the joint academic administration of the Science and Mathematics degree course by the Faculties of Biological Sciences and Science, considers and reports to the Professorial Board on all matters relating to studies, lectures and examinations in the science course.

The Schools

Once courses of study have been approved they come under the control of the individual Schools (eg the School of Chemistry, the School of Mathematics). The Head of the School in which you are studying is the person in this academic structure with whom you will be most directly concerned.

Executive Officers

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

He is assisted in this task by three Pro-Vice-Chancellors, Professor John Thornton, Professor Rex Vowels and Professor Raymund Golding; the Deans and the three heads of the administrative divisions.

General Administration

The administration of general matters within the University comes mainly within the province of the Registrar, Mr Keith Jennings, the Bursar, Mr Tom Daly, and the Business Manager (Property), Mr R.K. Fletcher.

The Registrar's Division is concerned chiefly with academic matters such as the admission of students, and the administration of examinations as well as the various student services (health, employment, amenities, and counselling). The Bursar's Division is concerned with the financial details of the day-to-day administration and matters to do with staff appointments, promotions, etc.

Student Representation on Council and Faculties/Boards

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

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

Open Faculty/Board Meetings

If you wish you may attend a Faculty/Board meeting, you should seek advice at the office of the Faculty whose meeting you wish to attend, as different faculties have their own rules for the conduct of open meetings.

Award of the University Medal

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

Identification of Subjects by Numbers

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

Textbook Lists

Textbook lists are no longer published in the Faculty handbooks. Separate lists are issued prior to the beginning of each session and are available at key points on the campus.

General Studies Program

Almost all undergraduates in Faculties other than Arts and Law are required to complete a General Studies program. The Department of General Studies within the Board of Studies in General Education publishes its own Handbook which is available free of charge. All enquiries about General Studies should be made to the General Studies Office, Room G56, Morven Brown Building, phone 3476.

Student Services and Activities

The University Library ...

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

There are also library services at other centres:

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

The library at the Broken Hill Division in the W.S. and L.B. Robinson University College building. Phone Broken Hill (080) 6022.

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

Each library provides reference and lending services to staff and students and each of the libraries on the Kensington campus is open throughout the year during day and evening periods. The exact hours of opening vary during the course of the academic year.

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

Accommodation

Residential Colleges

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

The Kensington Colleges

The Kensington Colleges comprise Basser College, Goldstein College, and Philip Baxter College. They house 450 men and women students, as well as staff members. Fees are payable on a session basis. Apply in writing to the Master, PO Box 24, Kensington, NSW 2033.

International House

International house accommodates 154 students from Australia and up to twenty other countries. Preference is given to more senior undergraduates and graduate students. Apply in writing, to the Warden, International House, PO Box 88, Kensington, NSW 2033.

New College

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

Shalom College

Shalom College provides accommodation for 86 men and women students. Non-resident membership is available to students who wish to avail themselves of the Kosher dining room and tutorial facilities. Apply in writing to the Master, Shalom College, The University of New South Wales, PO Box 1, Kensington, NSW 2033.

Warrane College

Warrane College provides accommodation for 200 men and is open to students of all ages, backgrounds and beliefs. A comprehensive tutorial program is offered along with a wide variety of activities and opportunities to meet informally with members of the University staff. Non-resident membership is available to male students who wish to participate in College activities and make use of its facilities. Warrane is directed by the International Catholic lay association Opus Dei. Apply in writing to the Master, Warrane College, PO Box 123, Kensington, NSW 2033.

Creston Residence

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

Other Accommodation

Off-campus Accommodation

Students requiring other than College accommodation may contact the Housing Officer in the Student Amenities and Recreation Unit for assistance in obtaining suitable lodging in the way of full board, room with cooking facilities, flats, houses, share flats, etc. Extensive listings of all varieties of housing are kept up-to-date throughout the year and during vacations.

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

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

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

Student Employment and Scholarships

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

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

The service is located in Room G19 of the Chancellery.

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

Student Health

A student health clinic and first aid centre is situated within the University. It is staffed by three qualified medical practitioners, assisted by two nursing sisters. The medical service, although therapeutic, is not intended to entirely replace private or community health services. Thus, where chronic or continuing conditions are revealed or suspected, the student may be referred to a private practitioner or to an appropriate hospital for specialist opinion and/or treatment. The health service is not responsible for fees incurred in these instances. The service is confidential and students are encouraged to attend for advice on matters pertaining to health.

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

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

Appointments may be made by calling at the centre or by telephoning extension 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 698 9499, or for The Prince of Wales Hospital clinics by telephoning 399 0111.

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 Unit 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 Unit 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 Unit is located in Hut B 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 Unit provides a recreational program for students and staff at the Physical Education and Recreation Centre. The Centre consists of eight

squash courts and a main building, the latter containing a large gymnasium and practice rooms for fencing, table tennis, judo, weight-lifting, karate and jazz ballet, also a physical fitness testing room. The recreational program includes intramurals, teaching/coaching, camping, 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 \$6 per year for all registered students and is open to all members of staff and graduates of the University.

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

Student Travel Concessions

The Student Amenities and Recreation Unit arranges distribution of bus, rail and ferry concessions. For the peak period during the week preceding and the first week of 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 SARU, Hut B, (extension 2617) or the Enquiry Desk, Chancellery, (extension 2551).

The University Union

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

The Union is housed in three buildings near the entrance to the Kensington Campus from Anzac Parade. These are the Roundhouse, The Blockhouse (Stage 2) and the Squarehouse (Stage 3). Membership of the Union is compulsory at \$45 per year for all registered students and is open to all members of staff and graduates of the University.

The full range of facilities provided by the Union includes a cafeteria service and other dining facilities, a large shopping centre, cloak room, banking and hairdressing facilities, showers, a women's lounge, common, games, reading, meeting, music, practice, craft and dark rooms. Photocopying, sign printing, and stencil cutting services are also available. The Union also sponsors special concerts (including lunchtime concerts) and conducts courses in many facets of the arts including weaving, photography, creative dance and yoga. Exhibitions are held in the John Clark Gallery.

Full information concerning courses is contained in a booklet obtainable from the Union's Program Department.

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

The Students' Union

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

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

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

The activities of the Students' Union include:

- Infakt: a student-run information referrat 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.
- 5. A nursery/kindergarten, The House at Pooh Corner.
- 6. Publication of the student paper Tharunka.
- 7. A free legal service run by a qualified lawyer employed by the Students' Union Council.
- 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.
- 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.
- 13. Provision of a bail fund.

Subject to revision at time of publication.

The Students' Union is affiliated with the Australian Union of Students (AUS) which represents students on the national level.

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

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, turnto page 2.

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 notice boards 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 663 0473.

University of New South Wales Regiment: The Adjutant, Regimental Depot, Day Avenue (just west of Anzac Parade). Phone 663 1212.

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 212 1011.

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 sparetime work would also be needed.

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

- Undergraduate and graduate bachelor degree courses
- Graduate diplomas
- Approved combined bachelor degree courses
- Master's qualifying courses (one year)

Benefits

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

1978 Higher School Certificate candidates and tertiary students receiving an allowance are sent forms in December/January. Other students may obtain forms from the Admissions Section or Student Employment and Scholarships Unit, or from the Regional Director, Department of Education, 323 Castlereagh Street, Sydney, NSW 2000 (phone 2188800).

Continuing students should submit application as soon as examination results are available. New students should do so as soon as they are enrolled. All students should apply by 31 March 1979, otherwise benefits will not be paid for the earlier months of the year.

Scholarships, Cadetships, Prizes

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

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

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

 Graduate Awards An honours degree is generally an essential requirement for gaining one of the many graduate scholarships which are available at the University. Therefore gifted students should not neglect the opportunity to qualify for honours and thus become eligible for an award.

Details of graduate awards are contained in the University Calendar.

Other Financial Assistance

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

1. Determent of Payment of Fees Determents may be granted for a short period, usually one month, without the imposition of a late fee penalty, provided the determent 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.

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 this scheme 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 giftfrom 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 (eg 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 Admission Office, located in the Chancellery on the upper campus, provides information for students on admission requirements, undergraduate and graduate courses and enrolment procedures. The Admission 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 Metropolitan Universities Admissions Centre.

How do I qualify for admission?

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

Enrolment

How do I enrol?

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

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

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

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

If a student is unable to pay the lees 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 lees by the end of the second week of the session for which enrolment is being effected. Penalties apply iffees are paid after that time (see Fees below). Payment may be made through the mail in which case it is important that the student registration number be given accurately.

New Undergraduate Enrolments

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

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

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

Re-enrolment

Students who are continuing courses (or returning after approved leave of absence) should enrol through the appropriate School in accordance with the procedures set out in the current *Enrolment Procedures* booklet, available from the Admissions Office and from School offices. Those who have completed part of a course and have been absent without leave need to apply for entry through the Metropolitan Universities Admissions Centre, PO Box 7049, GPO, Sydney 2001, by 3 October 1978.

Restrictions Upon Re-enrolling

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

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

Miscellaneous Subject Enrolments

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

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

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

Final Dates for Completion of Enrolments

No enrolments for courses extending over the whole year or for Session 1 only will be accepted from new students after the end of the second week of Session 1 (16 March 1979) except with the express approval of the Deputy Registrar (Student Services) and the Heads of the Schools concerned; no later year enrolments for courses extending over the whole year or for Session 1 only will be accepted after the end of the fourth week of Session 1 (30 March 1979) except with the express approval of the Deputy Registrar (Student Services) and the Heads of Schools concerned. No enrolments for courses in Session 2 only will be accepted after the end of the second week of Session 2 (3 August 1979) except with the express approval of the Deputy Registrar (Student Services) and the Heads of Schools concerned.

How do assisted students (eg scholarship holders) enrol?

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

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

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

Can I transfer from one course to another?

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

Can I change my course program?

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

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

Withdrawal from courses and subjects

Courses

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

For details see the Calendar.

Subjects

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

Students enrolled in the University for the first time (in any undergraduate course):

1. for one session subjects, the end of the eighth week of that session (27 April or 14 September)

2. for whole year subjects the end of the second week of Session 2 (3 August)

Students who have been enrolled in the University prior to 1979:

1. for one session subjects, the end of the fourth week of that session (30 March or 17 August)

2. for whole year subjects, the end of the eleventh week of Session 1 (18 May)

How do 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 Metropolitan Universities Admission Centre before October in the year preceding that in which you wish to resume studies.

Are there any restrictions upon students re-enrolling?

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

First-year Rule

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

Repeated-failure Rule

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

General Rule

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

The Session-unit System

4. (1) A student who infringes the provision of Rules 1. or 2. at the end of Session 1 of any year will not be required to show cause at that time but will be allowed to repeat the subject(s) (if offered) and/or continue the course in Session 2 of that year, subject to the rules of progression in that course.

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

Exemption from Rules by Faculties

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

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

'Showing Cause'

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

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

Appeal

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

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

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

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

The decision of the Committee shall be final.

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

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

(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-enroll 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 acount 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 enrollin any such course(s).

(3) A student excluded from a course or courses under the provisions of (1) of (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 Metropolitan Universities Admission Centre before the closing date for normal applications in the year prior to which readmission 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.

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.

Applications for re-admission to a course or subject that are unsuccessful [see 9. (2) (a) and (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 and on the Notification of Examination Results. The forms are available from the Enquiry Counter at the Chancellery and will be mailed to all potential graduates.

The completion and submission of the form ensures that:

 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' Graduation: Change of Address* should be submitted.

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

Fees

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

\$40

Do I have to pay fees for tuition?

No tuition fees are charged.

What other fees and charges are payable?

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

How much is my contribution to student activities and services on campus?

All students (with the exceptions noted below) will be required to pay the following fees if enrolling for a program involving two sessions. Those enrolling for only one session will pay one-half of the Student Activities Fees, and the full University Union entrance fee, if applicable.

University Union Entrance Fee, payable on first enrolment \$25

Student Activities Fees

University Union, annual subscription	\$45
Sport Association, annual subscription	\$6
Students' Union	
Students enrolling in full-time courses, annual subscription	\$14
subjects, annual subscription	\$11
Miscellaneous annual fee	\$25

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

Are fees charged for examinations?

Generally, there are no charges associated with exami	inati	ons;
however two special examination fees are applied:		
Examinations conducted under special circum-	~	
stances-for each subject		\$11
Review of examination result-for each subject		\$11

What penalties exist for late payment of fees?

The following additional charges will be made in 1979 when fees are paid late:

1.	Failure to lodge enrolment form according
to e	enrolment procedure \$20
2.	Payment of fees after end of second week
ofs	session \$20
3.	Payment of fees after end of fourth week

3. Payment of fees after end of fourth week of session

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

Locations and Hours of Cashier

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

Who is exempt from payment of fees?

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

2. Students enrolled in courses classified as *External* are exempt from all Students Activities Fees and the University Union entrance fee.

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

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

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

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

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

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

Is exemption from membership possible?

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

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

You must allow quite a substantial sum for textbooks. This can vary from \$250 to \$600 per year depending on the course taken. These figures are based on the cost of new books. The Students' Union operates a second-hand bookshop. Information about special equipment costs, accommodation charges and cost of subsistence on excursions, field work, etc, and for hospital residence (medical students) are available from individual schools.

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

Yes. The following rules apply:

1. If you withdraw from courses you are required to notify the Registrar in writing.

 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 youfail 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 (27 April 1979). In the case of a student enrolled for Session 2 only, this disbarment applies if any portion of fees is outstanding after the end of the sixth week of Session 2 (31 August 1979). In special cases the Registrar may grant exemption from disqualifications referred to in the preceding paragraph upon receipt of a written statement setting out all relevant circumstances.

Can I get an extension of time to pay?

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

Examinations

When are examinations held?

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

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

In the assessment of your progress in University courses, consideration may be given to work in laboratory and class exercises and to any term or other tests given throughout the year as well as to the results of written examinations.

How are examination passes graded?

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

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

When are examination results available?

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

Can examinations results be reviewed?

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

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

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

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

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

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

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

Use of electronic calculators

Where the use of electronic calculators has been approved by a faculty or school, examiners may permit their use in

examinations. Authorized electronic calculators are battery operated with the minimum operations of addition, subtraction, multiplication and division and are of a type in common use by university students. They are not provided by the University, although some schools may make them available in special circumstances.

Compulsory Industrial Training

Examinations including deferred examinations will not be permitted away from the campus unless the candidate is engaged on *compulsory* industrial training. Candidates must advise the Officer-in-Charge, Examinations Unit, immediately the location of the industrial training is known. Special forms for this purpose are available at the Enquiry Desk, the Chancellery.

Arrival at Examinations

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

Use of Linguistic Dictionaries

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

How are examinations conducted?

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

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

2. Candidates are required to be in their places in the examination room not less than 10 minutes before the time for commencement.

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

4. No candidate shall be admitted to an examination after 30 minutes from the time of commencement of the examination.

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

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

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

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

Abolition of Deferred Examinations

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

Can I buy copies of previous examination papers?

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

Essays

Should I list my sources?

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

Student Conduct on Campus

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

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

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

What are the rules related to attendance at classes?

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

In the case of illness or of absence for some other unavoidable cause you may be excused by the Registrarfor 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 80per cent of possible classes, you may be refused final assessment in that subject.

Why is my University and Union card important?

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

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

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

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

New students will be issued with cards on enrolment.

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

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

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

In general, no. The University treats examination results and information it receives from a student as confidential and will not reveal such information to third parties without the permission of the student except at the discretion of senior officers in circumstances considered of benefit to the student and when it is either impossible or impracticable to gain the student's prior permission. This happens rarely. This policy is considered so important that it often involves officers of the University in very difficult situations, for example, when they must refuse to reveal the address of a student to parents or other relatives.

In spite of the policy, there are sometimes accusations made that the University has revealed information, including addresses (especially to insurance companies).

All students should be aware that students' addresses are eagerly sought by various commercial agents and that sometimes tricks are used to obtain them. For example, from time to time people claiming to be from the University telephone students or their families and ask for information (usually another student's address) which is often given, unsuspectingly. There is evidence that this is a technique used by commercial agents.

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

How are student records kept up to date?

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

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

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

Can I get a permit to park on campus?

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

Lost Property?

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

Further Information

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

General

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

Notices

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

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

Appeals

Section 5(c) of Chapter III of the By-laws provides: 'Any person affected by a decision of any member of the Professorial Board

(other than the Vice-Chancellor) in respect of breach of discipline or misconduct may appeal to the Vice-Chancellor, and in the case of disciplinary action by the Vice-Chancellor, whether on apeal 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:

Monday 26 February 1979 11 am in the Clancy Auditorium

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

Tuesday 27 February 1979 11 am in the Clancy Auditorium

Part-time Students

Tuesday 27 February 1979 6.30 pm in the Clancy Auditorium

Meeting for Parents of New South Wales

Friday 2 March 1979 7.30 pm in the Clancy Auditorium

Foreword

This handbook is primarily for undergraduate students in the Faculty of Engineering and aims to provide information concerning the requirements for admission, enrolment and re-enrolment, conditions for the award of the different Bachelor degrees in the Faculty and the subject matter of the courses offered, including textbooks. It is important that each student in the Faculty becomes well acquainted with the information presented here. In addition to this Handbook, pamphlets and brochures issued in conjunction with the enrolment period and Orientation Week are available. These should be consulted, together with the University Calendar, for further information on problems associated with courses.

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

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

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 Ms R. C. Horwood School Office School of Electrical Engineering
School of Mechanical and		
Industrial Engineering	 	Associate Professor J. Y. Harrison Room 112 Mr G. Dusan Room 107 School of Mechanical and Industrial Engineering

*These courses are taught within the School of Mechanical and Industrial Engineering.

The Faculty of Engineering Handbook

Information Service for Students School of Surveying

Mr J. V. Fonseka School Office Room 529 Geography and Surveying Building

The Faculty of Engineering The Faculty consists of six Schools: Civil Engineering, Electrical Engineering, Mechanical and Industrial Engineering, Nuclear Engineering, Surveying, and Transport and Highways.

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

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

Special laboratories are equipped for work in the areas of Microelectronics, Microwaves, Digital Systems, Power Systems, Computer Control, Machines and Acoustics. A Measurements Laboratory provides a calibrating service under certificate from the National Association of Testing Authorities.

School of Mechanical and Industrial Engineering

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

The first two years of the full-time degree, and the first four stages of the part-time degree are common to all courses within the School. Thus a final decision on the discipline to be followed need not be made until the end of Year 2 for full-time and Stage 4 for part-time students.

Formal graduate courses of study are available, with a wide choice of subjects, leading to the degree of Master of Engineering Science. There are special Master of Engineering Science degree courses in Refrigeration and Air Conditioning, and in Industrial Engineering. The Department of Industrial Engineering within the School offers a course leading to the award of a Graduate Diploma.

Graduates with a good first degree may register for the higher degrees of Master of Engineering and Doctor of Philosophy. Current research fields are as follows — Aerodynamics, Agricultural Engineering, Applied Plasticity, Automatic Control, Bio-mechanics, Dynamics, Gas Dynamics, Heat Transfer, Fluid Mechanics, Metal Cutting, Naval Hydrodynamics, Refrigeration and Air Conditioning, and Two-phase Flow.

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

The School of Nuclear Engineering in the University of New South Wales was established in 1961. The School presently operates at the graduate level in the Faculty of Engineering. A fourth year undergraduate subject in Nuclear Power Technology is provided as an elective for other Schools (23.051 Nuclear Power Technology).

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

Special research interests in the School include the general field of fluctuation phenomena and noise in nuclear reactors, the coupled thermomechanical, fluid dynamics and nuclear aspects of reactor fuel elements and coolant channels, and the subject of reactor utilization and reactor strategy.

The School is presently situated in the Electrical Engineering building at Kensington. Library, workshop, digital and analogue computing facilities are available. Special digital and analogue equipment for the analysis and recording of random signals has been acquired for experimental noise research. Through the Australian Institute of Nuclear Science and Engineering, the special facilities of the Australian Atomic Energy Commisslon's Research Establishment at Lucas Heights can be made available for research purposes. Close personal contact is maintained between members of the School and the Engineering Research Division at Lucas Heights.

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

The School is located in the Geography and Surveying Building. Facilities include four photogrammetry laboratories with several equipment types, an observatory platform for positional astronomy and a comprehensive range of field equipment for surveying and geodesy. Computing facilities include programmable calculators, user terminals and a library of programs for use on the University's Cyber computer.

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

The Schools of Transportation and Traffic and Highway Engineering have been amalgamated in the new School of Transport and Highways. The fusing of the disciplines of the separate Schools—the one oriented towards planning and analysis and the other to design and construction—permits greater flexibility in the choice of MEngSc programs. The new School continues to offer graduate diplomas and special courses in Transport, Highway Engineering and Traffic Planning & Control. It supervises research degrees in a wide range of topics including urban and regional planning,

School of Nuclear Engineering

School of Surveying

School of Transport and Highways highway maintenance, transport systems, transport terminal operators, public transport, land use and transport interactions, environmental impact, road safety, noise and pollution.

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Faculty of Applied Science 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.

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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. 	Skills
 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.	Communication

• 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. Creativity including the ability to innovate new ideas and practices.

• The ability to evaluate independently and to criticise constructively their own work and the work of other engineers.

We hope to do much more than merely impart a body of knowledge to our undergraduates. Appropriate attitudes and skills for professional engineers operating into the twenty-first century must also be developed. Technology has come under increasing criticism from other sectors of society. It is no longer accepted that advances in technology are necessarily synonymous with the betterment of society, and future engineers must be prepared not only to take account of the ramifications of their work, but also to vindicate them to an increasingly doubtful public. It is also important for you, as a student, to join in the development of yourself as a professional engineer. Engineering is a co-operative profession where teamwork is very important. Whilst at university you should take as many opportunities as you can to join in the activities which help to develop the whole person. Student clubs and professional institutions provide many opportunities for gaining knowledge and experience which will be valuable in your work as an engineer.

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

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

H. R. Vallentine Dean Faculty of Engineering

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N. L. Svensson Chairman Faculty of Engineering

Faculty Information

Who to Contact

If you require advice about enrolment, degree requirements, progression within courses or any other general faculty matters contact:

Ms Margaret Leonard, Administrative Assistant, Faculty of Engineering, Room 508A, Surveying and Geography Building.

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

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

Faculty of Engineering Enrolment Procedures

All students re-enrolling in 1979 or enrolling in graduate courses should obtain a copy of the free booklet *Enrolment Procedures* 1979 available from School Offices and the Admissions Office. This booklet provides detailed information on enrolment procedures and fees, enrolment timetables by Faculty and course, enrolment in miscellaneous subjects, locations and hours of Cashiers and late enrolments.

Faculty of Engineering Library Facilities

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

The Physical Sciences Library

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

Physical Sciences Librarian Marian Bate

The Undergraduate Library

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

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

• The Open Reserve Section, housing books and other material which are required reading.

 The Audio Visual Section, containing cassette tapes, mainly lectures and other spoken word material. The Audio-Visual Section has wired study carrels and cassette players for student use.

Undergraduate Librarian Pat Howard

Student Clubs and Societies

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

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

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

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

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.

Centre for Biomedical Engineering

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

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

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

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

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

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

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

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

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

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

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

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

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

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

The Institution of Surveyors, Australia

During their years as undergraduates, students in the surveying course are encouraged to take the first steps in joining in the activities of the professional body which represents surveyors, The Institution of Surveyors. The aims of the Institution are to promote scientific, technical and educational aspects of surveying and to maintain high professional standards of practice and conduct. Student members receive the quarterly journal of the Institution, The Australian Surveyor and The NSW Survevors' Monthly Bulletin which is published by the New South Wales Division of the Institution. Membership also entitles the student to attend all meetings of the Institution and to attend the annual Congress at a special concessional rate. Membership application forms are available at the office of the School of Surveying and from the Institution office at 65 York Street, Sydney.

The Rupert H. Myers Award in Materials Engineering

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

Undergraduate Study

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

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

Common First Year

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

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

General Rules for Progression

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

 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 corequisite 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. 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.

Full-time Courses

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

Industrial Training Requirements

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

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

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

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

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

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

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

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

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

Part-time Courses

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

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

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; (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 ules relating to progression in University courses.

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

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

Honours Class I

Honours Class II, Division I

Honours Class II, Division II

Conditions for Award of Degree of Bachelor of Surveying

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

(1) comply with the requirements for admission;

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

(3) complete an approved program of industrial training for such periods as prescribed. In general this training should be completed before the commencement of Part 8 of the undergraduate studies*.

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

3. A student may be granted advanced standing by the Professorial Board on the recommendation of the Faculty of Engineering, but in each case must complete an adequate period of approved industrial training before being eligible for the degree. In addition to the above requirements a student coming from another institution must 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 1

Honours Class II, Division II

*This condition shall not apply after 1979.

Undergraduate Study

Course Outlines

School of Civil Engineering

Head of School Professor I. K. Lee

Administrative Officer Mr R. W. Prior

The School of Civil Engineering offers two degree courses in Civil Engineering: the Bachelor of Engineering (BE) course which can be taken on a 4-year full-time basis, a 7-stage part-time basis or any approved combination of full-time and part-time study; and the Bachelor of Science (Engineering) (BSc(Eng)) course which is a part-time program, comprising the first six stages of the 7-stage Bachelor of Engineering course. No enrolments are now accepted for the BSc(Eng) course in Civil Engineering; the last initial enrolment year was 1974.

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

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

A student who has completed the requirements for the award of the BSc(Eng) degree in Civil Engineering but has not taken out the degree by formal graduation may apply to the Head of School for enrolment on a part-time basis in the BE degree course. 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. The degree of Bachelor of Science (Engineering) may be awarded with Merit in recognition of superior performance throughout the course.

3620

Civil Engineering Full-time Course

Bachelor of Engineering BE

Year 1

		S1	S2
1.981	Physics (CE)*	5	3
2.981	Chemistry ICE†	6	2
5.0102	Introduction to Engineering		
	Design	2	0
5.0201	Engineering Dynamics	0	4
5.0301	Engineering Drawing	0	3
8.170	Statics	4	0
8.171	Mechanics of Solids	0	2
8.271	Introduction to Materials	0	2
8.670	Introduction to		
	Engineering Construction	0	. 1
10.001	Mathematics I**	6	6
			—
		23	23

* † **For footnotes, see overleaf, column one.

Hours Per Week

*Students are advised to attempt 1.981 Physics ICE but If timetabling difficulties arise or other exceptional circumstances prevail permission will be given to attempt 1.001 Physics 1 or 1.011 Higher Physics I. On successful completion of one of these latter subjects students will be exempted from one technical elective. +Students who have not satisfied the science prerequisite for 1.981 Physics ICE (ie 2 or 4 unit Science including Physics or Chemistry at Grades 1, 2 or 3) are advised to apply to enrol in two acceptable alternative subjects, 2.111 Introductory Chemistry and 2.121 Chemistry IA.

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

Year	2
------	---

	Hours Per Week	
	S1	S2
Mechanics of Solids II	4	0
Structural Design I	21/2	21/2
Civil Engineering Materials I	4	4
Systems Engineering	2	2
Hydraulics I	0	3
Engineering Construction	3	0
Engineering Mathematics II	4	4
Surveying for Engineers	0	6
Survey Camp†	11/2	11/2
Two Electives***	3	3
	-	
	24	26
	Mechanics of Solids II Structural Design I Civil Engineering Materials I Systems Engineering Hydraulics I Engineering Construction Engineering Mathematics II Surveying for Engineers Survey Camp† Two Electives***	Hours Pe S1 Mechanics of Solids II 4 Structural Design 1 2½ Civil Engineering Materials I 4 Systems Engineering 2 Hydraulics I 0 Engineering Construction 3 Engineering Mathematics II 4 Surveying for Engineers 0 Survey Camp† 1½ Two Electives*** 3 24

***See Electives on following page.

+Students are required to attend a one-week Survey Camp, which is equivalent to 11/2 class contact hours per week in each session.

Year 3 0 470

8.173	Structural Analysis I	3	0
8.174	Structural Analysis II	0	3
8.182	Structural Design II	3	3
8.273	Civil Engineering Materials II	3	3
8.351	Engineering Mathematics	5	0
8.572	Hydraulics II	3	0
8.573	Hydraulics III	0	3
8.581	Water Resources I	3	0
8.582	Water Resources II	0	3
8.672	Planning and Management I	0	4
	Two Electives***	3	3
		23	22
***See E	lectives on following page.	—	_
Year 4			

8.001	Industrial Training	0	0
8.191	Structural Engineering	3	0
8.274	Civil Engineering Materials III	3	3
8.583	Water Resources III	3	0
8.673	Planning and Management II	3	0
8.674	Planning and Management III	0	3
8.051	Design Project — Materials	0	11/4
8.052	Design Project — Structures	0	11/4
8.053	Design Project — Water	0	11/4
8.054	Design Project Construction	0	11/4
	Six Electives***	9	9
		21	20

***See Electives on following page.

3620 Civil Engineering — Part-time Course

Bachelor of Engineering BE

Stage 1

. . .

		S1	S2
1.001	Physics I*	6	6
1 0 .001	Mathematics*	6	6
			—
		12	12

Hours Per Week

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

Stage 2	2		
2.981	Chemistry ICE†	6	2
5.0102	Introduction to		
	Engineering Design	0	2
5.0201	Engineering Dynamics	0	4
5.0301	Engineering Drawing	0	3
8.170	Statics	4	0
8.171	Mechanics of Solids	0	2
8.271	Introduction to Materials	2	0
8.670	Introduction to		
	Engineering Construction	1	0
		13	13

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

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Stage 3

8.172 8.272 10.022 29.441	Mechanics of Solids II Civil Engineering Materials I Engineering Mathematics II Surveying for Engineers** Survey Campt	0 4 6 11⁄2	4 4 0 11/2
23.431		151/2	131/2

**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 11/2 class contact hours per week in each session.

Stage 4

8.181	Structural Design I	21⁄2	21⁄2
8.273	Civil Engineering Materials II	3	3
8.301	Systems Engineering	2	2
8.571	Hydraulics I	3	0
8.671	Engineering Construction	0	3
	Two Electives***†	з	3
		131/2	131/2

***See Electives on following page.

+One elective for 1978 Stage 1 students, if they have completed an elective

8.173 8.182 8.351 8.572 8.672	Structural Analysis I Structural Design II Engineering Mathematics Hydraulics II Planning & Management I Two Electives***	S1 0 3 0 4 6 13	S2 3 5 3 0 0 14
Stage 6	i		
8.174 8.191 8.274 8.573 8.581 8.582	Structural Analysis II Structural Engineering Civil Engineering Materials III Hydraulios III Water Resources I Water Resources II Two Electives***	3 0 3 0 3 11/2 131/2	$ \begin{array}{c} 0 \\ 3 \\ 0 \\ 3 \\ 0 \\ 4 \frac{1}{2} \\ 13 \frac{1}{2} \end{array} $
Stana 7	,		
8.001 8.051 8.052 8.053 8.054 8.583 8.673 8.674	Industrial Training Design Project — Materials Design Project — Structures Design Project — Water Design Project — Construction Water Resources III Planning & Management II Planning & Management III Four Electives***	0 0 11/4 11/4 0 3 6 111/2	$ \begin{array}{c} 0 \\ 11/4 \\ 11/4 \\ 0 \\ 3 \\ 3 \\ 0 \\ 6 \\ \hline 141/2 \\ \hline \end{array} $

Electives

Stage 5

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. For the BSc(Eng) degree course, six electives are required, three technical and three General Studies.

Approved technical electives for Year 2 are 6.851 Electronics and Instrumentation, 6.832 Industrial Electrical Machinery, 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 8.018 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, 8.015 Road 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, 8.039 Computer Programming, 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.

Double Degree

3730

How

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.

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

Physical Metallurgy and Chemistry Geography and Environmental Chemistry

For details of these programs see the Combined Sciences Handbook.

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

2.012 1.022, 1.032 8.172, 8.181, 8.272 10.1113 or 10.1213, 10.1114 or 10.1214, 10.2111 or 10.2211, 10.2112 or 10.2212 2 electives†

Year 3

1.023, 1.043, 1.133 or 1.313 or 1.323 8.173, 8.174, 8.182, 8.351, 8.571 10.111A or 10.121A 29.441, 29.491 1 elective†

Year 4

1.033, 1.133 or 1.313 or 1.323 8.273, 8.301, 8.572, 8.573, 8.581, 8.582, 8.671, 8.672 1 elective† Choose 2 Level II or Level III Mathematics units from Table 1 in the Combined Sciences Handbook

Year 5

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

Mathematics[‡]

Year 1 1.981* 2.981† 5.0102, 5.0201, 5.0301 8.170 8.171 8.271 8.4

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, 10.1113 or 10.1213, 10.2111 or 10.2211, 10.2112 or 10.2212 1 elective† Choose either 1. or 2.: 1. 10.3114 or 10.321A, 10.311B or 10.321B, 2. Choose 3 units fram: 10.411A or 10.421B, 10.411A or 10.421B, 10.211D or 10.221D,

10.1111, 10.1112 or 10.121C

Year 3

8.173, 8.174, 8.182, 8.351, 8.571 29.441, 29.491 2 electives† Choose 4 units from Mathematics from Table 1 of the Combined Sciences Handbook (at least one must be Level III) **Vear 4**

8.273, 8.301, 8.572, 8.573, 8.581, 8.582, 8.671, 8.672 1 elective† Choose 3 Level III (not Level II/III) Mathematics units from Table 1 of the Combined Sciences Handbook Year 5

8.001, 8.191, 8.274, 8.583, 8.673, 8.674, 8.051, 8.052, 8.053, 8.054 electivest Choose 1 or 2 units from Tables 1 or 3 in the Combined Sciences Handbook at Level II or higher

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 25.011 3 electivest

Year 3

2.042C 8.173, 8.174, 8.182, 8.351, 8.571 25.012, 25.022 29.441, 29.491 1 elective†

Year 4

8.273, 8.301, 8.572, 8.573, 8.581, 8.582, 8.671, 8.672 25.073, 25.023

Year 5

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

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

*Students are advised to attempt 1.981 Physics 1CE but if timetabling difficulties arise or other exceptional circumstances prevail permission will be given to attempt 1.001 Physics I or 1.011 Higher Physics I. On successful completion of one of these latter subjects together with 2.981 Chemistry 1CE students will be exempted from one technical elective.

**Students who have not satisfied the science prerequisite for 1.981 Physics 1CE (ie 2 or 4 unit Science including Physics or Chemistry at HSC Exam percentiles range 31-100, with results in the 11-70 range at a standard acceptable to the Professorial Board) 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.

tOf the six electives, four must be in General Studies and two must be technical electives. The technical electives are listed after Stage 4 of Course 3620. The choice of the technical electives must be approved by the Head of the School of Civil Engineering.

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 electivest

Year 3

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

Year 4

6.646, 6.647, 6.649 8.273, 8.301, 8.572, 8.573, 8.581, 8.582, 8.671, 8.672 1 elective† Choose 1 Level II or Level III Mathematics unit from Table 1 in the Combined Sciences Handbook

Year 5

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

School of Electrical Engineering

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

Senior Administrative Officer H. G. Phillips Administrative Assistant

Ms Robyn Horwood

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

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

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

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

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

Honours

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

Industrial Experience

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

t * ** †See footnotes at foot of previous page.

Engineering

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:

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Electrical Engineering

Bachelor of Engineering BE

Year 1		Hours Per Week	
		S1	S2
1.961	Physics 1*	6	6
2.121	Chemistry**	6	Ó
5.030	Engineering C	6	õ
6.010	Electrical Engineering I	0	6
10.001	Mathematics 1*	6	6
	Either		
2.131	Chemistry**	0	6
5.010	Engineering A	-	•
	One General Studies Elective	11/2	11⁄2
		251/2	251/2

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

**Available in either Session 1 or 2.

Year 2

1.972	Electromagnetism	0	4
1.982	Solid State Physics	4	0
	Electrical Engineering II		
6.021A	Circuit Theory I	4	0
6.021B	Power	0	4
6.021C	Electronics	Ó	4
6.021D	Introduction to Computing	0	4
6.021E	Digital Logic and Systems	4	Ó
10.111A	Pure Mathematics II (Linear		-
	Algebra)*	2	2
10.1113	Pure Mathematics II		
	— Multivariable Calculus*	21/2	0
10.1114	Pure Mathematics II		
	— Complex Analysis*	0	21/2
10.2111	Applied Mathematics II		
	Vector Calculus*	21/2	0
10.2112	Applied Mathematics II		
	 Mathematical Methods for 		
	Differential Equations*	0	21⁄2
	One General Studies Elective†	3	0
		_	
		22	23

*Students who have achieved a certain standard may attempt similar material at a higher level. Two General Studies electives in 1979.

Year 3*

	Hpw
S 1	S2
4	0
0	4
0	4
4	Ó
2	ž
2	2
4	0
4	ŏ
4	ñ
ō	Ă
ō	Å
õ	Å
ň	Ă
3	ň
_	_
23	24
	S1 4 0 0 4 2 2 4 4 4 0 0 0 0 3 23

. .

+Each student elects two of these four: a free choice may not be possible.

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

**Two General Studies electives in 1979.

Year 4

6.911	Thesis*	2	21
	Electrical Engineering IV		
	(6 electives) †	20	10
	and General Studies Elective	3	0
	•	_	
		25	31

*In Session 1 two hours per week and in Session 2 three days per week are devoted to directed laboratory and research work on an approved subject under the guidance of members of the lecturing staff. Generally, the project involves the design and construction of experimental apparetus together with laboratory tests. Each student is required to present a seminar and a written thesis must be submitted on each project by the penultimate Monday in November. 'See Electrical Engineering IV, immediately below.

Electrical Engineering IV

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

The list of electives is*:

2.041 Electrical Measurements	3.041	Electrical	Measurements
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- 6.042 Digital and Analogue Signals
- 6.044 Electrical Product Design and Reliability
- 6.202 Power Engineering 1
- 6.203 Power Engineering II
- 6.212 Power Engineering—Utilization
- 6.222 High Voltage and High Current Technology
- 6.303 High Frequency Circuits and Electronics I
- 6.313 High Frequency Circuits and Electronics II

.....

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

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

3650 Electrical Engineering

Bachelor of Science (Engineering) BSc(Eng)

Stage 1

		Hours per	SO
1 001	Physice I	6	6
10.001	Methematics I	õ	6
10.001	Mathematics (_	_
		12	12
Stage 2			
2.121	Chemistry	6	9
5.030	Engineering C	0	6
6.010	Electrical Engineering I	6	0
6.021A	Circuit Theory I	0	4
10.1113	Pure Mathematics II		
	— Multivariable Calculus	21/2	0
10.1114	Pure Mathematics II	-	~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~
	— Complex Analysis	0	272
		1.416	1216
		14/2	
Stage 3			
1 092	Solid State Physics	4	٥
6 021B	Power	Å	ŏ
6 021C	Flectronicst	ō	4
6.0311	Circuit Theory II	ō	4
10.111A	Pure Mathematics II - Linear		
	Algebra	2	2
10.2111	Applied Mathematics II		
	 Vector Calculus 	21/2	0
10.2112	Applied Mathematics II		
	- Mathematical Methods for	•	
	Differential Equations	114	2 72
	Une General Studies Elective	1 72	1 72
		14	14
			

†In 1979 students attempt 1.972.

Stage 4

		n n	2W
		S1 -	S2
1.972	Electromagnetism	0	4
1.992	Thermal Physics and Mechanics	4	0
6.021D	Computing	0	4
6.022	EE Materials†	4	0
6.0312	Utilization of Electric Energy	4	0
6.0313	Electronic Circuits I	0	4
	One General Studies Elective	11/2	11⁄2
		131/2	
		1074	1074

Stage 5

6 021E	Digital Logic and Systems	4	0
0.0216	Digital Logic and Systems	7	š
6.0314	Signal Processing	4	U
6.0315	Electrical Energy	0	4
6.0316	Electronic Circuits II	0	4
10.361	Statistics SE	2	2
6.0317	Communication Systems I	0	4
		10	14

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

Stage 6

Harris man Minale

5.661 6.902	Three Professional Electives* One General Studies Elective Mechanical Engineering Industrial Experience	10 0 3 0	5 3 3 0
		13	11

The list of electives to be offered largely corresponds to those in Electrical Engineering IV list (see the BE program). The full range of electives are not offered in the BSc(Eng) course: students who can arrange the necessary day attendance may request approval to substitute Electrical Engineering IV electives.

Course Revision

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

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

• no students will lose credit for any subject completed, and

• no students will be liable for increased requirements if they progress normally.

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

Prerequisites and Co-requisites

Full-time Bachelor of Engineering Degree Course 1979

Year	Subject	Prerequisites	Co-requisites	
1	1.961 2	See Matriculation and Admission Poquiromente		
	2.121 {	See Maniculation and Admission Requirements		
	5.010	2.121 See Matriculation and Admission Requirements		
	5.030	oce Mathemation and Admission Requirements		
	6.010	The Electricity & Magnetism section of 1.961		
	10.001	See Matriculation and Admission Requirements		
2	∫ 1.972	1.961, 10.001	10.2111, 10.2112	
	〔1.982			
	6.021A	1.961, 6.010, 10.001		
	6.0210	1 982 6 0214		
	6.021D	Computing strand of 5.030. If not, do 6.620		
	6.021E	10.001		
	10.111A	10.001		
	10.1113	10.001		
	10.1114	10.001		
	10.2111	10.001		
	6.022	1.961, 2.121		
	6.620	10.001		
	6.641	6.620 or 6.021D		
3	1,992	1.961, 10.001	10 2111 10 2112	-
•	6.056, 5.661	10.2111, 10.2112, 1.961	10.2111, 10.2112	
	10.033	10.111A, 10.1113, 10.1114, 10.2111, 10.2112		
	10.361	10.111A, 10.1113, 10.1114, 10.2111, 10.2112		
	6.0311	6.021A	10.111A, 10.1113,	
	6 0312	6.021A_6.021B	10.1114 desirable	
	6.0313	6.021A, 6.021C	6.0311	
	6.0314	6.0311		
	6.0315	6.0312 attempted		
•	6.0316	6.0313 6.0312 attempted		
	6.0317	6.0313 attempted	6.0314, 6.0316	_
4	6.041	6.0311, 6.0313		
	6.042	10.033, 10.361		
	6.202	6 0312 6 0315		
	6.203	6.202 attempted		
	6.212	6.0312, 6.0315		
	6.222	· · · · · · · · · · · · · · · · · · ·		
	6.303	6.0311, 6.0313, 6.0314, 6.0316, 6.0317	*	
	6 3 2 2	6.0313 6.0314 6.0316		
	6.323	6.0317	* *	
	6.333	6.0314, 6.0316, 6.0317		
	6.383	6.0311, 6.0313, 6.0314, 6.0316		
	6.412	6.0311, 6.0314		
	6.413	6.412		
	0.432	6.0313 6.0313		
	6.522	6.0313, 6.0316	•	
	6.612	6.021E or 6.602A or 6.631		
	6.622	6.620		
	6.911	(in graduating program only)	~	
	6.622 6.911	6.620 (in graduating program only)	~	

*One of the prerequisites may be taken as a co-requisite. **Working knowledge of elementary Fourier transforms and probability as in 10.033 and 10.361 is assumed.

Electrical Engineering — Substitution of Subjects

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

1. The replacement subject is at least of the same length and level as the prescribed subject it replaces; and

2. The resulting overall program of study is suited to the award of either the BE or BSc(Eng) degree as applicable.

Examples are:

(1) Replacement of two General Studies subjects by an approved Arts subject;

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

(3) If students proposing to attempt the BSc BE pattern include additional Computer Science or Applied Mathematics in their Year 2 Electrical Engineering program they open up a wider choice of subjects in their Science Year 3. Subjects omitted may be required to be taken in the student's Year 3 of Electrical Engineering.

(4) The normal Year 4 of the BE degree program includes 6 units of Electrical Engineering IV. Students may substitute for one of these units, a subject of suitable level and difficulty from an area outside the School of Electrical Engineering.

(5) Students proposing to major in Computer Science in the BE program may substitute appropriate Science units in Year 3 (for one technical elective and 6.0315), and in Year 4 for professional electives.

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

Double Degrees

3970/3640 Double Degree of BSc BE in Electrical Engineering

Students in Electrical Engineering may qualify for this double degree in five years of full-time study. Having completed the first and second year of the Electrical Engineering course, students with a creditable performance may transfer to the Science and Mathematics Course (this is subject to the recommendation of the Head of the School of Electrical Engineering and the approval of the Faculty of Engineering and the 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 sessionhours 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.

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Double Degree BA BE in Electrical Engineering

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

Any students wishing to enrol in, transfer into or continue in the double degree course BA BE shall have complied with all the requirements for prerequisite study and academic attainment (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*

- 10.001 Mathematics I
- 10.111A Pure Mathematics II (Linear Algebra)
- 10.1113 Pure Mathematics II (Multivariable Calculus)
- 10.1114 Pure Mathematics II (Complex Analysis)
- 10.2111 Applied Mathematics II (Vector Calculus)
- 10.2112 Applied Mathematics II (Mathematical Methods for Differential Equations)

or equivalent

- 1.961 Physics I
- 1.972 Electromagnetism
- 1.982 Solid State Physics
- 1.992 Thermal Physics and
 - Classical Mechanics

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

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

Subsequent Transfer to BA BE Course

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

Honours Degree in Arts

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

School of Mechanical and Industrial Engineering

Head of School Professor R. A. A. Bryant

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

Senior Administrative Officer G. Dusan

The courses in the School are planned to provide the appropriate academic training for the professional engineer in the fields of aeronautical, industrial and mechanical engineering, and for the naval architect.

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

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

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

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

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

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

Part-time courses may also be completed by a combination of part-time and of full-time study. Students proceeding to the BSc(Eng) degree whether by a combination of part-time and of full-time study, 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.)

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

The award of the degree BE or BSc(Eng) in Mechanical Engineering is recognized by the Institution of Mechanical Engineers, London, as giving exemption from Parts 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.

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Mechanical Engineering — Full-time Course

Bachelor of Engineering BE

Year 1		Hours Per	Week
		S1	S2
1.951	Physics I (Mech. Eng.)	4	4
2.951	Chemistry I (ME)	0	6
5.010	Engineering A	6	0
5.030	Engineering C	6	0
5.040	Engineering D	0	8
5.061	Technical Orientation	2	0
10.001	Mathematics I or)	•	6
10.011	Higher Mathematics I	0	0
Year 2			
5.032	Experimental Engineering II	2	2
5.111	Mechanical Engineering Des	ian I2	4
5.330	Engineering Dynamics	2	2
5.411	Mechanics of Solids II	2	2
5.611	Fluid Mechanics/Thermo-		
	dynamics I	4	4
6.801	Electrical Engineering	3	3
8.259	Properties of Materials	3	3
10.022	Engineering Mathematics II	4	4
	General Studies Elective	11/2	11/2
18.020	Industrial Orientation	0	1
		-	

		1	Hpw	
		S1	•	S2
Year 3				
5.033	Experimental Engineering III	11⁄2		11/2
5.043	Industrial Training I	0		0
5.071	Engineering Analysis	31⁄2		31⁄2
5.112	Mechanical Engineering Design II	3		3
5.331	Dynamics of Machines I	2		2
5.412	Mechanics of Solids III	2*		2
5.612	Fluid Mechanics/Thermo-			
	dynamics II	31⁄2		31⁄2
18.011	Industrial Engineering IA or	2		2
18.021	Industrial Engineering IB	2		2
	General Studies Elective	3		3
6.853	Analogue & Digital			
	Instrumentation*	3	or	3
Year 4				
5.044	Industrial Training II	0		0
5.051	Thesis	6		6
5.062	Communications	2		2
5.324	Automatic Control Engineering	3		3
	General Studies Elective	11/2		11/2
Plus 12 l	hours per week from the followin	g tec	hnic	al
electives	:			
4.913	Materials Science	3		3
5.113	Mechanical Engineering			
	Design III	6		6
5.332	Dynamics of Machines II	3		3
5.413	Mechanics of Solids IV	3		3
5.614	Fluid Mechanics III	3		3
5.615	Thermodynamics III	3		3
8.026	Systems Methods in Civil	~		~

Engineering 18.012 Industrial Engineering IIA 3 333 Industrial Engineering IIB 3 18.022 18.431 Design for Production 3 3 18.551 Operations Research 3 23.051 Nuclear Power Technology 3 3

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

3690

Mechanical Engineering — Part-time Course

Bachelor of Science (Engineering) BSc(Eng)

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

Stage 1

		Hours Per	Week
		S1	S2
1.001	Physics I or }	0	•
1.011	Higher Physics I	0	o
10.001	Mathematics (or)	•	~
10.011	Higher Mathematics I*	6	6
*Not avai	lable in the evening in 1979.		

Stage 2

		S1	" S2
2.951	Chemistry I (ME)	0	6
5.010	Engineering A	6	õ
5.030	Engineering C	6	0
5.040	Engineering D	0	8
Stane 3			
		<u> </u>	•
5.330	Engineering Dynamics	2	2
5.411	Desperties of Meterials	2	2
0.209	Froperties of Materials	3	3
10.022	Conoral Studios Electivo	4	4
	General Studies Elective	172	172
Stage 4			
5.032	Experimental Engineering II	2	2
5.111	Mechanical Engineering		
	Design I	3	3
5.611	Fluid Mechanics/		
	Thermodynamics I	4	4
6.801	Electrical Engineering	3	3
	General Studies Elective	11⁄2	1 1⁄2
Stage 5	i		
5.071	Engineering Analysis	31⁄2	31/2
5.112	Mechanical Engineering		•••
	Design II	3	3
5.331	Dynamics of Machines I	2	2
5.412	Mechanics of Solids III	2	2
5.612	Fluid Mechanics/		
	Thermodynamics II	31/2	31⁄2
Stage 6		· · · ·	
5.042	Industrial Experience*	0	0
5.113	Mechanical Engineering		
	Design III	6	6
5.324	Automatic Control	•	
	Engineering	3	з
	General Studies Elective	11⁄2	1 1⁄2
Plus one	of the following technical elective	s:	
4.913	Materials Science or		
5.332	Dynamics of Machines II or	3	3
5.413	Mechanics of Solids IV J		
*See the Engineering	introduction of School of Mechanical J.	and I	ndustrial

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Aeronautical Engineering — Full-time Course

Bachelor of Engineering BE

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

Year 3

rear o	and the second		
		Hours Per	Week
5.033	Experimental Engineering III	1 1/2	1 72
5.043	Industrial Training I	0	0

		F	łpw
		S1	- S2
5.071	Engineering Analysis	31/2	31⁄2
5.303	Mechanical Vibrations	11/2	0
5.412	Mechanics of Solids III	2	2
5.800	Aircraft Design	0	21/2
5.811	Aerodynamics I	3	3
5.822	Analysis of Aerospace Structur	res I2	2
6.853	Analogue & Digital		
	Instrumentation*	3	or 3
18.011	Industrial Engineering IA or	2	2
18.021	Industrial Engineering IB 💦 🐧	-	L
	General Studies Elective	3	3
*One sess	ion only. Students take this subjec	t in either	Session 1
Voar A			
- CO14	Inductoial Testaine II	•	•
5.044	Thesis	0	0
5.051	Communications	6	6
5.002	Aircraft Design	2	2
5.001	Ancran Design	4	4
0.012	Applyois of Acrospess	3	3
0.020	Structures II	•	2
5 921	Aircraft Bropulaion	5	2
0.001	General Studies Elective	11/2	116
DI	deneral olidies Liective	172	172
Plus one	of the following technical ele	ctives:	
4.913	Materials Science or	Ì	
5.324	Automatic Control	,	
0.000	Engineering or		•
0.020	Systems Methods In	د ۲	3
10.000	Civil Engineering or	Į	
10.022	Constantiane Research	1	
10.001	Operations Research)	
		2214	2214
		2372	2372

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Aeronautical Engineering --- Part-time Course

Bachelor of Science (Engineering) BSc(Eng)

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

Stage 5

olago	-	Hours Pe	r Week
5.071	Engineering Analysis	31⁄2	31⁄2
5.412	Mechanics of Solids III	2	2
5.811	Aerodynamics I	3	3
5.822	Analysis of Aerospace		
	Structures I	2	2
5.303	Mechanical Vibrations	11⁄2	0
		12	101/2

		Hpw	
Stage (5	S1	S2
5.042	Industrial Experience*	0	0
5.801	Aircraft Design	4	. 4
5.812	Aerodynamics II	3	3
5.823	Analysis of Aerospace Structures II	2	2
5.831	Aircraft Propulsion General Studies Elective	2 1½	2 1 ½
		121/2	121/2
• • • • • • •	Introduction in Octobel of 1		

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

3700 Naval Architecture — Full-time Course

Bachelor of Engineering BE

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

Year 3

		Hours Pe	r Week
5.033	Experimental Engineering III	1 1⁄2	11⁄2
5.043	Industrial Tarining I	0	0
5.071	Engineering Analysis	31⁄2	31⁄2
5.303	Mechanical Vibrations	11/2	0
5.412	Mechanics of Solids III	2	2
5.911	Naval Architecture	4	4
5.921	Ship Structures I	0	4
5.931	Principles of Ship Design IA	3	Ó
5.932	Principles of Ship Design IB	0	2
5.951	Hydrodynamics	11/2	0
18.021	Industrial Engineering IB	2	2
	General Studies Elective	3	3
		22	22
			_

		Hpw	
		S1	S2
Year 4			
5.044	Industrial Training II	0	0
5.051	Thesis	6	6
5.062	Communications	2	2
5.933	Principles of Ship Design II	3	3
5.934	Ship Design Project	3	41⁄2
5.941	Ship Propulsion and Systems	4	4
	General Studies Elective	11/2	11/2
5.922	Ship Structures II	4	0
Plus one	of the following technical elect	lves:	
4.913	Materials Science or		
8.026	Systems Methods in Civil		
	Engineering or	3	3
18.022	Industrial Engineering IIB or		
18.551	Operations Research		
	. 2		_
		261/2	24

3710 Naval Architecture — Part-time Course

Bachelor of Science (Engineering) BSc(Eng)

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

Stage 5

5.071 5.303 5.412 5.911	Engineering Analysis Mechanical Vibrations Mechanics of Solids II Naval Architecture	11/2 81 11/2 2 4	S2 31/2 0 2 4
5.921 5.931	Principles of Ship Design IA	3	4 0
		14	13½
Stage 6	1		
5.042	Industrial Experience*	0	0
5.922	Ship Structures II	4	ō
5.933	Principles of Ship Design II	3	3
5.934	Ship Design Project	3	41⁄2
5.941	Ship Propulsion and Systems	4	4
	General Studies Elective	1½	11⁄2
		151⁄2	13
Sea the	introduction of School of Macha	nicel and in	

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

Department of Industrial Engineering

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

The first two years of the full-time course and the first four years of the part-time course provide the student with a sound foundation in the basic science and engineering subjects, and this knowledge is used and extended in the later years in the study of the industrial subjects. Finally, the problems associated with the practical economics of manufacturing operations are studied. These three fields of study provide the student with the training necessary to carry out an industrial job and to examine it critically in the light of economic efficiency.

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

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

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

The Work of the Industrial Engineer

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

1. Industrial Economic Analysis

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

2. Planning and Control of Production

Manufacturing processes and operations must be planned in detail throughout an enterprise to ensure that they proceed smoothly and economically. Functions in this field include the establishment of production standards, the setting of production targets and, finally, control of quality.

The ultimate responsibility of those in charge of the planning and control of production is to ensure that the goods, as originally specified, perform satisfactorily and are produced when required at an optimum cost. Modern electronic computers may be called upon to help achieve this.

3. Product and Process Design

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

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

4. Methods Engineering

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

5. Operations Research

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

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

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3660 Industrial Engineering — Full-time Course

Bachelor of Engineering BE

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

Year 3		Hours Pe	r Week
5.033 5.043	Experimental Engineering III	11/2	52 11/2
5.071 5.112	Engineering Analysis Mechanical Engineering	31/2	31⁄2
5 331	Design II Dynamics of Machines I	3	3
5 412	Mechanics of Solids III	2	2
14.001	Introduction to Accounting A	11/4	ñ
14.002	Introduction to Accounting R	0	11/5
18.011	Industrial Engineering IA	2	2
18.021	Industrial Engineering IB	2	2
	General Studies Elective	3	3
		201⁄2	201⁄2
Year 4			
5.044	Industrial Training II	. 0	0
5.051	Thesis	6	6
5.062	Communications	2	2
18.012	Industrial Engineering IIA	3	3
18.022	Industrial Engineering IIB	3	3
18.431	Design for Production	3	3
18.551	Operations Research General Studies Elective	3 11⁄2	3 1½
Plus one	elective chosen from:		
4.913	Materials Science or		
5.324	Automatic Control		
	Engineering or		
5.332	Dynamics of Machines II or >	3	3
5.413	Mechanics of Solids II or		
8.026	Systems Methods In Civil Engineering		
		241/2	241/2

3670 Industrial Engineering — Part-time Course

Bachelor of Science (Engineering) BSc(Eng)

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

For outline of the first four stages see the Mechanical Engineering part-time course.

Stage 5

		Hours Pe	n meek
		S1	S2
5.071	Engineering Analysis	31⁄2	31/2
5.112	Mechanical Engineering		
	Design II	3	3
5.331	Dynamics of Machines I	2	ž
14.001	Introduction to Accounting A	11%	ñ
14.002	Introduction to Accounting B	0,72	1 1/6
18 011	Industrial Engineering IA	š	0
18 021	Industrial Engineering IR	2	2
	nicustrial Engineering (D	2	2
		14	14
			-
Stage 6	3		
5.042	Industrial Experience*	0	n
18.022	Industrial Engineering IIB	š	ă
18 432	Design of Production Systems	ē	2
18 551	Operations Research	2	~
10.001	General Studios Elective	3	3
	General Studies Elective	1 /2	1 1/2
		131/2	131/2
*See the Engineerin	Introduction to School of Mechar g.	lical and I	ndustrial

School of Surveying

Head of School Professor P. V. Angus-Leppan

Administrative Officer J. V. Fonseka

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

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

The course has undergone comprehensive revision.

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

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

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

Students wishing to become Registered Surveyors after graduation are advised to gain practical experience under a Registered Surveyor. Some reduction in the period of practical experience required before registration may be granted because of practical experience gained during the University course, provided the New South Wales Surveyors' Board is informed in the prescribed manner. Details are obtainable from the Registrar, Surveyors' Board, Department of Lands, Bridge Street, Sydney 2000. The degree of Bachelor of Surveying confers exemption from all written examinations of the Surveyors' Board. Students enrolled in the Bachelor of Surveying degree course are required to equip themselves with an electronic calculator. Details of the features required are available from the School.

3740 Surveying — Full-time Course

Bachelor of Surveying BSurv

Year 1

Session	1	Hours Per	Week
1.971 5.0102 10.001 29.001 29.800 29.700 29.191	Physics I Introduction to Engineering Dest Mathematics I Survey Draughting Professional Orientation Survey Camp I†	6 2 6 4 3 1 1	V2 V2 V2
		24	1/2

Session 2

		прж
1.971	Physics I	6
5.030	Engineering C*	6
10.001	Mathematics I	6
29.002	Surveying II	5
29.191	Survey Camp I†	11⁄2
		<u></u>
		241⁄2

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

Year 2

Session	1	
1.962	Physics of Measurement	3
10.022	Engineering Mathematics II (1st part)	4
10.341A	Statistics SU	2
27.295	Physical Geography for Surveyors†	4
29.003	Surveying III	5
29.151	Survey Computations t	4
29.192	Survey Camp II*	11⁄2
		231/2

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

Session 2

8.711	Engineering for Surveyors I	3
10.022	Engineering Mathematics II (2nd part)	4
10.341B	Statistics SU	2
29.004	Surveying IV	41⁄2
29.801	Cartography I	3
29.701	Seminar I	1
29.121	Electronics for Surveyors	2
29.192	Survey Camp II*	11/2
	General Studies Elective	3
		24

*Students are required to attend a one-week survey camp, which is equivalent to 11/2 class contact hours per week in each session.

Year 3

Session	1	
8.712	Engineering for Surveyors II	3
29.005	Surveying V	5
29.152	Survey Computations II	4
29.651	Land Development I	3
29.661	Cadastral Surveying and Land Law I	2
36.411	Town Planning	2
	General Studies Elective	3
		22

Session 2

		Hpw
29.006	Surveying VI	3
29.211	Geodesy I	4
29.311	Astronomy I	3
29.511	Photogrammetry I	4
29.652	Land Development II	з
29.631	Land Inventory I	2
29.662	Cadastral Surveying and Land Law II	3
29.195	Survey Camp III**	6
		28

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

Year 4

Session 1

(Part 7 --- Old Course)†

29.193	Professional Training	5 months
29 .194	Survey Camp*	2 weeks: Field
		2 weeks: Campus

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

+Offered in 1979 only.

Session 2

(Part 8 - Old Course)*

29.704	Management I	2
29.212	Geodesy II	3
29.312	Astronomy II	3
29.512	Photogrammetry II	3
	General Studies Advanced Elective	3
	Two Electives†	6
		-
		20

*Offered in 1979 only.

†See Year 4: Electives (Part 8 --- Old Course), immediately below.

Year IV: Electives (Part 8 - Old Course)

- 29.162 Hydrographic Surveying II
- 29.183 Cartography Advanced Elective
- 29.213 Geodesy III
- 29.313 Astronomy III
- 29.513 Photogrammetry III
- 29.173 Project
- 29.623 Land Development III
- 29.632 Land Inventory II
- 29.642 Land Law and Tenure II

Year 4

Session 1+

	* 1	
		Hours Per Week
29.212	Geodesy II	3
29.312	Astronomy II	2
29.512	Photogrammetry II	3
29.653	Land Development III	3
29.704	Management I	2
29.702	Seminar II	1
	Electives*	6
29.196	Survey Camp IV**	6
		26
		_

*See Year 4: Electives, immediately below.

**Two weeks of office computations equivalent to 6 class contact hours per week.

Session	2†	
29.705 29.703	Management II Seminar III Electives*	2 1 15
		18
†Available	e from 1980.	

*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
- Cadastral Surveying and Land Law III 29.663
- 29.664 Modern Title Concepts
- 29.802 Cartography II
- 29.803 Mapping Technology

3750 Surveying — Sandwich Course

Bachelor of Surveying BSurv

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

Part 6†

rait of	Hou	rs i	Per	Week
29.005	Surveying V		5	
29.152	Survey Computations II		4	
29 661	Cadastral Surveying and Land Law	1	2	
20.00	General Studies Electives		6	
29.211	Geodesv I		4	
29.511	Photogrammetry I		4	
			_	
			25	

†Offered in Session 1, 1979 only.

Part 7 (Old Course)**

29.193	Professional Training	
29.194	Survey Camp*	2 weeks: Field
		2 weeks: Campus

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

**Offered in Session 1, 1979 only.

Part 8 (Old Course)^{††}

29.704	Management I	- 2
29.212	Geodesy II	3
29.312	Astronomy II	3
29.512	Photogrammetry II	3
201012	General Studies Advanced Elective	3
	Two Electives†	6
	-	
		20

†See Electives (Part 8 - Old Course), immediately below.
††Offered in Session 2, 1979 only.

Electives (Part 8 - Old Course)

- 29.162 Hydrographic Surveying II
- 29.183 Cartography Advanced Elective
- 29.213 Geodesy III
- 29.313 Astronomy III
- 29.513 Photogrammetry III
- 29.173 Project
- 29.623 Land Development III
- 29.632 Land Inventory II
- 29.642 Land Law and Tenure II

Part 8t

29.006	Surveving VI	3
29.212	Geodesy II	3
29.312	Astronomy II	2
29.512	Photogrammetry II	3
29.653	Land Development III	3
29.704	Management I	2
	Two Electives*	6
		22

How

†Offered in Session 1, 1980 only.

Electives (Part 8)

29.161	Hydrographic Surveying I
29. 173	Project
29.514	Principles of Remote Sensing
29.802	Cartography II

Sandwich Course — Stages 1 and 2

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

Stage 1	l	Hours	Per Week
		S1	S2
1.001	Physics 1	6	6
10.001	Mathematics I	6	6
		· · · · ·	_
		12	12

Stage 2

5.0102	Introduction to Engineering		
	Design	2	. ,
29.001	Surveying I	41/2	
29.700	Professional Orientation	11/2	
29.800	Survey Draughting	3	
5.030	Engineering C*		6
29.002	Surveying II		5
29.191	Survey Camp**	11⁄2	11/2
		121/2	121/2

*Introduction to Systems and Computers Option.

**Students are required to attend a one week survey camp which is equivalent to 11/2 class contact hours per week in each session.

Graduate School of Engineering

Graduate Study

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

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

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

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

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

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

1. formal course work; or

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

completion of a research thesis.

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

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

Under the credit system in operation in the Faculty, one credit is normally equal to one hour's attendance per week for one session. The qualification 'normally' is required because of the varying ways in which credits are distributed for course work, design, critical review or research in the different schools. A minimum of *thirty-six* credits is required for the award of the Master of Engineering Science and Master of Surveying Science degrees in the Faculty.

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

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

Faculty of Engineering Enrolment Procedures

All students re-enrolling in 1979 or enrolling in graduate courses should obtain a copy of the free booklet *Enrol-ment Procedures 1979* available from School Offices and the Admissions Office. This booklet provides detailed information on enrolment procedures and fees, enrolment timetables by Faculty and course, enrolment imiscellaneous subjects, locations and hours of Cashiers and late enrolments.

School of Civil Engineering

		Credits
8.701G	Economic Decision Making in Civil	
	Engineering	3
8.702G	Network Methods in Civil Engineering	3
8.703G	Optimization Techniques in Civil	
	Engineering	3
8.704G	Stochastic Methods in Civil	
	Engineering	3
8.705G	Systems Modelling	3
8.706G	Experimental Methods in Engineering	
	Research	3
8.710G	Advanced Topics in Optimization in	
	Civil Engineering	3
8.714G	Advanced Topics in Systems	
	Modelling	3
8.723G	Construction Design	3
8.724G	Construction Technology	3
8.725G	Construction Accounting and Control	3
8.726G	Construction Law and Professional	_
	Practice	3
8.727G	Construction Planning and Estimating	6
8.728G	Design of Construction Operations	6
8.748G	Pavement Materials 1	3
8.749G	Pavement Materials 2	3
8.750G	Pavement Design and Evaluation 1	3
8.751G	Pavement Design and Evaluation 2	3
8.752G	Terrain Engineering	6
8.753G	Soil Engineering	3
8.754G	Applied Soil Mechanics	3
8.755G	Materials of Construction (Concrete	•
	Technology) I	3
8.756G	Materials of Construction (Metals and	~
	Plastics)	3
8.758G	Soil Mechanics	3
8.759G	Rock Mechanics	6
8.760G	Materials of Construction (Concrete	•
	Technology) II	3

	Ci	redits
8.764G	Composites in Civil Engineering	3
8.766G	Welding in Structural Engineering	3
8.771G	Foundation Engineering	6
8.772G	Soil Dynamics and Earthquake Analysis	6
8 780G	Geological Engineering	3
8.802G	Elastic Stability I	3
8.803G	Elastic Stability II	з
8 804G	Vibration of Structures I	3
8 805G	Vibration of Structures II	3
8 806G	Prestressed Concrete I	3
8 807G	Prestressed Concrete II	3
0.0070	Prestressed Concrete III	3
8,0000	Prestressed Concrete 1	š
0.0090	Reinforced Concrete II	3
0.0100	Reinforced Concrete III	3
0.0110	Renticed Concrete In Righting Applying and Design of Steel	Ū
0.0120	Chrysteres I	3
0.0400	Structures i Blastic Applying and Deplan of Stool	0
8.813G	Plastic Analysis and Design of Steel	3
	Structures in	3
8.814G	Analysis of Plates and Shelis	3
8.81/G	Experimental Structural Analysis I	3
8.818G	Bridge Design I	3
8.819G	Bridge Design II	3
8.820G	Structural Analysis and	~
	Finite Elements 1 (SAFE 1)	3
8.821G	Structural Analysis and	~
	Finite Elements 2 (SAFE 2)	3
8.822G	Structural Analysis and	-
	Finite Elements 3 (SAFE 3)	3
8.830G	Hydromechanics	3
8.831G	Closed Conduit Flow	з
8.832G	Pipe Networks and Transients	3
8.833G	Free Surface Flow	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	13
8.841G	Hydrometeorology	3
8 842G	Groundwater Hydrology	з
8.843G	Groundwater Hydraulics	3
8 844G	Soil-Water Hydrology	з
8 847G	Water Resources Policy	з
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	
0.0010	Engineering	3
8 8520	Water Distribution and Sewage	_
0.0020	Collection	3
0 9520	Public Health Science	ĕ
0.0000	Water and Wastewater Analysis and	•
0.0000	Quality Bequirements	3
0.0000	Water Treatment	à
8.856G	Nater freatment and Disposel	3
0.00/0	Water Quality Management	3
8.858G	water quality Management	0
8.860G	nivestigation of Groundwater	9
0.0040	Resources I	0
8.861G	Investigation of Groundwater	2
0.0000	Resources Z	a
8.862G	Fluviai mydraulics	2
8.863G	Estuarine Hydraulics	3

Digital Communications

		Credits
8.901G	Civil Engineering Elective 1	3
8.902G	Civil Engineering Elective II	3
8.909G	Project	9
8.918G	Research Project	18
8.936G	Research Project	36
	A 36 Credit Research Project is	not normally
	approved in the School of Civil	Engineering.
-	The normal program includes	a 9 Credit
	Project.	

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6.347G

School of Electrical Engineering

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

6.050G	Occasional Elective
6.053G	Advanced Mathematics II
6.054G	Numerical Computation
6.071G	Electrical Measurements
6.073G	Precise Electrical Measurements
6.074G	Superconductivity
6.075G	Electric Contacts
6.150G	Communication Elective
6.160G	Field Theory in Electrical Engineering
6.161G	Field Mapping
6.164G	Microwave Antenna Theory and Applications
6 167G	Propagation and Transmission of
00.0	Flectromagnetic Wayes
6 169G	Microwave Circuits: Theory and Techniques
6 170G	Microwave Electronics
6 224G	Electrical Insulation Engineering
6 225G	Electrical Discharges and their Technical
0.2200	Applications
6.226G	Electrical Apparatus Design
6.227G	Assessment of Insulation Performance in
	Electrical Plant
6.228G	Power System Equipment
6.234G	Power System Protection
6.244G	Power Systems I
6.246G	Power System Operation and Control
6.247G	Power System Analysis
6.248G	Power System Planning
6.249G	Dynamic Performance of Power Systems
6.250G	Power Elective I
6.251G	Power Elective II
6.254G	Electrical Machines I
6.255G	Electrical Machines II
6.256G	Underground Systems
6.257G	Electric Power Distribution Systems
6.337G	Sound Broadcast Systems
6.338G	Television Systems
6.339G	Electroacoustics
6.340G	Communication Electronics
6.341G	Signal Analysis
6.343G	Digital and Analogue Communications
6.344G	Communication Theory
6.345G	Analogue and Digital Filters
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6.348G	Optical Communications
6.349G	Radar and Navigation Aids
6.350G	Solid State Electronics Elective
6.373G	Semiconductor Devices
6.375G	Integrated Circuit Technology
6.376G	Reliability Engineering
6.377G	Integrated Circuit Design
6.378G	Solar Energy Conversion
6.452G	Principles of Feedback Control
6.453G	Computer Methods of Optimization
6.455G	System Identification and Modelling
6.456G	General Concepts in Formal System Theori
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
6.467G	Digital Image Processing Systems, Scene
	Analysis and Machine Vision
6.468G	Computer Display Systems and Interactive
	Instrumentation
6.470G	Advanced Topics in Control
6.471G	Systems and Control Elective

Theories Digital

- 6.484G **Biological Signal Analysis**
- Medical Instrumentation 6.485G
- Computer Science Elective 6.650G
- 6.651G **Digital Electronics**
- 6.654G Digital Systems
- 6.655G Computer Organization and Architecture
- 6.656G Software Systems A
- 6.657G Software Systems B
- 10.061G Advanced Mathematics I
- 10.361G Statistics

†6.909G	Project	9 credits
6.918G	Research Project	18 credits
6.936G	Research Project	36 credits

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

School of Mechanical and Industrial Engineering

· · ·		Credits
5.045-6-70	Advanced Topics in Mechanical	
	Engineering	2, 2, 2
5.073G	Ordinary Differential Equations in	
	Mechanical Engineering	3
5.075-6G	Computation Methods in Mechanical	
	Engineering I, II	2, 2
5.077-8G	Analogue Computation in Mechanical	
	Engineering I, II	2, 2

		Credits
5.101-2G	Optimization Methods for Mechanical	
	Engineers I, II	2, 2
5.110G	Morphology of Design	4
*5.151-2G	Refrigeration and Air Conditioning	
	Design I, II	3, 3
5.304-5G	Advanced Dynamics I, II	2, 2
5.315-6G	Mechanisms I, II	2, 2
*5.321-2G	Automatic Control I, II	2, 2
5.328-9G	Control and Modelling of Mechanical	
	Systems I, II	2, 2
5.335G	Vibrations	2
5.401G	Experimental Stress Analysis	2
5.415-6G	Stress Analysis for Mechanical	
	Engineering Design I, II	3, 3
5,417G	Mechanics of Fracture and Fatigue	3
5.428G	Advanced Mechanics of Materials	2
**5.490G	Solid Mechanics (for Medical	
	Graduates)	~ ~
5.491-2G	Biomechanics I, II	2,2
**5.491-2G	Biomechanics I, II	2, 2
5.493G	Mechanics of the Human Body	
**5.494G	Mechanical Properties of Biomaterials	
- 5.495G	Biomechanics of Physical Republication	
E 6150	Reciproceeting Internal Combustion	
5.015G	Enginee	2
5 621-20	Gaedynamics L II	22
5.631-20	Lubrication Theory and Design I. If	22
5 653-46	Acoustic Noise I II	22
*5 712-36	Convection Heat Transfer L II	22
5 718G	Conduction Heat Transfer	2
5 719G	Radiation Heat Transfer	2
5.725G	Statistical Thermodynamics	2
5.735G	Direct Energy Conversion	2
*5.751-2G	Refrigeration, Air Conditioning and	-
	Cryogenics I. II	2.2
*5.758G	Refrigeration and Air Conditioning	
•	Applications	4
5.909G	Project	9
5.912-3G	Naval Hydrodynamics I, II	2, 2
5.918G	Research Project	18
†5.936G	Research Project	36
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*Candidates wishing to specialize in Refrigeration and Air Conditioning should select these subjects.

**These subjects are part of the Master of Biomedical Engineering course.

 $\uparrow A$ 36 credit Research Project is not normally approved in the School of Mechanical and Industrial Engineering.

Department of Industrial Engineering

		Credits
*18.061G	Industrial Experimentation I	3
*18.062G	Industrial Experimentation II	3
*18.073G	Ergonomics	2
*18.171G	Inspection and Quality Control	3

*18.271G	Theory of Machining and Forming	
	Processes	3
*18.272G	Technology of Machining and	
	Forming Processes	3
*18.371G	Factory Design and Layout	3
*18.461G	Design for Production	4
*18.462G	Industrial Design	2
*18.463G	Tool Design	4
*18.471G	Design Communication	2
*18.472G	Engineering Design Analysis	6
18.571G	Operations Research I	6
18.574G	Operations Research II	3
18.579G	Case Studies in Operations Research	3
18.671G	Decision Theory	2
18.761G	Simulation in Operations Research	3
18.763G	Variational Methods in	
	Operations Research	2
18.770G	Stochastic Control	2
18.772G	Information Processing Systems in	
	Organisations	2
18.774G	Applied Stochastic Processes	2
18.775G	Networks and Graphs	2
18.776G	Production and Inventory Control	2
18.777G	Time Series and Forecasting	2
18.778G	Scheduling and Sequencing	2
18.779G	Game Theory	2
18.862G	Linear Programming	2
18.863G	Non-Linear Programming	2
18.871G	Mathematics for Operations	
	Research	2
18.874G	Dynamic Programming	2
18.875G	Geometric Programming	2
18.876G	Advanced Mathematics for	•
	Operations Research	2
18.877G	Large-scale Optimisation	2
18.878G	Industrial Applications of	_
	Mathematical Programming	2
18.879G	Mathematical Programming Analysis	3
18.960G	Advanced Table in Draduation	0
18.96/G	Advanced Topic in Production	•
10.0000	Engineering Advanced Tenio in Braduction	2
10.900G	Advanced Topic in Production	
19 0600	Advanced Topic in Braduction	2
10.909G	Engineering	2
19 0700	Charations Passarah Saminar	2
19.9700	Advanced Topic in Operations	0
10.3770	Research	2
18 0780	Advanced Topic in Operations	4
10.3700	Research	2
18 9790	Advanced Topic in Operations	2
10.0700	Research	2
18,9096	Project	ā
18 9180	Research Project	18
118.936G	Research Project	36
0		
Candidates 1	taking their Project in Operations Research are	generali

Credits

Candidates taking their Project in Operations Research are generally required to take 18.571G, 18.574G, 18.871G and 14.062G Accounting for Engineers.

*Candidates with a Project in Production Engineering are generally required to take at least two-thirds of the formal credits from these subjects.

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

School of Nuclear Engineering

Head of School Professor J. J. Thompson

Each subje	ect counts as three credits.		
23.013G	Neutron Transport and Diffusion		
23.014G	Fewgroup Reactor Theories		
23.015G	Multigroup Reactor Theories		
23.016G	Neutron Kinetics and Reactor Dynam	lics	
23.023G	Reactor Thermal Performance		
23.024G	Boiling and Two Phase Flow		
23.025G	Reactor Structural Mechanics		
23.026G	Reactor Systems Analysis		
23.027G	Boiling Reactor Dynamics		
23.028G	Reactor Accident and Safety Analysis	8	
23.032G	Mathematics Analysis and Computati	ion	
23.033G	Matrix Theory and Computation		
23.034G	Random Processes and Reactor Nois	se	
23.042G	Nuclear Fuel and Energy Cycles		
23.043G	Nuclear Power Costing and Economi	cs	
23.044G	Nuclear Engineering Optimization		
23.045G	Uranium Enrichment Technology		
23.909G	Project	9	credits
23.918G	Research Project	18	credits
23.936G	Research Project	36	credits

School of Surveying

		Credits
29.106G	Special Topic A	3
29.107G	Special Topic B	3
29.154G	Adjustment of Observations	6
29.163G	Mathematical Methods 1	
	Numerical Analysis	3
29.164G	Mathematical Methods 2	
	Statistics of Observations	3
29.165G	Mathematical Methods 3	
	Ellipsoidal Harmonics	3
29.215G	Geometrical Geodesy	3
29.216G	Geodetic Surveying	3
29.223G	Dynamic Geodesy	3
29.224G	Physical Geodesy	6
29.314G	Geodetic Astronomy	6
29.516G	Mathematical Model of the Imaging	
	Process	3
29.517G	Stereophotogrammetry	3
29.518G	Analytical Photogrammetric Orientation	3
29.519G	Photogrammetric Instrumentation	3
29.520G	Photogrammetric Production	
	Processes	3
29.521G	Control Extension A	3
29.522G	Control Extension B	3
29.909G	Project	9
29.918G	Research Project	18
29.936G	Research Project	36

School of Transport and Highways

Head of School Professor W, R. Blunden

		Creat
24.001G	Human Factors in Transport	3
24.002G	Transport, Environment, Community	6
24.003G	Theory of Land Use/	
	Transport Interaction	3
24.004G	Local Area Transport Planning	3
24.005G	Urban Transport Planning Practice	3
24.006G	Regional Transport Planning	3
24.007G	Transport System Design (Non-Urban)	3
24.008G	Transport System Design (Urban)	3
24.009G	Interchange Design	3
24.010G	Highway Engineering Practice Part 1	3
24.011G	Highway Engineering Practice Part 2	3
24.012G	Economics for Transport Studies	3
24.013G	Transport Economics	3
24.014G	Transport Systems Part 1	3
24.015G	Transport Systems Part 2	3
24.016G	Traffic Engineering	6
24.017G	Transport and Traffic Flow Theory	6
24.018G	Statistics for Transport Studies Part 1	3
24.019G	Statistics for Transport Studies Part 2	3
24.020G	Mathematical Techniques for	
	Transport Studies	3
24.021G	Law and Administration	3
24.022G	Pavement Materials 1	3
24.023G	Pavement Materials 2	3
24.024G	Pavement Design and Evaluation 1	3
24.025G	Pavement Design and Evaluation 2	3
24.026G	Bridges and Highway Structure	
	Part 1	3
24.027G	Bridges and Highway Structure	
	Part 2	3
24.028G	Transport and Highways Elective	3
24.909G	Project	9
24.918G	Research Project	18
24.936G	Research Project	36
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Graduate Diplomas in Engineering

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

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

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

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

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

School of 6.457G	Electrical Engineering Cybernetic Engineering	Credits 3
6.481G	Biology and Physiology for Engineers	3
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
1 4.0 42G	Industrial Law	2
14.062G	Accounting for Engineers	3
School of	Transport and Highways	
24.101G	Characteristics of Transport	6
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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 1	7
24.110G	Road Location and Design Part 2	7
24.111G	Road Construction	6
24.112G	Highway Materials	6
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Division of Postgraduate Extension Studies* Human Communication

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

97.001G	Linguistics and Written and Spoken	
	Communication	2
97.002G	Basic Information Theory	6
97.004G	Psychology of Communication	3
97.005G	Audio and Video Equipment	
	Capabilities and Applications	4
97.007G	Audio Video Signals in	
	Communication	3
97.008G†	Body in Communication	2
97.012G	Project	5
97.013G	Presentation of Information	3
97.010G	Basic Fortran	2

+Half-session only.

Subjects offered by Tape Correspondence

5.075G	Computational Methods in Mechanical	
	Engineering, Part 1	2
5.076G	Computational Methods in Mechanical	
	Engineering, Part 2	2
6.373G	Semiconductor Devices	3
6.376G	Reliability Engineering	з
6.377G	Integrated Circuit Design	3
6.378G	Solar Energy Conversion	3
6.490G	Using Microprocessors in Real-time	
	Applications	2
8.708G	Finite Element Methods in Civil	
	Engineering	3
97.010G	Basic Fortran	2
97 031G	Linguistics, and Written and Spoken	-
	Communication	1
97 032G	Basic Information Theory	i
97 034G	Psychology of Communication	2
97 0350	Audio Video Equipment	5
07.0276	Audio Video Signale in	-
37.037 a	Communication	ंग
07 0290	Body in Communication	-
97.0300	Body in Communication	
97.043G	Presentation of Information	1
97.345G	Active and Adaptive Circuits for	~
	Integrated Systems	3

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

4.102G	Fundamentals of	
	Transport Economics	

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Projects and Research Projects -**Research Areas by School**

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

Civil Engineering

Engineering Construction and Management

Construction techniques. Equipment selection.

Field studies of spatial layout, material flow, and construction operations.

Micro, macro, and system structure of construction operations.

Civil Engineering Management.

Critical path methods, and operations research methods in engineering construction.

Information flow requirements and decision processes of office and field agents.

Engineering Materials

Application of finite element techniques to analysis of raft foundations, pile foundations, layered soils, and rigid retaining structures.

Structure - foundation Interaction analysis for space frames supported on a raft foundation.

Stabilization of acidic soils.

Deformation and failure of soil under three dimensional stress state (experimental).

Influence of 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.

Hydrology

Flood estimation. Yield and reservoir studies. Hydrological instrumentation and data collection. Mathematical rainfall - runoff models. Stochastic hydrology. Hydrometeorology.

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. Eiltration.

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.

Water Resources Engineering

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

Electrical Engineering

Communications

Communication theory including system theory. Digital systems. Digital filters. Active and adaptive circuits. Microwaves, antennas and wavequides, Lasers and optical systems. Wave propagation in anisotropic and non-linear media. Solid state devices including surface elastic wave devices. Acoustics, including psychoacoustics. Electronic music.

Systems and Control

Analysis and design of non-linear systems.

Structural problems in identification, especially feedback problems.

Numerical methods of optimization including large scale systems.

Deterministic and stochastic control, self tuning regulators.

Cybernetics.

Computer aided design including linear and non-linear simulations, MIMO frequency domain design.

Biological signal analysis and system modelling.

Application of the above ideas including: control of a cement kiln; boiler identification and control; reactor boiling channel identification; quality control of eggs; fermentation process control; computer control and instrumentation; micro-processors; renal dialysis.

Electric Power

The stability, dynamics and control of electric power systems.

Instrumentation and protection in power systems. Power system security and on-line security analysis,

Applications of field theory.

Applications of field theory.

Electrical measurements.

Superconductivity.

Electrical machines and thyristor control schemes. Special Electrical machines.

High voltage and heavy current phenomena.

Electrical discharges and their uses.

Insulation research including partial discharges. Data acquisition and transmission and switching control in power systems.

Computer Science

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

Solid State Electronics

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

Mechanical and Industrial Engineering

Agricultural Engineering

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

Applied Mechanics

Biomechanics. Mechanics of solids, stress analysis. Impact mechanics. Adaptive control systems. Process stimulation and control. Spatial mechanisms. Dynamics of machines. Multi-mode vibrations. Lubrication and wear. Computer aided design. Plastic deformation.

Fluid Mechanics/Thermodynamics — Including Aeronautical Engineering and Naval Architecture

Two-phase flow with and without heat transfer. Slurries. Hydraulic transients. Hydrodynamics, water hammer. Fluidics. Conduction, convection and radiation, Natural convection. Refrigeration and air conditioning. Energy conversion and conservation. Solar energy and systems. Engine performance and emissions. Gas dynamics. Transonic flow. Shock waves. Jets, turbulent mixing. Noise. Light aircraft design and performance. Development of a ship structure optimization system. Analysis and design of plated grillages. Vortex shedding in aeronautical and maritime engineerina. Economic studies relative to ship industry.

Hydrodynamics of planning surfaces.

Industrial Engineering — including Operations Research and Production Engineering

Engineering economic analysis. Efficiency of production lines. Optimum length of bars. Application of probability theory in the allocation of engineering tolerance. Computer generation of timetables. Job shop scheduling. Least-cost tolerance. Optimum reject allowance. Optimum reject allowance. Optimum reduction. 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, identation, compression, rolling, drawing. Performance of single and multipoint cutting tools including tool life and economics of machining. Properties of materials at high rates of strain. Materials handling studies. Factory design and location studies. Plant layout by computer. Ergonomics. Social psychology in industry. Production design studies. Engineering design analysis and tolerance technology. Metrology studies. Group technology studies.

Nuclear Engineering

Neutron transport and diffusion theory.

Thermal and thermo-mechanical analysis of reactor components.

Nuclear reactor noise theory and analysis.

Reactor channel hydrodynamics.

Boiling and two-phase flow.

Nuclear reactor dynamics, stability and control.

Numerical methods for reactor analysis and simulation. Nuclear power planning and reactor strategy.

Optimization and optimal control in nuclear engineering. Structural mechanics in reactor technology.

Laser-plasma interaction.

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.

Geodesy

Satellite geodesy, precise orbit determinations, satellite altimetry analysis.

Physical geodesy, geoid and gravimetric studies, Earth models.

Remote sensing ocean dynamics from satellites, sea surface topography, unification of vertical datums.

Applications of lunar laser ranging and very long baseline interferometry in polor 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.

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.

Terrestial photogrammetry.

Precise Surveying

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

Transport and Highways

The testing of aggregates.

The properties of pavement materials subjected to repeated loading.

The surface texture of aggregates.

The stability of bituminous mixes.

Engineering

The testing of full scale pavement systems. The effects of porosity on the properties of rocks and road making aggregates. Investigations of the geometric shape of the road alignment on the driver's view of the road. Study of road alignment design in three dimensions. Problems of land use and transport interaction. Theories of traffic structure and flow. Measurements, planning and control of traffic. Transport systems analysis. Investigation of human factors. Economic evaluation of transport investments. Transport planning — urban systems. Investigations into transport economics and policy. Design of information systems. Graduate Study

Conditions for the Award of Higher Degrees

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

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

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

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

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

Title	Abbreviation	Calendar/Handbook	
Doctor of Science	DSc	Calendar	Higher Degrees
Doctor of Letters	DLitt	Calendar	
Doctor of Laws	LLD	Calendar	
Doctor of Medicine in the Faculty of Medicine	MD	Calendar Medicine	
Doctor of Philosophy	PhD	Calendar and all faculties	
Master of Applied Science	MAppSc	Applied Science	
Master of Architecture	MArch	Architecture	

Higher Degrees

Engineering

Title	Abbreviation	Calendar/Handbook
Master of Arts	MA(Hons)	Arts Military Studies
	ма	Arts Military Studies
Master of Biomedical Engineering	MBiomedE	Engineering
Master of Building	MBuild	Architecture
Master of Business Administration	MBA	AGSM
Master of Chemistry	MChem	Sciences*
Master of Commerce (Honours)	MCom(Hons)	Commerce
Master of Commerce	MCom	Commerce
Master of Counselling (Education)	MCouns(Ed)	Professional Studies
Master of Education	MEd	Professional Studies
Master of Educational Administration	MEdAdmin	Professional Studies
Master of Engineering Master of Engineering without Supervision	ME	Applied Science Engineering Military Studies
Master of Engineering Science	MEngSc	Engineering Military Studies
Master of General Studies	MGenStud	General Studies
Master of Health Administration	MHA	Professional Studies
Master of Health Personnel Education	MHPEd	Calendar
Master of Health Planning	MHP	Professional Studies
Master of Landscape Architecture	MLArch	Architecture
Master of Laws by Research	LLM	Law
Master of Librarianship	MLib	Professional Studies
Master of Mathematics	MMath	Sciences*
Master of Optometry	MOptom	Sciences*
Master of Psychology	MPsychol	Sciences‡
Master of Public Administration	MPA	AGSM
Master of Science Master of Science without Supervision	MSc	Applied Science Architecture Engineering Medicine Military Studies Sciences*‡
Master of Science (Acoustics)	MSc(Acoustics)	Architecture

MScSoc

MSW

MStats

MS

MSc(Biotech) MSc(Building)

- Sciences*
- Sciences‡
- Architecture
- **Professional Studies**
- Sciences*
- Medicine

Master of Science (Acoustics)
Master of Science and Society
Master of Science (Biotechnology)
Master of Science (Building)
Master of Social Work
Master of Statistics
Master of Surgery

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Title	Abbreviation	Calendar/Handbook	
Master of Surveying Master of Surveying without Supervision	MSurv	Engineering	
Master of Surveying Science	MSurvSc	Engineering	
Master of Town Planning	MTP	Architecture	
Graduate Diploma	GradDip	Applied Science Architecture	Graduate Diplomas
		Engineering Sciences*+	
Graduate Diploma in the Faculty of Professional Studies	DipArchivAdmin DipEd DipLib	Professional Studies	
*Faculty of Science. ‡Faculty of Biological Sciences.			
1. The degree of Doctor of Philosophy n mendation of the Professorial Board to significant contribution to knowledge and	nay be granted by t a candidate who h who has satisfied t	he Council on the recom- as made an original and he following requirements:	Doctor of Philosophy (PhD)
2. A candidate for registration for the d	egree of Doctor of	Philosophy shall:	Qualifications
(1) hold an honours degree from the U	niversity of New Sou	uth Wales; or	
(2) hold an honours degree of equivalent	standing from anoth	ner approved university; or	
(3) if he holds a degree without honour other approved university, have achiever recognized by the appropriate Faculty or	s from the University d by subsequent wo Board of Studies as	y of New South Wales or ork and study a standard equivalent to honours; or	
(4) in exceptional cases, submit such qualifications as may be approved by the the Faculty or Board of Studies.	other evidence of Professorial Board	general and professional on the recommendation of	
3. When the Faculty or Board of Studies is not satisfied with the qualifications submitted by a candidate, the Faculty or Board of Studies may require him, before he is permitted to register, to undergo such examination or carry out such work as the Faculty or Board of Studies may prescribe.			
4. A candidate for registration for a course of study leading to the degree of Doctor of Philosophy shall:			Registration
(1) apply to the Registrar on the prescri the commencement of the session in which	bed form at least or the desires to registe	ne calendar month before er; and	
(2) submit with his application a certifict which he proposes to study stating that course of study and research leading to the school is willing to undertake the in candidate and of reporting to the Faculty on the merits of the candidate's performan	ate from the head o the candidate is a the degree of Docta responsibility of sup or Board of Studies ce in the prescribed of	f the University school in fit person to undertake a or of Philosophy and that ervising the work of the at the end of the course course.	

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

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

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

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

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

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

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

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

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

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

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

10. A candidate may be required by the Faculty of Board of Studies to attend a formal course of study appropriate to his work.
11. On completing his course of study every candidate must submit a thesis which Thesis complies with the following requirements:

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

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

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

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

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

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

The abstract shall indicate:

(1) the problem investigated;

(2) the procedures followed;

(3) the general results obtained;

(4) the major conclusions reached;

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

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

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

16. Four copies of the thesis shall be submitted together with a certificate from the supervisor that the candidate has completed the course of study prescribed in his case. The four copies of the thesis shall be presented in a form which complies with the requirements of the University for the preparation and submission of higher degree theses.* The candidate may also submit any work he has published whether or not such work is related to the thesis.

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

18. There shall normally be three examiners of the thesis, appointed by the Professorial Board on the recommendation of the Faculty or Board of Studies, at least one of whom shall be an external examiner.

19. After examining the thesis the examiners may:

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

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

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

*See Conditions for the Award of Degrees in the Calendar.

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

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

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

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

Master of Blomedical Engineering (MBiomedE)	 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 com- pleted an approved program of advanced study.
Qualifications	 (1) An applicant for registration for the degree shall have been admitted to an appropriate Bachelor degree in the University of New South Wales or other University or tertiary institution at a standard acceptable to the Committee. (2) In exceptional cases an applicant may be registered as a candidate for the degree if he submits evidence of such academic and professional attainments as may be approved by the Committee.
	(3) Notwithstanding any other provisions of these conditions, the Committee may require an applicant to demonstrate fitness for registration by completing a qualifying program as determined by the Committee.
Registration	3. (1) An application to register as a candidate for the degree shall be made on the prescribed form which shall be lodged with the Registrar two months before commencement of the session in which the candidate desires to commence.
	 (2) An approved candidate shall register in one of the following categories: (a) student in full-time attendance at the University; (b) student in part-time attendance at the University.
	(3) A candidate for the degree shall be required to undertake such formal courses of study and pass such examinations as may be prescribed by the Committee and shall undertake a specified research project, the satisfactory completion of which shall be regarded as part of the examination.
	(4) The progress of a candidate shall be reviewed at least once annually by the Com- mittee 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.

Recommendation for Admission to Degree

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

Fees

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

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

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

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

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

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

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

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

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

(c) student working externally to the University.

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

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

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

Master of Engineering (ME)

Qualifications

Registration

Thesis

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

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

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

Recommendation for Admission to Degree

Fees

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

or not the candidate should be admitted to the degree.

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.

- Registration 3. (1) An application to register for the degree shall be made on the prescribed form which shall be lodged with the Registrar at least two full calendar months before the commencement of the course.
 - (2) An approved candidate shall register in one of the following categories:
 - (a) student in full-time attendance at the University;
 - (b) student in part-time attendance at the University.
 - (3) A candidate for the degree shall

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

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

(c) complete an approved combination of the above.

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

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

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

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

(8) No full-time candidate shall be considered for the award of the degree until the lapse of two sessions from the date from which registration becomes effective. No parttime candidate shall be considered for the award of the degree until the lapse of foursessions 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 Fees by the Council.

Thesis/Project

Recommendation for Admission to Degree

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- 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 betore the commencement of the session in which the candidate desires to register.

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

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

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

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

(6) Unless otherwise recommended by the Committee, no candidate shall be awarded the degree until the lapse of four complete sessions from the date of registration, save that the case of a candidate who obtained the degree of Bachelor with Honours or who has had previous research experience, this period may be reduced by up to two sessions with the approval of the Committee. A candidate who is fully engaged in research for the degree shall present himself for examination not later than six academic sessions from the date of registration. A candidate not fully engaged in research shall present himself for examination not later than twelve academic sessions from the date of his registration. In special cases an extension of these times may be granted by the Committee. 4. (1) A candidate for the degree shall be required to submit three copies of the thesis referred to in paragraph 3. (4) which shall be presented in a form which complies with the requirements of the University for the preparation and submission of higher degree theses. The candidate may submit also for examination any work he has published whether or not such work is related to the thesis.

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

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

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

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

 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.

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

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

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

(2) For each candidate there shall be at least two examiners appointed by the Professorial Board on the recommendation of the Committee, one of whom shall be an internal examiner. Master of Science (MSc) Master of Engineering (ME) Master of Surveying (MSurv) Without Supervision

Recommendation for

Admission to Degree

Fees

Qualifications

Registration

Thesis

Thesis

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

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

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

Fees

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

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

Qualifications

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

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

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

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

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

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

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

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

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

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

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

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

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

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

Thesis

Recommendation for Admission to Degree

Fees

Graduate Diploma

Graduate Diploma (GradDip)

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.

An applicant for admission to a graduate diploma course shall be:
 a graduate of the University of New South Wales or other approved university.
 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;

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

4. Graduate subjects are indicated by the suffix G.

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

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

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

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

Information Key

The following is the key to the information supplied about each subject listed below: S1 (Session 1); S2 (Session 2); F (Session 1 *plus* Session 2, 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 HSC Examination.

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

	School, Department etc *Subjects also offered for cour	Faculty	Page
			<u> </u>
1	School of Physics*	Science	115
2	School of Chemistry*	Science	76
3	School of Chemical Engineering*	Applied Science	76
4	School of Metallurgy*	Applied Science	113
5	School of Mechanical and Industrial Engineering	Engineering	100
6	School of Electrical Engineering	Engineering	88
7	School of Mining Engineering	Applied Science	
8	School of Civil		
_	Engineering	Engineering	77
9	School of Wool and Pastoral Sciences	Applied Science	
10	School of Mathematics*	Science	99
11	School of Architecture	Architecture	
12	School of Psychology	Biological Sciences	
13	School of Textile Technology	Applied Science	
14	School of Accountancy*	Commerce	76
15	School of Economics*	Commerce	88
16	School of Health Administration	Professional Studies	
17	Biological Sciences	Biological Sciences	
18	School of Mechanical and Industrial Engineering (Industrial Engineering)	Engineering	108
21	Department of Industrial Arts	Architecture	
22	School of Chemical Technology	Applied Science	
23	School of Nuclear Engineering	Engineering	114
24	School of Transport and Highways	Engineering	124
25	School of Applied Geology	Applied Science	
26	Department of General Studies	Board of Studies in General Education	
27	School of Geography*	Applied Science	99
28	School of Marketing	Commerce	
29	School of Surveying	Engineering	117
30	Department of Organizational Behaviour**	Commerce	
31	School of Optometry*	Science	
35	School of Building	Architecture	
36	School of Town Planning*	Architecture	124
37	School of Landscape Architecture	Architecture	

	School, Department etc	Faculty	Page
	*Subjects also offered for cou	rses in this handbook.	
38	School of Food	Applied Science	
39	Graduate School of the Built Environment	Architecture	
40	Professorial Board		
41	School of Biochamistry	Biological Sciences	
42	School of Biological Technology	Biological Sciences	
43	School of Botany	Biological Sciences	
44	School of Microbiology	Biological Sciences	
45	School of Zoology	Biological Sciences	
50	School of English	Arts	
51	School of History	Arts	
52	School of Philosophy	Arts	
53	School of Sociology	Arts	
54	School of Political Science	Arts	
55	School of Librarianship	Professional Studies	
56	School of French	Arts	
57	School of Drama	Arts	
58	School of Education	Professional Studies	
59	School of Russian	Arts	
62	School of History and Philosophy of Science	Arts	
63	School of Social Work	Professional Studies	
64	School of German	Arts	
65	School of Spanish and Latin American Studies	Arts	
66	Subjects Available from Other Universities		
68	Board of Studies in Science and Mathematics	Board of Studies in Science and Mathematics	
70	School of Anatomy	Medicine	
71	School of Medicine	Medicine	
72	School of Pathology	Medicine	
73	School of Physiology and Pharmacology	Medicine	
74	School of Surgery	Medicine	
75	School of Obstetrics and Gynaecology	Medicine	
76	School of Paediatrics	Medicine	
77	School of Psychiatry	Medicine	
79	School of Community Medicine	Medicine	
80	Faculty of Medicine	Medicine	
8 5	Australian Graduate School of Management	AGSM	
90 97	Faculty of Law Division of Postgraduate Extension Studies	Law	87

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

Accountancy

Undergraduate Study

14.001 Introduction to Accounting A S1 L11/2 T0

An introduction for non-commerce students to the nature, purpose and conceptual foundation of accounting. Information systems including accounting applications. Analysis and use of accounting reports.

14.002 Introduction to Accounting B S2 L1 ½ T0

Prerequisite: 14.001.

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

Chemical Engineering

Undergraduate Study

3.302 Fuels and Energy

A servicing subject for students in Electrical Engineering which deals with sources and properties of fuels (with particular emphasis on coal, crude oil and natural gas), principles of combustion including combustion calculations and the technology of bollers and other fuel plant. A variety of alternative energy sources and review of the national and global energy situation.

Chemistry

Undergraduate Study

2.111 Introduction Chemistry

Prerequisite: None.

Classification of matter and the language of chemistry. The gas laws and the Ideal Gas Equation, gas mixtures and partial pressure. The structure of atoms, cations and anions, chemical bonding, properties of ionic and covalent compounds. The Periodic classification of elements, oxides, hy-

S1 L2T4

drides, 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
Prereau	isites:	
		HSC Exam
		Percentile
		Range Required
2 unit S	cience (any strands)	31-100
or		
4 unit S	cience (multistrand)	31-100

Stoichiometry and solution stoichiometry. Structure of matter, solids, liquids, gases. Thermochemistry. Equilibria and equilibrium constants, entropy changes, free energy changes, the relationship between equilibrium and standard free energy changes. Ideal solutions, colligative properties. Equilibrium in electrolyte solutions, acid-base equilibria, solubility equilibria and redox equilibria. The rate of a chemical change and chemical kinetics.

2.131 Chemistry IB Prerequisite: 2.111 or 2.121.

S1 or S2 L2T4

Relative stability of oxidation states. Electronic structure of atoms in terms of the quantum mechanical model. Structure of the Periodic Table and its relationship to electronic configuration. Chemical bonding, hybridization. Properties of compounds of selected elements, acid-base character of oxides and hydroxy compounds. Chemistry of carbon compounds, stereoisomerism, reactions of aliphatic and aromatic hydrocarbons, alcohols, phenols, ethers, alkyl halides, aldehydes, ketones, carboxylic acids and their derivatives, esters.

2.021 Chemistry IE

acyl halides, anhydrides, amides, amines.

S1 or S2 L3T3

A terminating subject for students in the Aeronautical, Civil, Electrical, Industrial, Mechanical and Mining Engineering, and Naval Architecture courses.

Classification of matter and theories of the structure of matter. Atomic and molecular structure, the periodic table and chemical behaviour. Chemical bonding and the nature and properties of chemical systems. Equilibrium and energy changes in chemical systems. Introduction to colloidal systems.

2.951 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

Classification of matter and theories of the structure of matter. Atomic structure and the properties of compounds. Chemical change and energy concepts. Equilibrium and energy changes. Ionic equilibria. Introduction to colloidal systems.

Civil Engineering

Undergraduate Study

8.001 Industrial Training

Prerequisite: 8.670. Requirement for the Bachelor of Engineering degree.

Students are required to complete a minimum of sixty working days of approved industrial training and submit a report on this training prior to enrolment in the final year.

8.002 Industriaj 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 SS L0T3

Equal to one technical elective.

A minor thesis or research project on any approved topic.

8.012 Elements of Architecture SS L2T1

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

8.013 Bridge Engineering

SS L112 T112

Prereguisite: 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 SS L2T1

Prerequisite: 8.273, Co-requisite: 8.191.

Revision of fundamentals of FORTRAN; programming and some advanced techniques such as the use of tapes, discs, etc, and plotting. Development of some numerical techniques such as finite element method for programming. Applications to problems in structural analysis and geomechanics.

8.015 Road Engineering

SS L2T1

Prerequisites: 8.272, 8.671.

Design of roads in urban and rural areas. Properties of asphalts and bitumens. Base course materials. Pavement design. Skid resistance. Performance evaluation.

8.016 Hydraulics

SS L2T1

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 SS L2T1

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 SS L2T1

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 SS L2T1

Track geometry. Traffic systems. Design of rail beds. Properties of ballast and track materials. Design project. Railway development. Maintenance planning.

8.020 Hydrology

SS L2T1

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

SSL2T1

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 proceedures 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; Φ and ψ functions, Laplace equation, standard flow patterns; practical applications.

8.024 Foundation and Dam Engineering SS L2T1

Prereguisite: 8.273.

Foundations of structures and dams. Problems. Alternative foundation types. Treatment of foundation soils. Piling and grouting. Consolidation and drainage. Allowable settlement of structures. Settlement calculations. Design of earth and rock fill dams. Stability during construction and drawdown. Case studies of dam failures. Piping. Erosion.

8.025 Structural Failures SS L2T1

Preregulsites: 8.174, 8.182.

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

8.026 Systems Methods in Civil Engineering SS L2T1

Prerequisite: 8,672.

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

8.027 New Materials I SS L2T1

Preregulaite: 8.272. Co-regulaite: 8.273.

History and development of polymers. Structure of polymeric materials. Properties and applications of thermoplastics and thermosels. Reinforced plastics; Fabrication. Structural Analysis and application to the design of FRP structures. Building adhesives, epoxies and ceramic wall tile fixing. Modified concrete, polymer concrete and glass fibre reinforced cement.

8.028 New Materials II SS L2T1

Prereguisites: 8.273, 8.182.

Theory and application of fibre reinforcements — glass and steel fibre reinforced cements, mortars and concrete composites. Shrinkage compensated and expansive cements applications. Utilization of blast-furnace slag. Special aggregates and high strength concretes. New techniques of testing and removing concrete and reinforced concrete structures.

8.029 Continuum Mechanics

Prerequisite: 8.172.

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

8.030 Construction Management SS L2T1

Co-requisite: 8.672.

Civil Engineering Construction organization, management and control.

8.031 Construction Project Finance SS L2T1

Co-requisite: 8.672.

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

8.032 Law for Builders SS L2T1

Co-requisite: 8.672.

Introduction to the law, including brief outline of sources of law in New South Wales and the System of judicial precedent. General principles of law of contract. Some special forms of building contract.

8.033 Industrial Law and Arbitration SS L2T1

Prerequisites: 8.672, 8.032

Introduction to industrial law, including reference to Commonwealth and State statutory provisions dealing with conciliation and arbitration, State and Commonwealth awards, Industrial disputes. Employers' association. Trade unions. Introduction to real property and local government law.

8.034 Engineering Economy SS L2T1

Prerequisite: 8.672.

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

8.038 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

Introduction to structural geology rock types. Macro and Micro characteristics base studies. Fabric analysis. Defects in rocks. Representation of defects. Schmidt diagrams. Laboratory studies.

8.041 Geological Engineering

Prerequisite: 8.272.

SS L2T1

Site investigations. Techniques. Mechanical properties of rocks. Laboratory testing of rocks. Schmidt projections applied to slope stability. Flow of water in rock masses. Underground and open excavations. Rock blasting.

SS L2T1

8.042 Water Resources

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

8.043 Public Health Engineering SS L2T1

Prerequisite: 8.581.

Water collection, transmission and distribution systems. Sewage collection and effluent disposal. Design of sewage treatment and water treatment processes. Principles of advanced wastewater treatment. Swimming pools. Refuse collection and disposal.

8.047 History of Civil Engineering SS L2T1

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

8.051 Design Project - Materials

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

8.052 Design Project --- Structures

Prereguisite: 8,191*

Final year design project in the field of structural engineering.

8.053 Design Project - Water

Prerequisites: 8.573, 8.582.

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

8.054 Design Project — Engineering Construction Prerequisite: 8.672.

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

8.055 Applied Structural Analysis SS L2T1

Prerequisite: 8.191*

Practical applications of methods of structural analysis both for a small design office (with programmable calculator) and a design office of moderate or large size (with minicomputer, 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.

SS L2T1

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 88 L2T1

Prerequisite: 8.174,

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

8.060 Numerical Methods in Geotechnology SS L2T1

Prerequisite: 8.272.

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

8.113 Civil Engineering for Electrical Engineers

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

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

8.170 Statics

SS L2T2

S1 L2T2

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

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

8.171 Mechanics of Solids I

SS L112712

Prerequisite: 8.170.

Concepts of stress, strain. Stress and deformation due to axial force; linear and non-linear problems; compound bars. Concepts of stiffness and flexibility. Bending moment and shear force in simple beams. First and second moments of area. Stress and deformation due to bending; linear and non-linear problems; use of step functions.

8.172 Mechanics of Solids II SS L2T2

Prerequisite: 8.171.

Structural statics. Bending moments, shear force and torsion. Stresses due to shear force in solid and thin-walled sections; shear centre. Torsion of circular, non-circular and thin-walled sections. Principal stresses and strains; yield criteria. Combined stresses. Concepts of instability.

8.173 Structural Analysis I SS L2T1

Prerequisite: 8.172.

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

8.174 Structural Analysis II SS L2T1

Prerequisite: 8.173.

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

8.181 Structural Design I FL1T11/2

Prerequisite: 8.171.

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

8.182 Structural Design II FL1T2

Prerequisites: 8.172, 8.181.

Extension of the fundamental concepts developed in Structural Design I to the behaviour and design of more advanced members and structures. Further consideration of safety and design loads including wind and earthquake loading. Some reference to codes of practice, concentraling 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.

8.191 Structural Engineering SS L11/2 T1 1/2

Prerequisites: 8.174*, 8.182*.

 Variational theorems applied to rigid frames; non linear analysis; dynamic analysis. Plastic analysis of steel structures. Brief treatment of finite element methods, cable structures, arches, plates and shells.

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

8.259 Properties of Materials

FL1T2

Mechanical behaviour of materials. Response to static loading in tension, compression, shear and bending. Use of static test data in analysis and design; variability of material properties; factors of safety. Hardness tests. Creep in solid materials. Response to dynamic loading; fatigue; impact. Deterioration of engineering materials. Rheological classification of materials. Structure and properties of binary alloys; control of structure and properties, commercial alloys, materials selection.

8.271 Introduction to Materials

SS L2T0

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

8.272 Civil Engineering Materials I F L2T2

Co-regulate: 8.271.

Solis, crystals and types of bonds. Soli mineralogy and classification. Minerals, texture and fabric in rocks, engineering significance. Mapping and site investigations. Cements, chemistry and major constituents, hydration products. Concrete, factors affecting workability and strength, effects of curing conditions. Mechanical behaviour of materials. Response to loads, static, dynamic and impact. Effects of stress state, strain rate and temperature. Interpretation of test results. Behaviour of typical materials, non-metals, metals, elastomers, plastics and glass-reinforced composites. Timber and its properties as a structural material. Structure and properties of metals and alloys. Hot and cold working. Thermal treatments. Welding, classification of processes. Characteristics of welds and weld metal. Heat-affected zones and thermal history. Quality assurance.

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

SS L1% T1%

8.273 Civil Engineering Materials !! F L1½ T1½ 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; fatiure and shear

tion; effective stress law; soil suction; failure and shear strength of soils and rocks; stress strain characteristics of soils and rocks; stability of soil masses; steady seepage; consolidation; stabilization; slope stability; earth and rockfill dams.

8.274 Civil Engineering Materials III F L11/2 T11/2

Prerequisite: 8.272. Co-requisite: 8.182.

Structural fatigue. Fracture safe design. Specification of metallic materials. Corrosion and corrosion protection. Modern steels. Structural aluminium alloys, properties, selection, applications and limitations.

Properties of concrete. Structure and composition. Rheological models of fresh concrete. Mix design. Multi-phase theory of elastic behaviour. Bond with reinforcement. Creep and drying shrinkage. Durability, physical and chemical deterioration, permeability. Non-destructive testing.

8.301 Systems Engineering

Prerequisites: 10.001, 5.0102, 8.670.

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

8.351 Engineering Mathematics SS L21/2 T21/2

Prerequisite: 10.022.

Probability and Statistics: Introduction to probability. Random variables and standard elementary distributions. Sampling distributions. Statistical Inference, hypotheses testing. Engineering applications.

Engineering Computations: Flow charts and computer programming. Error propagation. Interpolation, finite differences and regression analysis. Solution of simultaneous equations, matrix operations and eigenvalue problems. Numerical integration and solution of ordinary and partial differential equations.

8.571 Hydraulics I SS L11/2 T11/2

Fluid properties: hydrostatics, stability of floating bodies; fluid acceleration; flow patterns, continuity; Euler, Bernoulli, energy and momentum equations.

8.572 Hydraulics II

SS L1½T1½

FL1T1

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: 8.571.

Channel flow, steady non-uniform flow, backwater curves, hydraulic jump. Flow measurement. Unsteady flow in pipes and channels. Hydraulic machlnery, radial and axial flow, characteristic curves, cavitation.

8.581 Water Resources I SS L11/2 T11/2

A prior knowledge of elementary hydraulics is assumed.

Water pollution and water quality criteria. Sources of supply, collection, transmission and distribution. Quality requirements and treatment processes. Waste water collection: reticulation and pumping stations; effluent quality requirements; outline of treatment processes. Outfall structures and ocean disposal. Water reclamation.

8.582 Water Resources II SS L11/2 T11/2

A prior knowledge of elementary hydraulics is assumed.

The hydrologic cycle, water and energy balances, climatology, atmospheric moisture, precipitation, runoff cycle, infiltration, stream gauging, hydrograph analysis, storm runoff and loss rates, design storms, flood estimation, yield and storage determination, groundwater.

8.583 Water Resources III SS L1T2

Prerequisites: 8.572, 8.582.

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

8.670 Introduction to Engineering Construction SS L1T0

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

8.671 Engineering Construction

Prereguisite: 8.670.

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

8.672 Planning and Management I SS L2T2

Prerequisite: 8.671.

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

SS L2T1

8.673 Planning and Management II SS L1T2

Prerequisite: 8.672.

Fundamentals of Engineering Economy developed within a micro-economic systems framework for application by the following decision-makers: plant engineer, contractor, developer, local government engineer, and State/National engineering project managers.

8.674 Planning and Management III SS L1T2

Prerequisite: 8.672.

Project implementation, organization and control, field management techniques, industrial relations, field documentation and information flow, field change orders, risks, and delays, legal aspects, the relationship and duties between professional agents involved in projects.

8.711 Engineering for Surveyors I SS L11/2 T1 1/2

Aspects of Hydraulics: fluid properties, hydrostatics, motion of fluids, continuity, energy and momentum aspects, closed conduit flow and open channel flow. Aspects of Hydrology: Scope and applications. Hydrologic measurements, rainfall analysis, storm rainfall-runoff relations, flood estimation. Urban drainage design.

8.712 Engineering for Surveyors II SS L3T0

Municipal Engineering. Soil Mechanics: Soil forming processes; pedological classification; engineering classification; of soils; pavement design based on engineering classification; effective stress concept for saturated and unsaturated soils, sheer 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

8.112	Structures	S1 L1T2
8.250	Properties of Materials	SS L2T2

Graduate Study

8.701G Economic Decision Making in Civil Engineering

Review of practical engineering decision-making problems and relevant techniques. Engineering economics, benefit/ cost analysis, consideration of inflation and taxation in investment decisions, bidding, decision theory, microeconomic theory, objectives and criteria, multiple objective planning.

8.702G Network Methods in Civil Engineering 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

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

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

8.706G Experimental Methods in Engineering Research

Purposes of experimentation in engineering research. Design of experiments; factorial and other designs; replication. Analysis of experimental data: analysis of variance and covariance; 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, coffer-dams, ground anchors, floating plant, formwork and falsework, bridge centring, well-points and dewatering systems.

8.724G Construction Technology

C3

C3

C3

C3

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.

C8

C3

C3

8.725G Construction Accounting and Control C3

Engineering economic planning, control of labour, plant and materials. Insurances. Financial accounting. Project finance and taxation. Management accounting techniques and cost controls.

8.726G Construction Law and Professional Practice C3

Nature and sources of law, court procedures, interpretation of documents, evidence, technical opinions. Contract law. Company law. Arbitration. Duties of an engineer.

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 timelapse methods; field methods at foreman, superintendent, engineer, and project manager levels; field studies of specific construction operations.

8.748G Pavement Materials I

Properties and usage of soil and rock as pavement materials in road, rail or other construction work. Modification and evaluation of these properties; criteria for use and acceptance testing; variability and quality control: requirements of crushed rock for surfacings: use of non-standard materials in pavements: materials resources: in service conditions and their effect on materials performance.

8.749G Pavement Materials II

Properties and usage of bitumens, asphalts, tars and concrete as pavement materials in road, rail, airfield or other construction work. Rheology of bitumens: bituminous coating of aggregates and the optimization of bituminous mixtures: asphaltic concrete. Bituminous sealing practice and theory. Bituminous soil stabilization: concrete pavement mixtures, reinforcement, and placement. Concrete-bitumen mixtures. Reinforcement materials for pavements. Bituminized membranes. Quality control and performance of bituminous and concrete pavement materials.

8.750G Pavement Design and Evaluation I C3

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

8.751G Pavement Design and Evaluation II C3

Evaluation of pavement condition. Pavement instrumentation. Types of pavement distress, their origins and remedy. Roughness and skid resistance. Environmental influences and effects. Pavement maintenance for flexible and rigid pavements. Overlays. Special Maintenance requirements for airfields and railtracks. Maintenance scheduling. Systems design for rigid and flexible pavements for optimization of cost-benefit.

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

Soil pedology, fabric studies. Soil stabilization with cement, lime, bitumen and others. Grouting. Special techniques of piling. Soil anchors, slurry trench design. Freezing and thermal soil treatments. Vacuum and Electro osmotic dewatering. Advanced techniques for the in site measurement of soil properties. Variability of safety factors.

8.754G Applied Soil Mechanics

C3

C3

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

8.755G Materials of Construction (Concrete Technology) 1 C3

Concrete as a structural material. Basic Structure; strength, microcracking and failure mechanisms; significance of tests and relation to design requirements. Variability, target strength, code and special criteria for acceptance and rejection of concrete. Non-destructive testing. Accelerated curing and special high-strength concretes for column and prestressed construction. Recent developments in constituent materials, special cements and admixtures. Workability, mix design theories and practical applications.

8.756G Materials of Construction (Metals and Plastics)

Metals: Use of metals as structural materials. Specification, Structural aluminium alloys, Modern Steels. Philosophy of materials selection; properties, applications, limitations. Behaviour under mechanical loading. Effects of environment. Corrosion and corrosion protection. Plastics: Nature, mechanical and physical properties. Use of plastics in construction.

8.758G Soli 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 stressstrain 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

Finite element analysis of rock mechanics problems. Failure theories. Creep and fracture. Influence of joints on strength and deformation of rock masses. Rock slope engineering. Tunnelling in rock.

8.760G Materials of Construction (Concrete Technology) I

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

8.764G Composites in Civil Engineering C3

History; relationship between structure and mechanical and physical properties. Elastomers, adhesives, reinforced plastics, natural composites. Applications and case studies.

8.766G Welding in Structural Engineering C3

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

8.771G Foundation Engineering C6

A specialized study of theoretical and practical aspects of geotechnical engineering directly relevant to the analysis and design of foundation systems. The primary object of the course is to establish the state-of-art with particular emphasis on the application of recent theoretical developments to foundation engineering, including piles, 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

Rock stability investigations, mapping of exposed structures, in-site strength and deformation measurements. Drilling techniques, logging and representation of engineering geological information. Photogrammetric mapping and techniques. Classification of discontinuities in rock and mechanics of faulting and fracture. Strain analysis for rock masses.

8.802G Elastic Stability I

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

8.803G Elastic Stability II C3

Energy methods of formulation 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

Vibration of buildings. Earthquake and blast loading. Bridges under moving loads. Vibration effects in foundations. Generalised dynamics and Lagrange's Equations.

8.806G Prestressed Concrete I

Historical development. Methods of prestressing, Elastic analysis and design. Flexural capacity and shear capacity of prestressed elements.

8.807G Prestressed Concrete II C3

Analysis and design of statically indeterminate structures. Methods of securing continuity. Composite structures.

8.808G Prestressed Concrete III C3

Analysis and design of various prestressed concrete structures. Estimating and costing. Partial prestressing.

8.809G Reinforced Concrete I

Historical development. Methods of analysis and design, including limit state concepts. Analysis and design for bending, compression and combined bending and compression. Shear and torsion. Serviceability requirements.

8.810G Reinforced Concrete II

C3

C3

C3

Creep and shrinkage effects in concrete structures. Application of limit theorems to structural concrete. Lower bound methods of design. Analysis and design of plates and slabs. Slenderness effects in columns.

C3

C6

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C3

8.811G Reinforced Concrete III

C3

Preliminary design of concrete structures. Detailing of members and connections for strength and serviceability. Joints. Fatigue effects. Composite construction. Design of multistorey buildings. Marine structures.

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 Shelis C3

Stress and strain in thin elastic plates bent by transverse loads. Solutions of the plate equation. Applications. Stress and strain in thin plates loaded in the plane of the plate. Applications.

8.817G Experimental Structural Analysis I C3

Dimensional analysis and principles of similitude, model analysis and design of models. Instrumentation and special methods of measurement. Evaluation of data.

8.818G Bridge Design I C3

Historical development, Design philosophies. Loadings and factors of safety, Design of slab and slab-and-beam bridges; skew and stiffened-kerb bridges, multibeam bridge decks. Analysis of orthotropic plates and grid frames. Plate web girders and box girders.

8.819G Bridge Design II

C3

C3

C3

Advanced bridge design. Box girder and cable-braced bridges in steel and reinforced concrete. Orthotropic plate construction. Design of bridges by limit state methods. Serviceability requirements.

8.820G Structural Analysis and Finite Elements I

Stiffness analysis of structures. Basis of finite elements: Principle of virtual work, variational theorems, constraint equations. Effects of In-plane rigid floors and axially rigid members on the behaviour of multi-storey frames.

8.821G Structural Analysis and Finite Elements II

Variational formulation of finite elements. Plane stress and plate-bending elements. Mesh grading. Flat slabs and flat plates in building frames. Hybrid elements and shear wall analysis. Isoparametric elements, numerical integration. Finite element methods in numerical analysis.

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 C3

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

8.831G Closed Conduit Flow

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

8.832G Pipe Network and Transients

Multiple and branching pipes, energy distribution in pipe systems. Computer solution of pipe network problems Unsteady flow in pipes. Branching pipes and reflections. Effect of pumping plant behaviour.

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 It C3

Wave forces on structures, shore processes and beach erosion. Estuarine hydraulics, wave and tide models.

8.837G Hydrological Processes

СЗ

C3

Hydrologic cycle, water and energy balances, almospheric 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 method, unit hydrographs, introduction to urban drainage design, flood frequency.

8.839G Advanced Flood Estimation C3

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

8.840G Reservoir Design and Yield Determination C3

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

8.841G Hydrometeorology C3

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

8.842G Groundwater Hydrology C3

Confined and unconfined aquifers, analogue and digital models of aquifer systems, water movement in the unsaturated zone, recharge, groundwater quality, sea water intrusion.

8.843G Groundwater Hydraulics C3

Mechanics of flow in saturated porous materials, steady and unsteady flow to wells, leaky aquifers, partial penetration. multiple aquifer boundaries, delayed yield from storage, regional studies.

8.844G Soil-Water Hydrology C3

Hydrologic characteristics of unsaturated media, hysteresis, theory of infiltration, drainage and redistribution studies, laboratory and field instrumentation, applications to field problems.

8.847G 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

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, soll characteristics, field measurement of hydraulic conductivity and soil water pressure, significance of unsaturated zone, practical aspects.

8.851G Unit Operations in Public Health Engineering

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

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C6

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

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.

8.855G Water and Wastewater Analysis and Quality Requirements

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

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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

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

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

Geophysical methods, remote sensing, photointerpretation, arid-environment studies, analog models, case studies.

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97.012G	Project	S2 T5 C5
97.013G	Presentation of Information S	1 L1T2 C3
Communic media. Pr and video	cation in education. Formal education ar oduction and presentation of informatio displays.	nd the mass on by audio
97.031G	Linguistics and Written and Spoke Communication	n C1
As for 97.0	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.	005G (lectures only).	
97.037G	Audio Video Signals In Communication	C1
As for 9.0	07G (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

Revision of discrete and distributed RC synthesis as a preliminary to the discussion of active elements embedded in RC networks. The synthesis of linear active RC systems (with controlled sources, negative immittance converters, gyrators, etc), including state-space methods. Sensitivity considerations and integrated realization. Non-linear and time-variable circuits. Adaptive filters for equalization and echo cancelling. Circuit techniques for achieving reliability in integrated circuits.

conomics	
dustrial Relations	
ndergraduate Study	

15.501 Introduction to Industrial Relations

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

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

Electrical Engineering

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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

Prereguisites: 1.961 or equivalent, 6.010, 10.001.

Lumped modelling concepts used in circuit theory and their relationship to observed physical properties and behaviour. Linear circuit elements. Kirchhoffs Laws. Resistive network topology and systematic derivation of network equations using node and loop methods. Network theorems. Exponentials and first order transients. Sinusoidal steady state operation including phasors, Impedance and admittance concepts and systematic circuit equations. Power relations and second order systems response. Resonance, Q factor and bandwidth. Three phase circuits. Controlled sources and two port analysis.

8.862G Fluvial Hydraulics

C3

Unsteady and varied flow in non-uniform channels, secondary currents, sediment transport, channel morphology, scour and shealing, river control works, modelling of fluvial processes.

8.863G Estuarine Hydraulics C3

Classification of estuary types and their characteristics. Tides, their origin, prediction and effect on estuarine circulation. Entrainment and mixing process in estuaries. Salinity intrusion, tidal flushing, dispersion of pollutants. Sediment transport, channel stability.

8.901G Civil Engineering Elective I C3

A Session 1 occasional elective on a civil engineering topic, selected according to current demand and availability of local and visiting specialists.

8.902G Civil Engineering Elective II C3

A Session 2 occasional elective on a civil engineering topic, selected according to current demand and availability of local and visiting specialists.

8.909G	Project	C9
8.909G	Project	C3

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8.918G Research Project C18
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Division of Postgraduate Extension Studies

Graduate Study

97.001G Linguistics and Written and Spoken Communication S1 L2T1 C2

The broad purpose of the lectures on linguistics is to analyse the structure of English on the phonetic, phonemic, morphological and syntactical levels but in making this analysis, consideration is given to:

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

97.002G Basic Information Theory F L1T2 C6

Nature and description of information, Measurement of information flow. Information content of printed, audio and video signals. Concept and measurement of redundancy. Capacity of a channel, bandwidth and power considerations. Signals in the presence of noise and crosstalk. Applications of feedback theory to communication. Entropy and mutual information. Coding. Neurological model theories. Feedback and information flow in the human nervous system. Information storage and retrieval.

97.004G The Psychology of Communication S1

S1 L2T1 C3

The basic communication process analysed in terms of Source, Medium/Message, Respondent and Effects. A social context theory of communication relating the influence of groups, roles, social class, power, status etc on communication. Attitude change through communication. Statistics and statistical analyses in the experimental study of communication.

97.005G Audio and Video Equipment — Capabilities and Applications S2 L2T2 C4

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

97.007G Audio and Video Signals in Communication

S1 L1T2 C3

Wave-theory. Propagation through media. Studio and free space acoustics. Measurement of loudness and noise. Signal fidelity.

Light in electromagnetic spectrum. Chrominance — hue and saturation. Chromaticity diagram and colour triangle. Measurement of Illumination and brightness. Basic lighting design.

97.008G The Body in Communication S2 L1T2 C2

Vocal organs. Phonation. Formant patterns of speech. Acoustic specifications of speech. Mechanism and characteristics of the ear. Mechanism and characteristics of the eye. Sensation. Vision defects and illusions. The brain. Neurological signal transmission characteristics. Reflexaction. Organization of motor system.

97.010G Basic Fortran

FL1 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.

6.021B Introduction to Electromagnetic Energy Conversion S1 or S2 L2T2

Prerequisite: 6.021A.

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

SS L2T2

6.021C Electronics

Prerequisites: 1.982, 6.021A.

A unified treatment of the fundamental principles of bipolar and field-effect transistors and their operation in simple circuits at low frequencies and room temperature in the static approximation (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 a program expressed in the more commonly encountered, lower-level, non-algorithmic programming language FORTRAN. Computer organization: simple machine architecture; data storage devices; simple operating system concepts.

6.021E Digital Logic and Systems 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 circuitry, digital systems and PDP 11 assembler programming.

6.022 Electrical Engineering Materials SS L3T1

Prerequisites: 1.961 or equivalent, 2.121.

Not offered in 1979.

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

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

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

Typical linear time invariant systems modelled and described by differential equations leading to use of Laplace transforms. Parital 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. Steadystate 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

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

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

6.0313 Electronic Circuits I S1 L2T2

Prerequisites 6.021A, 6.021C. Co-regulate: 6.0311.

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

6.0314 Systems and Control

S2 L2T2

Prerequisite: 6.0311.

An introductory overview of systems and control, with examples from modern industrial and scientific practice. Dynamic systems modelling. Time and frequency domain relationships. Block diagrams. Feedback theory and sensitivity. Operational amplifier systems. Simulation of systems by analog and digital computers. Stability theory. Nyquist theorem. Routh test. Root locus. Introduction to sampling theory and sampled data systems,

6.0315 Electrical Energy

Prerequisite: 6.0312.

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

6.0316 Electronic Circuits II

S2 L2T2

S2 L2T2

Prerequisite: 6.0313.

Extension of 6.0313 to include tuned and difference amplifiers, operational amplifiers, power amplifiers, oscillators. Schmitts; comparators and multivibrators with increasing emphasis on the integrated circuit embodiment of these.

6.0317 Communication Systems I

Prerequisite: 6.0313. Co-requisites: 6.0316, 6.0314.

Overview of information acquisition, transmission and processing. Aims to enable a student not specializing in this field to sualitatively understand the communication problems he is likely to meet in his career, and a general background if he intends to specialize in communications.

\$2 L2T2

6.041 Electrical Measurements SS L2T3

Prerequisite: 6.0313.

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

6.042 Digital and Analogue Signals S1 L2T3

Prereguisites: 10.033, 10.361.

Analysis and processing of continuous-time and discretetime (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.

1.8.1

6.044 Electrical Product Design and Reliability SS L2T3

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

6.056 Mechanical Engineering S2 L/T4

Prerequisites: 1.961 or equivalent, 10.211A.

Topics: selected from 5.661 Mechanical Engineering III.

6.202 Power Engineering—Systems I SS L2T3 Prerequisite: 6.0315.

An elective emphasizing parameters and performance of power system components: transmission lines, power system overvoltages, transformers, fault calculation, circuit interruption, protection.

6.203 Power Engineering—Systems II SS L2T3 Prerequisite: 6.202.

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

6.212 Power Engineering-Utilization SS L2T3

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

LS L2T3

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

S1 L2T3

SS L2T3

Prerequisites: 6.0311, 6.0313, 6.0314, 6.0316, 6.0317 (one of these may be taken as a co-requisite).

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 fieldeffect transistors.

6.313 High Frequency Circuits and Electronics II S2 L2T3

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 terrestial communications. Waveguide theory and aperture antennas. Parametric amplifiers. Microwave sources, with emphasis on Gunn and impatt diodes.

6.322 Electronics

Prerequisites: 6.0313, 6.0314, 6.0316.

Theory and applications of some electronic devices and systems with an associated laboratory-design program, presented as in earlier years. Topics include: DC Amplifiers, active filters, transistor switch applications, phase locked loops, optical links, design factors of large electronic systems, power electronics, analogue and digital integrated circuits.

SS L2T3

6.323 **Communication Systems 2A** S1 L2T3

Prerequisite: 6.0317. In addition, a working knowledge of elementary Fourier transforms and probability as in 10.033 Electrical Engineering Mathematics III and 10.361 Statistics SE is assumed

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

6.333 Communication Sylems 2B S2 L2T3

Prerequisites: 6.0311, 6.0314, 6.0316, 6.0317.

Theoretical and practical coverage of the major broadcast and location systems, including: radio and sound systems (AM and FM, psychoacoustics, electroacoustics), television, radar, sonar, navigation systems, and aspects of radio propagation relevant to these systems.

6.383 Biomedical Engineering

Prereguisites: 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, instru-mentation and measurement techniques and modelling of various types of biological systems.

6.412 Automatic Control

S1 L2T3

SS L2T3

Prerequisites: 6.0311, 6.0314.

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

S2 L2T3 6.413 Modern Systems Engineering

Prereaulsite: 6.412.

The understanding and use of methods to analyse and design control systems for complex dynamic plants. Applications from many fields, including power systems, communication systems, nuclear and steam generating plant, biological systems; extensive use of modelling, simulation and control design programs developed for the Cyber and Varian Computer systems.

Computer Control and 6.432 Instrumentation

SS L2T3 Prereguisites: 6.0311, 6.0313, 6.0316.

Current practice in hardware and introduction to software techniques as applied to the implementation of control and instrumentation systems. Analog computers and associated circuit techniques. Transducers, actuators, controllers and special electro-mechanical devices discussed from both physical and dynamic response viewpoint. Digital instrumentation and displays. Hybrid devices and analog conversion. Sampling. Computer organization and interfacing concepts. Microprocessors. Peripherals. Introduction to software systems for control applications. Computer control of processes via on-line languages.

6.512 Advanced Semiconductor Device Theory

Preregulsite: 6.0313.

Principles of operation and circuit characteristics of a range of semiconductor devices including bloolar 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.

Transistor and integrated Circuit 6.522 Design SS L2T3

Prerequisite: 6.0316.

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

6.600 Introduction to Computers S2 L3T2

Excluded: 6.620, 6.021D.

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

6.606 **Computing Science Honours**

6.607A Computer Hardware Architecture S1 L3T2

Prerequisites: 6.602A, 6.602B, 6.602C, 6.602D at an acceptable level

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

6.607B Advanced Software Technology S2 L3T2

Prerequisites: 6.602A, 6.602B, 6.602C, 6.602D at an acceptable level.

A selection of topics from a list which normally includes Artificial Intelligence, Program Vertification, High Speed Calculation of Mathematical Functions, Computer Graphics.

6.612 Computer Systems Engineering SS L2T3

Prerequisites: 6.021E or 6.602A.

Analysis and design of clocked-sequential and fundamentalmode sequential circuits. Use of hardware descriptive languages for digital system design and simulation language. Applications to the description, design and simulation of basic computer circuits and organizations. Machine organization and hardware, control units, micro programming, input-output, high-speed arithmetic units.

6.613 Computer Organization and Design SS L2T3

Prerequisite: 6.631. Excluded: 6.612.

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

6.620 Introduction to Computing Science S1 L3T2

Prerequisite: 10.001. Excluded: 6.600, 6.620, 6.021D.

For those students who intend to take further subjects in computing science. Introduction to programming: design and correctness of algorithms and data structures; programming in a high-level algorithmic language which provides simple, high-level program control and data structuring facilities. Introduction to dynamic data structures, elementary logic. Introduction to computer organization: simple machine architecture. Introduction to operating systems and computing machinery.

6.622 Computer Application and Software SS L2T3 Prerequisite: 6.620.

Topics chosen from the following: simulation, heuristics, numerical analysis, mathematical optimization, data structures, machine organization, high-level languages, compilers and operating systems.

6.631 Digital Logic and Systems S2 L3T2

Prerequisites: 6.620 or 6.600 (C). Exclusions: 6.602A, 6.021E, 6.031D.

A hardware-oriented subject concerned with the design of digital circuits for control and general computational purposes. Includes representation of digital information, combinational logic design, clocked sequential circuits, digital systems and PDP11 assembler programming.

6.632 Operating Systems S2 L3T2

Prerequisites: 6.631, 6.641. Excluded: 6.602B.

Introduction to operating systems via an intensive case study of a particular system, namely the UNIX Time-sharing system

which runs on the PDP11 computer. Includes system initialization, memory management, process management, handling of interrupts, basic input/output and file systems. A comparison of UNIX with other operating systems. General principles for operating system design.

6.633 Data Bases and Networks S2 L3T2

Prerequisites: 6.632, 6.641. Not offered before 1980.

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.

6.641 Programming I S2 L3T2

Prerequisite: 6.620 or 6.600 (C).

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

6.642 Programming II

S1 L3T2

Prerequisite: 6.641.

Development and analysis of algorithms and data structures. Models of computation. Set manipulation problems. Trees: optimal, balanced, multiway. Graphs. Pattern-matching algorithms. Dynamic programming. Balanced merge and polyphase sorting. Heaps. NP-complete problems.

6.643 Compiling Techniques and Programming Languages

S2 L3T2

Prerequisites: 6.641 . Excluded: 6.602D.

 Language description: phrase structure grammars, Chomsky classifications, context-free grammars, linite state grammars, Backus Naur Form, syntax graphs, LL(k), LR(k), SLR(k), LALR(k), simple-precedence and weak-precedence grammars.
 Lexical analysis: translation of an input (source) string into a (machine independent) quasi-terminal symbol string. Finite state recognizers.

 Syntax analysis: top-down compilation for LL(1) grammars using syntax graph driven analysers or recursive descent. Bottom-up compilation for simple- and weak-precedence and LR(k) grammars.

4. Semantic analysis: program translation and code generation.

5. Compiler generators: automatic generation of compilers for LALR(1) grammars.

Code optimization by systematic program transformation.
 Run-time organization: activation record stacks, heap management.

6.646 Computer Applications

Prerequisites: 6.620 or 6.600 (C). Excluded: 6.602C.

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

6.647 Business Information Systems S1 L3T2

Prerequisites: 6.641. Excluded: 14.602, 14.603, 14.604, 14.605.

Introduction to accounting concepts and terminology. Auditing, internal controls. Systems Analysis. Flowcharting. Decision tables. Models of business information systems. System design. Feasibility sutdies, presentation of designs, implementation, testing. The COBOL programming language. Data files: sequential, random, index sequential, inverted. File updating. Data bases. Integrated information systems.

6.649 Computer Practice*

S2 L3T2

S1 L3T2

Prerequisite: 6.641. Co-requisites: 6.633 or 6.643 or 6.647. Not offered before 1980.

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

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

6.801 Electrical Engineering F L1T2

Consists of 6.851 and 6.852.

6.831 Chemical Instrumentation S1 L1T2

Prerequisite: 1.001.

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 instrumentation 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.

6.851 Electronics and Instrumentation S1 L1T2

Prerequisite: 1.001 or equivalent.

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

Also known as 1.922 Electronics.

6.853 Analog and Digital Instrumentation SS L2T1

Prerequisites: 6.851 & 6.852.

Study of electrical and electronic equipment, emphasising analog and digital techniques applicable to the electrical measurement of non-electrical quantities. Open-loop and closed-loop control systems and some of their applications to instrumentation.

6.902 Industrial Experience

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

6.911 Thesis

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

Servicing Subject

6.852 Electrical Machinery and Supply S2 L1T2

Graduate Study

6.050G Occasional Elective

This syllabus changes from one occasion to the next, allowing presentation of a modern topic at graduate level, particularly by visiting academics of eminence.

6.053G Advanced Mathematics II C3

Mathematical techniques applicable to electrical engineering problems. Topics may include: an introduction to state variable theory, Green's functions, operator theory.

6.054G Numerical Computation C3

Topics include numerical solution of partial differential equations and approximation theory.

6.071G Electrical Measurements C3

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

6.073G Precise Electrical Measurements C3

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

6.074G Superconductivity

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

6.075G Electric Contacts C3

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

6.150G Communications Elective C3

As for 6.050G Occasional Elective.

6.160G Field Theory in Electrical Engineering C3

Revision of metric transformations and co-ordinate systems. Solution of the Laplace and Poisson equations in the eleven Eisenhart co-ordinate systems in three dimensions. Extension to selected cases of the diffusion and wave equations.

6.161G Field Mapping

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

6.164G Microwave Antenna Theory and Applications

Co-requisite: 6.167G or similar.

An advanced level treatment of antenna design and analysis, including reflector antennas and phased arrays and their applications. Includes: A review of basic theory. Analysis and synthesis of phased arrays. Reflector antennas; single and dual reflector systems. Tolerance theory. New concepts of primary radiator design. Optimization techniques. Primary feeds for monopulse radar. Antennas for navigation eids. Adaptive phased arrays and their application to radar; basic adaptive array algorithm, acquisition techniques and implementation.

6.167G Propagation and Transmission of Electromagnetic Waves

Fundamental concepts and analytical techniques of guided wave propagation and antennas. Waveguide theory; rectangular and circular waveguides, optical fibres and microstrip transmission lines. Numerical techniques; finite difference and finite element methods. Tropospheric and lonospheric propagation. Fading. Basic antenna theory. Aperture antennas. Phased arrays.

Required as a prerequisite or co-requisite for 6.164G, 6.169G, 6.170G, 6.337G, 6.338G and 6.349G.

6.169G Microwave Circuits: Theory and Techniques

Co-requisite: 6.167G or similar.

C3

C3

C3

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

6.170G Microwave Electronics

Co-requisites: 6.167G, 6.340G or similar.

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

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

6.225G Electrical Discharges and their Technical Applications C3

Low and high pressure gaseous discharges, both naturally occurring and laboratory produced. Methods of production of discharges. Diagnostic techniques. Arcing in circuit interrupters and methods of control and extinction. Other technological applications of electrical discharges.

6.226G Electrical Apparatus Design

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.

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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 arrestors 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 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

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

Problems of operation and control in interconnected power systems. Objectives and priorities of system operation. Basis of operation costs. Stages in operation and operational planning — long, medium short term. Plant ordering (unit commitment). Spinning reserve. Economic dispatch, State estimation. Security monitoring. Economic dispatching calculations, Reactive-power dispatching calculations, including optimization and voltage levels and transformer taps. Frequency control schemes. Voltage and VAr control. Switching and protection control of an integrated power system both manually and automatically. Emergency control, load shedding.

6.247G Power System Analysis

СЗ

C3

C3

Digital computer techniques for power system analysis. Review of topics in numerical analysis: simultaneous linear and nonlinear equations, numerical integration. Eigenvectors and eigenvalues. Sparsity programming techniques and optimat equation ordering. Network equations. Load flow. Short circuit analysis. State estimation. Stability analysis: steady state and transient. Long-term dynamic simulation.

6.248G Power System Planning

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

8.249G Dynamic Performance of Power Systems

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

6.250G As for 6.0	Power 050G.	Elective I	C3
6.251G As for 6.0	Power 050G.	Elective II	C3
6.254G	Electric	cal Machines I	C3

6.255G	Electrical	Machines	11	C3

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

6.256G Underground Systems 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 enlity. Distribution system planning. Overall design criteria. Co-ordination of thermal ratings. Protection of distribution network: cables and overhead lines. Design and performance of individual plant items. Particular problems of urban and rural distribution systems. Demonstrations and project work.

6.337G Sound Broadcast Systems

Prerequisites: 6.167G, 6.341G or similar.

Theory and practice of sound broadcasting systems. Topics: Specifications: coverage, bandwidth, power. AM radio: studio equipment, sound equipment, medium and shortwave systems, transmitters, antennas. FM radio: stereotransmission, studio equipment, transmitters, antennas. Recording equipment: links, etc. Distortion: distortion in recorders, distortion and noise in various parts of the transmission path.

6.338G Television Systems

Prerequisites: 6.167G, 6.341G or similar.

Theory and practice of broadcast television systems. Topics: Representation of colour and luminance. Australian standards: synchronization, colour coding, reasons for choice. Other systems. Studio equipment: cameras, video recorders, etc, transmitters. Propagation problems, distortion. Receivers. Teletext.

СЗ

6.339G Electroacoustics

Aspects of acoustics which are relevant to sound engineering. Includes: scalar wave equation, plane and spherical waves, plane piston as a sound source; analysis of mechanical and acoustical lumped systems; loudspeaker and microphone types, practical aspects; room acoustics; sound recording; the ear, loudness and annoyance; underwater sound; introduction to sound in solids.

6.340G Communication Electronics C3

Modern electronics as used in communication systems. Includes: analogue and digital integrated circuits (including ADCs, DACs, PLLS, VCOs, multipliers, etc, and a survey of the main digital IC families); high-frequency and noise performance of active and passive circuits, particularly those using transistors; transistor ratings; microwave ICs; microstrip, thick film, and thin film circuits; CCDs and SEW devices, and their use in signal processing; introduction to active and other filters; factors involved in the design of large electronic systems.

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

6.341G Signal Analysis

C3

C3

C6

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.

Prerequisite or co-requisite for 6.337G, 6.338G, 6.343G, 6.344G, 6.345G and 6.349G.

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

Fundamentals of modern telecommunications systems, including theoretical and practical aspects of: linear and nonlinear analogue modulation (AM, SSB, FM, etc), digital signal transmission, pulse code modulation, computer communication, effects of noise in analgoue 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

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.

<u>C3</u>

C3

C3

6.345G Analogue and Digital Filters

Co-requisites: 6.340G and 6.341G or similar.

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

Prerequisite: 6.343G or similar.

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

6.348G Optical Communications

Co-requisites: 6.167G, 6.343G or similar.

Optical communications, with emphasis on optical fibre communication. Includes: theory of optical fibre propagation, cable technology, LED and laser sources, optical detectors and receiver design, measurements on optical fibres, system performance, wide-band systems and future systems, applications to power and military systems.

6.349G Radar and Navigation Aids C3

Co-regulates: 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, terrainavoidance and terrain-following radar; aircraft landing systems; DME; radio ranges; hyperbolic navigation systems, Doppler navigation, satellite navigation.

6.350G Solid State Electronics Elective — Solar Cells and Related Optoelectronic Devices C3

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

6.373G Semiconductor Devices

C3

Theory and characteristics of semi-conductor devices, notably bipolar transistors, field effect transistors, and thyristors. The course discards many of the simplifications and generalizations made in the undergraduate treatment of transistors.

6.375G Integrated Circuit Technology C3

An account of the modern planar technology of seminconductor device and integrated circuit fabrication.

6.376G Reliability Engineering 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 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, lowpass and bandpass circuits, digital gates and complex functions, computer-aided design.

6.378G Solar Energy Conversion C3

World and Australian energy resources. Solar energy and the environment. Characteristics of received solar radiation. Thermal conversion (including thermoelectric devices). Selectively absorbing surfaces. Biological methods of conversion. Fundamentals of pholovoltaic generation. Present and future applications of photovoltaic cells. Solar energy storage, and system considerations. Solar energy: research for the future.

6.452G Principles of Feedback Control 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 Metthods of Optimization 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 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 (on-line 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.

Input-output, state transition, fuzzy, axlomatic-hierarchical and evolutionary representants will be reviewed with discussion based on differential and discrete models, and some form of pulsed automata.

Basic concepts presented include the state properties and basis functions for linear systems; equivalence and reduction, structure, decomposition and interconnection; complexity; accessibility of states and stability considerations.

6.457G Cybernetic Engineering

C3

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 perceptrons, subsystems of the human brain, and 'functional' descriptions for a 'Cybernetic Brain', an introduction to Industrial manipulators and third generation robots; self-organizing control for manipulators and robots and the social consequences of flexible automation with industrial robots.

6.458G Decision and Syntactic Systems for Digital Pattern Recognition

Concepts and techniques in decision-theoretic pattern recognition systems with an in-depth study of both non-parametric and parametric methods. Includes: pattern, feature and classification spaces, feature selection, linear discriminant functions; decision rules; the Bayes framework, approximation of probability densities; clustering and dimensionality reduction. Structural pattern recognition, including such topics as formal linguistics, primilives, grammar and syntax analysis as a recognition procedure.

6.459G Control Computing

Review of fundamental principles of digital and analog computation with special reference to the solution of engineering and control problems. Topics include: small computer systems architecture; process control interfacing techniques; machine language programming; operation of hybrid computers and their applications.

6.460G Real Time Computing

C3

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.

6.464G 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 leastsquares 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-Alded Design of Multivariable Control Systems C3

Many control problems result from interaction between key variables and can only be solved by a multivariable analysis. This can be approached in the time domain, 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.

6.467G Digital Image Processing Systems, Scene Analysis and Machine Vision C3

The fundamentals of image processing including such topics as visual perception and the image model; uniform and nonuniform 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 similiarity. Material oriented toincluding 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 inputoutput.

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

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.

C3

C3

C3

C3

C3

6.485G Medical Instrumentation

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

6.650G Computer Science Elective C3

As for 6.050G Occasional Elective.

6.651G Digital Electronics

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

6.654G Digital Systems C3

Computer architecture, implementation and realization. Use of hardware description languages for the analysis, design and specification of arithmetric units, storage and control Microprogramming techniques.

6.655G Computer Organization and Architecture

Number systems and computer arithmetic --- storage, control, input/output. System organization.

6.656G Software Systems A C3

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

6.657G Software Systems B

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

6.909G	Project	C9
6.918G	Research Project	C18
6.936G	Research Project	C36

Geography

Undergraduate Study

27.295 Physical Geography for Surveyors S1 L2T2

Fundamentals of physical geography. Landscapes of Australasia. Techniques of landscape appraisal. Laboratory classes to support the above, including map analysis, air photo interpretation and examination of soil properties. There is a compulsory one-day excursion.

Graduate Study

27.901G Geomorphology for **Hydrologists** S2 L11/2 T11/2

Geomorphological controls in the initiation of drainage systems. Drainage networks as geomorphological systems. Types of drainage channel. River floodplains and terraces. Drainage systems of arid regions. Geomorphology of representative basins and vigil catchments. Geomorphology in the assessment of water resources. Landforms produced by underground water. Airphoto and map analysis of drainage features and map and field study of a vigil catchment.

Mathematics

Undergraduate Study

10.001	Mathematics	Ł
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Prerequisite:

FL4T2

UCC Evam

	2 unit Mathematics		Percentile Range Required 71-100
	or		
	3 unit Mathematics		11-100**
	or		
	4 unit Mathematics		1-100★
	or		
	10.021B		
14	10 0014 10 0010	10 0010	

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 71-100

3 unit Mathematics 01

4 unit Mathematics 1-100* Excluded: 10.001, 10.021A, 10.021B, 10.021C.

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

Engineering Mathematics II **F L2T2** 10.022

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

10.033 Electrical Engineering Mathematics III

FL1%T%

Numerical Analysis: Interpolation, roots of equations, approximation of definite integrals. Difference equations, Ztransform. Approximate solution of ordinary differential equations. Approximate solution of matrix problems, matrix inversion, eigenvalue and eigenvector problems.

Partial Differential Equations: Characteristics. Continuous and discrete Fourier transforms. Autocorrelation. Spectral density. Laplace transform. Potential theory. Numerical solution of parabolic, elliptic and hyperbolic partial differential equations.

Optimization.

10.111A Pure Mathematics II - Linear FL1%T% Algebra

Vector spaces, linear transformations and matrices, change of basis. Eigenvalues and eigenvectors, generalised eigenvectors. Functions of matrices. Linear systems of differential equations including the use of Laplace transform. Inner products, orthogonalization, projections. Unitary and selfadjoint transformations. Quadratic and Hermitian forms.

10.1113 Pure Mathematics II --- Multivariable S1 L1%T1 Calculus

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

10.1114 Pure Mathematics II --- Complex Analysis

S2 L11/2T1

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

10.2111 Applied Mathematics II --- Vector S1 L11/2T1 Calculus

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

*Results in the percentile range 1-10 at a standard acceptable to the Professorial Board.

★★Results in the percentile range 11-30 at a standard acceptable to the Professorial Board.

FL4T2

10.2112 Applied Mathematics II -- Mathematical Methods for Differential Equations S1 L1%T1

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

10.341 Statistics SU

F L1T16

For students in the School of Surveying.

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

10.342A Statistics SU (Part A Sandwich L1T% course)

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

10.342B Statistics Su (Part B Sandwich S1 L1T1/2 Course)

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

10.351 Statistics SM

FL1T%

FL1%T%

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

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

10.361 Statistics SE

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 χ^2 and t. Estimation by moments and maximum likelihood; confidence interval estimation. The standard tests of significance based on the above distributions with a discussion of power where appropriate.

An introduction to linear regression, auto-regression. Probability limit, law of large numbers and central limit theorem. Multivariate normal distribution. Stochastic processes in discrete and continuous time: Poisson and Gaussian processes.

Graduate Study

10.061G Advanced Mathematics for Electrical Engineers

Boundary value problems in partial differential equations. Selected topics from complex variable analysis, integral transforms and othogonal functions and polynomials.

10.062G Advanced Mathematics General

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

10.361G Statistics

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

10.371G Statistics

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

Mechanical and Industrial Engineering

Undergraduate Study

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

For subject description, see top of column one, next page

SStudents who wish to enrol in this subject in courses other than the full-time courses in Aeronautical Engineering, Civil Engineering, Industrial Engineering, Mechanical Engineering and Naval Architecture can make up for the lack of the prerequisite by work taken in Physics in the first half of first year.
Statics: Composition and resolution of forces, laws of equilibrium. Friction. Statics of rigid bars, pin-jointed frames, and beams. Simple states of stress. Statics of fluids.

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

Introduction to Materials Science: The structure and properties of the main types of engineering materials, with emphasis on the way in which properties may be controlled by controlling structure.

5.0102 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.

Mechanics of Solids I: 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.

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

Engineering Drawing: Graphic communication first and third angle orthographic projection and isometric projection. Descriptive geometry fundamentals and their application to engineering problems with special emphasis on visualization of problems and development of methods for their solution. Australian standard engineering drawing practice. Applications involving detail and assembly drawings, functional dimensioning and tolerancing.

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

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

fitting and machining. Project involving appraisal of an existing design and a report recommending design improvements, materials, equipment items and processes to be utilized.

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

3. Introduction to Systems and Computers: Introduction to computers to follow the computer work in Mathematics I. To develop: (1) familiarity with algorithms; (2) the use of procedure-oriented languages; and (3) an introduction to computing equipment.

Systems. To give students an appreciation of some of the concepts used in engineering, to relate the concepts to phenomena within their experience, and to illustrate them by case histories and engineering examples. Quantitles. Concepts. Components. Systems.

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

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

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

7. (Electrical Engineering students must take this option) Introduction to Computing: Introduction to computer 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.

 (Industrial Chemistry students take this option) Introduction to Chemical Technology: Introduction to computation in chemical technology: process flow diagrams, information flow diagrams, flow charts in computer programming, developing of algorithms.

Principle of operation of processors. Batch and real-time processing. Concepts of steady-state and unsteady-state simulation. Programming in Fortran IV and Real-Time Basic and of programmable calculators. Concepts of on-line data acquisition and reduction. Data processing laboratory and plant data.

Engineering

9. (Ceramic Engineering students take this option) Introduction to Ceramic Engineering: 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 place; fundamental problems of position and measurement. Application of descriptive geometry to certain problems arising in engineering practice. Special emphasis on ability to visualize problems and processes involved in their solution. Instruction in the correct use of drawing instruments and the application of drawing standards. Measurements and dimensioning. Orthographic and isometric projections.

5.032 Experimental Engineering II F L1T1

Prerequisites: 1.001 or 1.951, 5.040, 10.001. Co- or prerequisites: 5.311 or 5.330, 6.801, 5.111, 5.611.

A series of lectures, demonstrations and experiments designed to show the theory and techniques of instrumentation in Mechanical Engineering.

5.033 Experimental Engineering III F L1T1/2

Prerequisites: 5.032. Co-or prerequisite: 5.071.

A series of experiments and associated lectures to illustrate some common problems in experimental work.

5.040 Engineering D

Co- or prerequisites: 5.010, 5.030.

Mechanics of Solids I: Stress and strain. Bars under axial loading. Stresses and deformation due to bending. Strain energy. Flexibility and stiffness. Stress and deformation due to torsion. Helical springs.

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 LOTO

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 LOTO

An industrial training report must be submitted to the School for assessment after completion of the period of training and must meet School requirements.

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

5.044 Industrial Training II

An industrial training report must be submitted to the School for assessment after completion of the period of training and must meet School requirements.

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

5.051 Thesis F LOT6

Prerequisite: All subjects in Years 1, 2 and 3.

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

5.061 Technical Orientation S1 L2T0

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

5.062 Communications

F L2T0

Development of skill in the use of the various media of communication. Effective interpersonal and mass communication using visual and oral transmission. Dynamics and performance of groups. Organizing and directing conferences. Chairmanship. Professional ethics and etiquette.

5.071 Engineering Analysis F L21/2 T1

Prereguisite: 10.022.

SS L3T5

Digital Computer Programming: Numerical Methods: Roots of non-linear equations. Systems of linear equations. Finite differences; numerical differentiation and integration. Solution of ordinary differential equations—series and stepwise methods. Solution of partial differential equations—finite difference and iterative methods. Emphasis to be placed on the use of digital computers. 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 χ_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 of linear regression.

5.111 Mechanical Engineering Design I F L1T2

Prerequisites: 5.010, 5.030, 5.040. Co- or prerequisites: 5.311 or 5.330, 5.611, 5.411, 8.259, 5.032.

Application of design strategy to creative design projects, Modelling, analysis and design of basic engineering elements and systems with further engineering drawing practice. Review of currently available mechanical technology and use of standard equipment items, codes and trade literature.

5.112 Mechanical Engineering Design II F L1T2

Prerequisite: 5.111. Co- or prerequisite: 5.412.

Mathematical Modelling and Analyses, decision theory, computer programming for design applications. More advanced design analyses and drawing with individual and group project engineering experience.

LOTO

FL1%T%

5.113 Mechanical Engineering Design III F L11/2 T41/2

Prerequisite: 5.112.

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

5.301 Engineering Mechanics SS L1T1

Prerequisites: 1.001 or 1.951, 5.010. Co- or prerequisite: 10.001.

Kinematics and kinetics of the plane motion of particles. Rectilinear, curvilinear and relative translational motion; work and energy; impulse and momentum.

5.303 Mechanical Vibrations S1 L1T½

Prerequisites: 5.311 or 5.330, 10.022.

Periodic motion, Fourier analysis, simple harmonic motion. Laplace Transform and phasor methods. Single degree-offreedom system (free and forced vibrations). Some vibrationmeasuring instruments. Vibration insolation.

Multi-degree-of-freedom systems. Systems with negligible damping, Dunkerley's formula. Introduction to beam vibrations.

5.311 Engineering Mechanics SS L11/2 T1

Prerequisites: 1.001 or 1.951, 5.010 & 10.001 or 10.011.

Kinematics and kinetics of rigid bodies in planar motion: absolute motion and motion relative to translating and rotating frames of reference; constraint and degrees of freedom; dynamic equilibrium; differential equations of motion; work and energy, variational principles; impulse and momentum, impact.

5.324 Automatic Control Engineering F L2T1

Prerequisite: 10.022.

Laplace transforms and transfer functions. Mathematical modelling of dynamic engineering systems: block diagram methods; properties of linear elements; linearization; analysis of components and systems. Time response and stability; response of lirst- 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 Machines I

Prerequisites: 5.311 or 5.330, 10.022.

Dynamics of Planar Mechanisms: Analytical and graphical methods for the analysis of velocities, accelerations and forces in planar mechanisms. Kinematics of gear tooth profiles. Static and dynamic rotor balancing.

Mechanical Vibrations: Simple harmonic motion. One degree of freedom systems, free and forced vibrations, transmissibility and motion isolation. Whirling of shafts.

5.332 Dynamics of Machines II F L2T1

Prerequisite: 5.331.

Vibration of multiple degree of freedom systems. Dynamic effects in machinery. Kinematic equations of motion of spatial systems. Analysis of complex mechanisms and an introduction to the synthesis of planar mechanisms. Industrial acoustics. The plane wave equation. Transmission effects. Mufflers. The three-dimensional wave equation. Enclosures. Transmission in ducts.

5.411 Mechanics of Solids II F L1T1

Prereguisites: 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. Stressstrain relations. Theories of static failure. Instability of elastic columns.

5.412 Mechanics of Solids III FL11/211/2

Prerequisites: 5.411, 8.259, 10.022.

Fatigue strength, biaxial and triaxial loading. Virtual workunit 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 F L2T1

Prerequisite: 5.412.

Elasticity: Continuum Mechanics: Equilibrium and compatibility. Plates and shells, design of pressure vessels, rotating discs. Contact stresses. Thermal stresses.

Stress Analysis: Experimental stress analysis. Numerical stress analysis. Use of computer packages.

Plasticity: Laws of plastic deformation. Residual stress, Limit analysis theorems.

5.611 Fluid Mechanics/Thermodynamics I F L2T2

Prerequisites: 1.001 or 1.951, 5.010, 5.020, 10.001. Co- or prerequisites: 5.311 or 5.330, 10.002.

Dimensional systems, units, dimensional analysis, properties of substances. Statics of fluids. One-dimensional flow. Mass, energy and momentum equations. Laminar and turbulent motion. Flow in pipes. Elementary boundary layer theory. Drag. Fluid measurements. Angular momentum equation. Turbomachines. Concepts and conservation principles of thermodynamics. First and second laws of thermodynamics. Properties of ideal gases, liquids and vapours. Non-flow and flow processes. Ideal cycles. Factors limiting performance of rea cycles.

5.612 Fluid Mechanics/Thermodynamics II F L2½T1

Prerequisites: 5.311 or 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. Onedimensional 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 transfer. Radiant heat transfer. Combined modes of heat transfer.

5.614 Fluid Mechanics III

F L2T1

Prerequisite: 5.612.

Cartesian tensors. Compressible flows. Navier-Stokes and energy equations, Turbulent motion. Reynolds stresses. Boundary layer theory. Forced convection in laminar and turbulent flows. Free convection. Diffusion. Mass transfer,

5.615 Thermodynamics III F L2T1

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. Radiai flow and axial flow turbomachinery. Design considerations. Cavitation. Matching of component characteristics.

5.661 Mechanical Engineering III F L2T1

Prerequisites: 1.961 or equivalent, 10.211A.

Fluids and fluid properties. The differential equations of fluid flow. Flow of nonviscous fluids. Flow of viscous fluids. Turbulence. Dimensional analysis and its applications. Turbulent flow in pipes; pipe flow problems. Boundary layers. Convection heat transfer, Laminar and turbulent flow. Heat transfer in closed conduits. Conduction and radiation. Engineering units, tables and charts. Analysis of some heat-power cycles. Steam turbines. Elementary theory of pumps and turbines. Specific speed. Design parameters. Cavitation. Scale up laws.

5.800 Aircraft Design

Prerequisites: 5.111, 5.311 or 5.330, 5.411, 8.259. Co- or prerequisite: 5.412.

Aircraft types and development, overall design process, inertia forces, load factors, wing load, shear force, bending moment and torque distributions. Detailed stressing of lugs, sockets, pins, bearings, fittings, hinges, gears, riveted, welded and bonded joints. Design and drawing of small fittings such as hinge assembly, spar for tailplane, control stick or landing gear component.

5.801 Aircraft Design

Prerequisites: 5.303, 5.412, 5.800 (full-time only), 5.811, 5.822. Co- or prerequisite: 5.823.

Integrated lectures, drawing office for design of an aircraft. **1.** Aerodynamic Design authorities, criteria, flight envelope, design cases. Airloads. Weight and Balance. Performance and stability estimation.

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

5.811 Aerodynamics I FL2T1

Prerequisites: 5.311 or 5.330, 5.611, 10.022.

Elementary boundary layer theory: turbulence, convection, friction and form drag; bluff bodies, industrial æerodynamics, wind tunnels; test facilities. Airfoil families and characteristics. Vorticity, circulation; Prandtl wing theory, induced drag, spanwise lift distribution, wing characteristics. Static longitudinal stability, control. Manoeuvrability. Standard atmosphere, performance calculations. One-dimensional gas dynamics, isentropic, adiabatic and nozzle flow; rocket equation. Normal shock waves.

5.812 Aerodynamics II F L2T1

Prerequisites: 5.612 or 5.811; 5.303 or 5.331.

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

5.822 Analysis of Aerospace Structures | FL11/2T1/2

Prerequisites: 5.311 or 5.330, 5.411, 8.259, 10.022. Co- or prerequisite: 5.412.

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

5.823 Analysis of Aerospace Structure II F L11/2 T1/2

Prerequisites: 5.412, 5.822.

Stress functions. Shear lag. Sandwich construction and analysis. Buckling of columns; elastic, perfect, imperfect and inelastic columns; empirical equations. Buckling of plates with various loadings and edge conditions. Thin walled columns, local buckling, crippling. Stiffened panels. Tension field beams, monocoque cylinders. Warping of open and closed sections. Torsional instability. Introduction to matrix methods of structural analysis.

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SS L1%T1

5.831 Aircraft Propulsion

Prerequisites: 5.611, 5.811.

Propulsion systems. Thrust equations; propulsive efficiency. Propeller theory, characteristics and performance. Power plant thermodynamics. Fuels, combustion. Internal aerodynamics. Compressors and turbines, subsonic and supersonic intake diffusers, nozzles. Design, performance of aircraft reciprocating internal combustion engines, gas turbines, ramjets, rockets.

FL1%T%

5.911 Naval Architecture F L3T1

Prerequisite: 5.311 or 5.330. Co- or prerequisite: 5.951 (full-time only),

Hydrostatic calculations. Stability at small angles. Free-surface effects. Inclining experiment. Trim due to weights and flooding. Grounding. Effects of permeability. Stability at large angles. Stability after flooding. Dynamic stability. Floodable length. Requirements of damaged-stability. Wave theory. Wave patterns. Rolling, heaving and pitching. Launching.

5.921 Ship Structures I S2 L3T1

Prerequisites: 5.411, 8.259, 10.022. Co- or prerequisite: 5.412.

Longitudinal strength of ship structures: load types and load prediction; section modulus, shear lag, torsion, superstructure, discontinuities. Transverse strength; frame and finite element analysis. Limit analysis of beams. Brackets and connections. Combined axial and lateral loads. Laterally loaded plates, grillages and stiffened panels.

5.922 Ship Structures II S1 L3T1

Prerequisites: 5.071, 5.412, 5.921.

Buckling of plates and stiffened panels; combined loads; limit analysis. Structural details. Fatigue and brittle fracture. Design for production. Finite element method. Rational design synthesis: reliability, optimization, computer-aided structural design.

5.931 Principles of Ship Design IA S1 L3T0

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

5.932 Principles of Ship Design IB S2 L2T0

Co-requisite: 5.911 (5.931 full-time only).

Modern ship types and developments. The overall design process. Ship structural arrangements. Lines plan. Freeboard, tonnage, capacity. Rules of Classification Societies. Preliminary estimate of ship dimensions.

5.933 Principles of Ship Design II F L2T1

Prerequisite: 5.932.

Theory and technique of ship design. Development of ship's lines. Design criteria and data. Criteria of statutory bodies relating to design. Details of ship's structure. Rudders and steering arrangements. Structural design requirements of classification societies. Ship arrangements and equipment. Specifications. Modern shipbuilding methods and prefabrication. Ship operation economics.

5.934 Ship Design Project S1 L0T3 S2 L0T41/2

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

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

5.941 Ship Propulsion and Systems FL21/2T11/2

Prerequisites: 5.071, 5.951 (full-time only).

Hydrodynamics. Model testing. Determination of resistance and power requirements of hull form from statistical data. Optimum form characteristics. Propulsion systems. Propeller theory and design. Trials and analysis of data. Steering. Ship vibrations. Prime movers and auxiliaries. Ship systems: ventilation, airconditioning, refrigeration, pumping, flooding and draining.

5.951 Hydrodynamics

SS L1T1/2

Prerequisites: 5.311 or 5.330, 5.611, 10.022. Co- or prerequisite: 5.071.

Kinematics of fluids, stream functions, velocity potentials, added mass, representation of bodies by source singularities, vorticity. Descriptive treatment of the effects of viscosity in typical situations, such as boundary layers and separation.

Graduate Study

5.045G	Advanced Topic in I Engineering	Mechanical C2
5.046G	Advanced Topic In I Engineering	Mechanical C2
5.047G	Advanced Topic in i	Mechanical

5.047G Advanced Topic in Mechanical Engineering C2

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

5.073G Ordinary Differential Equations in Mechanical Engineering C3

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 1 C2

Computer programming and numerical analysis review. Solution of transcendental equations. Systems of equations. Calculus of finite differences. Numerical integration, differentiation. Numerical solution of ordinary differential equations.

5.076G Computational Methods in Mechanical Engineering II C2

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

5.077G Analogue Computation in Mechanical Engineering I C2

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

5.078G Analogue Computation in Mechanical Engineering II C2

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.

5.101G Optimization Methods for Mechanical Engineers 1 C2

Mathematical theories of optimization. Calculus of variation.

5.102G Optimization Methods for Mechnical Engineers II C2

Application of theory with special reference to design of mechanical elements and systems.

5.110G Morphology of Design C4

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

5.151G Refrigeration and Air Conditioning Design I C3

5.152G Refrigeration and Air Conditioning Design Ii C3

Design of refrigeration equipment: compressors; throttling devices; condensers; evaporators. Cooling towers: evaporative condensers; air conditioning colls. Generators and absorbers for absorption systems. Piping systems. Air ducts. Steam raising and water heating equipment. Calculation of translent heating and cooling loads. Air conditioning systems. Load analysis and system capability.

5.304G Advanced Dynamics I C2

5.305G Advanced Dynamics II C2

Revision of Engineering Mechanics. Velocities and accelerations in three-dimensional co-ordinate systems. Moving frames of reference (vector equations). Eulerian angles. Ellipsoid of inertia. Lagrange's equations (various examples including applications to vibrations). Euler's equations of motion. General motion of tops and gyroscopes—stability. Lagrange's equations for impulsive forces. Hamilton's Principle.

5.315G Mechanisms I C2

5.316G Mechanisms II

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

5.321G Automatic Control I

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

5.322G Automatic Control II C2

Analysis³ of non-linear control systems. Describing functions and limit cycle amplitude and frequency determination. Studies of systems in which the following non-linearities dominate the behaviour: backlash, coulomb friction, deadspace, hysteresis and saturation. Analog simulation of nonlinear systems. Electronic systems for control. On-off control with and without feedback stabilization. Single-speed floating control, with and without feedback stabilization.

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

C2

C2

Comparison of time, frequency, transform domain techniques for linear systems analysis. Application of Lagrange's equations and matrix methods in free, forced multi degree-offreedom systems. Model analysis; numerical methods. Beam shaft vibrations; approximate methods. Self-excited vibrations, stability. Random vibrations. Laboratory work on vibration measurement, testing.

5.401G Experimental Stress Analysis C2

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

C2

Stress Analysis for Mechanical Engineering 5.415G Design (ักจ

5.416G Stress Anaylsis for Mechanical Engineering Design II <u>C3</u>

Three topics in each subject selected from: Pressure vessels and enclosures. Analysis for fatigue. Plastic collapse, limit state design. Analysis of stress concentrations. Plate girder panel structures. Lightweight structures. Analysis of machine frames. High temperature components. Strength of gears. Use of computer packages in stress analysis.

5.417G Mechanics of Fracture and Fatigue C3

Theories of fracture; failure modes. Ductile, brittle fracture. Mechanics of crack propagation, arrest. Measurement of static fracture properties. Fatigue crack initiation, propagation. Engineering aspects of fatigue.

5.428G Advanced Mechanics of Materials C2

Plasticity, Creep.

5.490G Solid Mechanics (for Medical Graduates) C4 \$2L2T2

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

5.491G Biomechanics |

C2 S1L2

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

5.492G Blomechanics II C2 S2L2

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

5.493G Mechanics of the Human Body C4 SSL2T2

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

5.494G Mechanical Properties of **Biomaterials** C4 SSL2T2

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

5.495G **Biomechanics of Physical** Rehabilitation C4 SSL2T2

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

5.615G Reciprocating Internal Combustion Engines

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

5.621G Gasdynamics | C2

5.622G Gasdynamics II Č2

Kinematics, dynamics, thermodynamics, vorticity, Nozzle, Wind tunnel. Diffusers. Shock waves; steady, moving. Method of Characteristics. Combustion. Real gas behaviour at high temperature. Hypersonic aerodynamics, free molecule flow, re-entry; high energy experimental methods.

5.631G Lubrication Theory and Design I C?

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

Continuum equations of hydrodynamic lubrication. Journal bearing dynamics. Rolling contacts. Elastohydrodynamic lubrication. Grease lubrication. Plasto-elastohydrodynamic lubrication. Metal forming, cutting lubrication.

5.653G Acoustic Noise I

Acoustic waves, sources. Near, far fields. Vibrating surfaces. Turbulent flows. Transmission in gases, liquids, solids. Boundary reflection, refraction, transmission, scattering. Absorbing materials. Reverberant, anechoic environments, spaces, ducts. Resonators.

5.654G Acoustic Noise II

Noise measuring, instrumentation. Random signal analysis. Human response. Noise ratings, indices. Noise criteria. Assessment problems, control, isolation. Vibration control. Acoustic damping materials. Common noise source characteristics.

5.712G Convection Heat Transfer I C2

5.713G Convection Heat Transfer II

Fluid Dynamics: boundary layer equations, solutions; transition, turbulence. Pipe flow, surface roughness. Pressure gradients. Isothermal two-phase flow. Forced convection: laminar flow; thermal boundary layers; variable fluid properties; approximate solutions; turbulent flows; high-speed flows; rarefied gases; transpiration, film cooling. Free convection: vertical surfaces, isolated bodies, horizontal surfaces, cavities, heat transfer with change of phase: condensation, evaporation; boiling, burnout; boiling in tubes; two-phase flow with phase changes. Heat exchangers; overail performance estimation.

C2

C2

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. Nonhomogeneous 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; solar angles; atmospheric absorptions of solar radiation; direct and diffuse radiation; pyrheliometers.

5.725G Statistical Thermodynamics C2

Mathematical probability. Classical statistical mechanics. Quantum statistics. Statistical-mechanical ensembles. Ideal monatomic gas. Fermi-Dirac statistics, Fermi-Dirac gas. Ideal Bose-Einstein gas-Black-body radiation. Ideal latice gas. Ideal diatomic gas. Gas of symmetrical diatomic molecules at low temperatures. Ideal polyatomic gas. Chemical equilibrium In Ideal gas mixtures. Lattice statistics. Imperfect gas. Approximate cell and hole theories of the liquid state. The solid phase. Inveversible processes.

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 thermoelectricity; radioisotope, solar powered generators; semiconductors, basic ideas of quantum physics, Fermi level and energy bands. Other modes of direct energy conversion: photovoltaic; thermionic, Nernst effect generator.

5.751G Refrigeration, Air Conditioning and Cryogenics I

5.752G Refrigeration, Air Conditioning and Cryogenics II

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, Peltler, 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

Industrial, commercial and domestic application of refrigeration and air conditioning. The science and technology of foods. Building design and construction. Engineering acoustics. Refrigeration technology. Law in relation to engineering. Ergonomics and biomechanics.

C4

5.909G Research Project C9

5.912G Naval Hydrodynamics I C2

5.913G Naval Hydrodynamics II C2

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

Industrial Engineering

Undergraduate Study

C2

C2

18.011 Industrial Engineering 1A FL1%T%

Prerequisite: 10.022. Co- or prerequisites: 5.071, 5.111.

Manufacturing Properties of Materials: Stress-strain curves to high strains, effects of strain-rate and temperature. Properties under hot and cold working. Combined stresses, yield criteria, introduction to plasticity theory. Friction effects in metal working, plane strain forging and rolling. Metal Cutting Theory: Mechanics of the process, effect of work-hardening, prediction of shear angle and cutting force. Metal Cutting Tools: Tool materials: plain carbon, alloy steel and sintered materials, hardening and heat treatment, T.T.T. curves. Tool wear, life and failure, tool performance. Surface finish. Machinability. Economics of machining. Other Metal Removal Processes: Electric-discharge machining, electrochemical machining.

FL1T2

18.012 Industrial Engineering IIA

F L2T1

Prereauisites: 5.112, 18.011.

Theory of Manufacturing Processes: Processes including extrusion, tube making, rolling, blanking and piercing, sheet metal forming and deep drawing, oblique machining and application to practical tools. Machine tool design and utilization. Static and dynamic response of machine tools systems and effect on workpiece accuracy.

Technology of Manufacturing Processes: Selection of processes and machine tools to achieve the design requirements for a product. Functional and economic analysis of various conventional and computer-numerically-controlled (CNC) processes in relation to design. Product analysis project. Analysis of manufacturing processes and methods of assembly of selected products.

18.020 Industrial Orientation

S2 L1T0

A series of lactures 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 FL11/2T1/2

Prerequisite: 10.022. Co- or prerequisite: 5.071.

Engineering Economy: Price-output decisions under various competitive conditions. The time-value of money, net present worth and DCF rate of return, and their applications in the selection and replacement of processes and equipment. Construction and optimization of particular models, eg replacement, capital rationing. Measures of profitability. Industrial Application of Probability: Tutorial problems from the fields of sampling inspection, quality control, control charts—simple economic models, eg newsboy problem. length of steel bars.

18.022 Industrial Engineering IIB

FL2T1

Prereauisites: 5.071, 18.021.

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

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

Production Control: The detailed mechanics of control of jobbing production, and its extension to batch and continuous production. Manufacturing organisations, functions, interrelationships and information flow. Application of data processing and control systems. Introduction to inventory control. Analysis of some engineering planning decisions. Sampling techniques in quality control. Control charts. Further quantitative work.

18.431 Design for Production

Prerequisite: 5.112.

General method for geometric analysis of engineering designs. Analysis for various interchangeability policies; selective assembly, unit assembly, application of probability theory. Geometry tolerancing; interpretation, datum systems, analysis, standard presentation, grouping. Economics of tolerance allocation. Process capability; relationship between process capabilities and product requirements. Principles of gauging and gauge design; production datum systems and their relation to function datum systems, effect of jig, fixture and gauge tolerances on product function. Metrology; measurement of size, form and position.

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.

18.551 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.

Servicing Subjects

18.121 Production Management

F L3TO

Prerequisites: 10.031, 10.331.

Engineering Economy: Economic objectives of the firm. Economic measures of performance: net present value, annual equivalent value and the DCF rate of return (including the incremental rate of return) and their application in the selection and replacement of processes and equipment. The Use of Human and Physical Resources: Methods engineering, ergonomics, motion and time study, financial incentives, applications to machine controlled processes, work sampling and data collection. Plant location, factory layout.

Production and Quality Control: Control of jobbing, repetitive batch and continuous production. Manufacturing organizations, functions, inter-relationships and information flow. Introduction to inventory control. Analysis of some engineering planning decisions.

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

18.131 Operations Research

The formation and optimization of mathematical models of industrial processes. The development of decision rules. Some techniques of operational research and applications, eg mathematical programming, queueing theory, inventory models, simulation.

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.

18.080G Organization and Administration C2

The development of the theory and practice of organization in industry. The nature and types of organizations. The application of the principles of organization in the design of organizational structures.

18.083G Industrial Studies

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

Probability and Statistics: An introduction to probability theory. Random variables and distribution functions. The Binomial, Poisson and Normal distributions in particular. Standard sampling distributions, including χ^2 , t and F. Estimation by moments and maximum likelihood. Confidence Interval estimation. The standard tests of significance based on the above distributions, with a discussion of power where appropriate. An introduction to linear regression. Least squares adjustment of data. Industrial Applications: Tutorial problems from the fields of sampling inspection, quality control, control charts. Simple economic models—for example, the newsboy problem, length of steel bars.

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.

18.271G Theory of Machine and Forming Processes

Plasticity Theory: Approximate methods of solution including upper bound; slip line field theory. Manufacturing Properties of Materials: Influence of strain, strain rate and temperature on flow stress. Analysis of Forming Processes: Application of theoretical methods; solutions for ideal and work hardening materials. Analysis of Machining Processes: Orthogonal and oblique machining theories; application to drills and multipoint tools; prediction of cutting forces, temperature, stresses.

18.272G Technology of Machining and Forming Processes

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

18.371G Factory Design and Layout

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, queueing 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.

C4

C3

C3

C3

C3

C3

C3

C2

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18.380G Methods Engineering

Methods Study: History and objectives. Charting and systematic improvement of methods, factory and workplace layout. Physical and social aspects of working conditions. Work Measurement: Defining and using 'standard times'. Time study techniques and problems, pre-determined motion-time systems, work sampling, standard data and formulae. Accuracy and statistical testing of data. Industrial Psychology: Motivation to work, frustration and conflict in industry, sources of job satisfaction. Financial incentive schemes, job enrichment and worker participation.

18.461Q Design for Production

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

18.462G Industrial Design

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

18.463G Tool Design

Advanced theories and techniques for design and specification of outting tools; jig and fixture design; press tool design, gauge design; design of selected machine tool components; computer aided tool design.

18.471G Design Communication

Communication system in design; alds to design communication; engineering drawing practice; standardization; interpretation of design information.

18.472G Engineering Design Analysis C6

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 sludies.

18.571G Operations Research I

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

18.574G Operations Research II

C6

C6

Problem definition. Principles of model building. Participation in an operational simulation. Construction of decision rules. Operations. Research case studies and seminars. 18.579G Case Studies in Operations Research C3

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

18.580G Operations Research

C4

C4

C2

C4

C2

C6

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

18.671G Decision Theory

C2

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

18.680G Decision Making under Uncertainty C2

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 and their application to solving realistic problems.

18.681G Engineering Economic Analysis C3

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

18.761G Simulation in Operations Research C3

The relationship of simulation to other methods of comparing alternative solutions to industrial problems. Computer simulation languages. Process generation. Variance reduction techniques. Analysis of simulation generated time series. Formulation and construction of models for simulation. Problems of simulation. Design of simulation experiments. Optimization through simulation. Examples of the use of simulation. Heuristics.

18.763G Variational Methods in Operations Research

C2

The variational problem and its history. The modern formulations. Mathematical Theory. Application to a wide range of problem areas such as production and inventory control, advertising, machine maintenance, natural resource utilization and probability, Quality.

18.770G Stochastic Control

Markov decision processes for finite and infinite planning horizons. Optimality criteria. Contraction mappings. Computational techniques. Optimal stopping. Semi-Markov decision processes. Application to inventory, replacement and queues.

18.772G Information Processing Systems in Organizations

The place of operations research in information processing systems. Computer hardware and software. Data structures and data manipulation techniques. Typical structures of suites of programs. The life cycle of information processing systems. System design. Applications packages with emphasis on systems for production and inventory control. Major problems in information processing systems.

18.773G Optimal Control in Operations Research C2

Not available in 1978.

Brief survey of dynamic optimization techniques. Introduction to the calculus of variations and the maximum principle for both continuous and discrete systems. Applications to operations research problems drawn from the areas of production and inventory control, machine maintenance, investment, and natural resource utilization.

18.774G Applied Stochastic Processes C2

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

18.775G Networks and Graphs C2

Basic concepts. Application of Hamiltonian paths, Euler cycles, trees, planar graphs, dominating and independent sets to operations research problems. Shortest route algorithms. Concept of maximum flow in a network applied to transportation assignment and scheduling problems.

18.776G Production and inventory Control C2

Basic inventory replenishment models, continuous stock review, periodic re-ordering and base stock models, with deterministic, probabilistic, and dynamic demands. Variations of the basic models to include additional features (eg demand dependent on delivery time). Costs of the complete system in practice. Production smoothing models. Forecasting techniques. Optimum stock locations in multistage systems. Practical inventory surveys and control systems.

18.777G Time Series Forecasting C2

Stationary series. Autoregression. Spectral analysis. Estimation of trends, seasonal effects and parameters. Exponential smoothing. Error analysis and tracking signal. Choice of method.

18.778G Scheduling and Sequencing C2

Criteria for evaluation schedules. Scheduling of single machines. Job-shop scheduling with two, three or more machines. Permutation schedules. Groups of machines. Scheduling constrained resources.

18.779G Game Theory

C2

C2

Two-person zero-sum games: the minimax theorem, relationship to linear programming. Two-person general-sum games. Non-co-operative and co-operative n-person games. Games without side payments. Economic market games.

18,780G Production Control

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

18.862G Linear Programming

The revised simplex method. Sparse matrix techniques. Duality and postoptimality analysis. Extensions to the simplex method. Generalized upper bounding. Decomposition. Simplex-based nonlinear programming. Integer programming. Applications.

18.863G Nonlinear Programming

Single variable optimization. Search methods. Conjugate gradient and quasi-Newton methods. Methods for linear constraints. Extension to large-scale systems. Penalty function methods for nonlinear constraints. Lagrangian methods. Applications.

18.871G Mathematics for Operations Research C2

Classical optimization techniques. Convexity. Kuhn-Tucker conditions. Search and gradient methods in one and several dimensions. Probabilistic models and their optimization. Curve fitting, correlation and regression.

18.874G Dynamic Programming

C2

The principle of optimality. Structure and formulation of dynamic programming problems. One-dimensional deterministic and probabilistic sequential decisions. Approximations in function and policy space. Multidimensional problems, computational aspects. Applications to allocation problems, inventory theory, replacement.

18.875G Geometric Programming

C2

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

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.

C2

C2

C2

18.877G Large-scale Optimization

C2

C2

C2

C2

C2

C2

Overview of large-scale problem. Identification of the master problem and subproblem. Structure of the problem: coupling variables, coupling constraints; block diagonal, block triangular matrices. Solution strategies.

18.878G Industrial Applications of Mathematical Programming C2

Problem formulation: profitability criteria, operating constraints. Conventions for large-scale matrix construction; listand 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, quasiconvexity 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
10.3030	Project	- Ca

- 18.918G Research Project C18
- 18.936G Research Project C36
- 18.960G Seminar (Production Engineering) C0
- 18.967G Advanced Topic in Production Engineering*
- 18.968G Advanced Topic In Production Engineering*
- 18.969G Advanced Topic in Production Engineering*
- 18.970G Seminar (Operations Research) C0
- 18.977G Advanced Topic In Operations Research* C2
- 18.978G Advanced Topic in Operations Research*
- 18.979G Advanced Topic in Operations Research*

Metallurgy

Undergraduate Study

4.913 Materials Science

F L2T1

The structure and properties of crystalline substances. Crystal structures, crystal planes and directions. Examination of crystals by X-ray, electron and neutron diffraction techniques. The properties of crystalline solids. Defect structure of crystals. Influence of defects on the behaviour of crystals. The properties of metals and metallic alloys in terms of modern theories. The development of alloys for specific engineering applicatons. The elastic and plastic properties of solids. The mechanisms of fracture in crystalline solids. Ductile and brittle fracture. Creep. Fatigue. Design of materials.

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

Ceramic materials. The structure and properties of ceramics. Similarities and differences with other crystalline solids. Ceramic-metal composites.

4.921 Materials Science

FL1TO

SS L2T1

The atomic structure of metals. The crystalline nature of metals and its significance. The solidification of metals. Plastic deformation of crystalline materials and its effect on properties. Phase equilibria in metallic alloys. The heat treatment of some ferrous and non-ferrous alloys. Corrosion. The electron theory of metals. Conductors, semi-conductors and insulators. Magnetic materials — structure and properties.

4.931 Metallurgy

For students of Civil Engineering. Part of 8.272 Civil Engineering Materials I.

The atomic structure of metals. The grain structure of metals; origin; effects of manufacturing processes. Structure of alloys—theory. Structure, properties and heat treatment of commercially important alloys. The selection and properties of structural steels. Corrosion.

4.941 Metallurgy for Engineers FL1

For students of Civil Engineering. Part of 8.259 Properties of Materials.

Solidification of metals, defects in cast metals, casting methods. Phase equilibrium in alloys, Strengthening mechanisms in metals, Elastic and plastic deformation of crystalline materials; mechanisms of slip dislocations. Fracture mechanisms, brittle fracture, fatigue and creep. Corrosion and oxidation of metals. Specification and selection of engineering alloys.

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

Nuclear Engineering

Undergraduate Study

23.051 Nuclear Power Technology FL21/2T1/2

Nuclear processes, reaction rates, fission and energy release. Neutron multiplication, slowing down and diffusion. Nuclear reactor criticality and burnup, neutron kinetics and reactor control.

Thermal and fast reactor types, operation, environmental and safety aspects. Nuclear fuel enrichment and utilization, nuclear power costing and economics.

Heat generation and removal, fluid dynamics and heat transfer aspects of gas and liquid coolants, boiling, two phase flow and burnout. Structural mechanics in reactor technology, thermo-mechanical performance of fuel pins and pressure vessels.

Graduate Study

Not all subjects are available in any one year.

23.013G Neutron Transport and Diffusion C3

Neutron and nuclear reactions, the formation of neutron spectra in infinite multiplying media, transport and diffusion theories, and their application to the analysis of heterogeneous reactor lattices.

23.014G Fewgroup Reactor Theories C3

The derivation and use of fewgroup reactor models for the macroscopic analysis of finite reactor criticality, burnup and control.

23.015G Multigroup Reactor Theories S2 L21/2 T1/2 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 L2½ T½ C3

The derivation and application of point reactor kinetic models to the study of macroscopic power reactor dynamics, stability and control, and the development of general space-time kinetic models.

23.023G Reactor Thermal Performance

S1 L21/2 T1/2 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.

23.024G Boiling and Two Phase Flow S1 L2½T½ C3

Subcooled and bulk boiling, boiling crises, and the special problems associated with the analysis of reactor channel and core performance under boiling and two-phase flow conditions.

23.025G Reactor Structural Mechanics S1 L21/2 T1/2 C3

A study of the theoretical models and numerical techniques required for the analysis of mechanical and thermal stress, deformation, and failure modes of reactor core components and containment structures under high temperature, neutron and gamma irradiation.

23.026G Reactor Systems Analysis S2 L21/2 T1/2 C3

Nonlinear and linear system dynamics and stability theory applied to reactor processes and components, for the development and use of overail reactor and power system dynamics models.

23.027G Boiling Reactor Dynamics S1 L21/2 T1/2 C3

The special problems associated with the dynamics and stability of fluid cooled reactors under boiling conditions.

23.028G Reactor Accident and Safety Analysis S2 L2½ T½ C3

The mathematical modelling and computation of ideal and actual reactor accident histories, particularly for fluid cooled systems, and the application of probability theory to reactor hazard evaluation.

23.032G Mathematical Analysis and Computation S1 L2½T½ C3

Mathematical methods, partial differential equations, special functions, and numerical methods for digital computation, relevant to Nuclear Engineering.

23.033G Matrix Theory and Computation

S2 L21/2 T1/2 C3

Matrix theory and matrix computations required for the numerical solution of problems in neutronics, fluid dynamics, structural mechanics, etc, arising in the analysis and prediction of nuclear power system performance.

23.034G Random Processes and Reactor Noise S2 L2½T½ C3

The mathematics of random processes applied to fluctuation phenomena in nuclear reactors, and the practical application of noise analysis techniques to reactor monitoring, control, and parameter estimation. 23.042G Nucear Fuel and Energy Cycles S1 L2½ T½ C3

The utilization of nuclear energy, the thermodynamics of nuclear power systems and applications, and the study of nuclear fuel cycles.

23.043G Nuclear Power Costing and Economics S2 L2½ T½ C3

The principles of nuclear power cost estimation for various reactor types and applications, the comparative evaluation of nuclear power systems, and the problem of reactor strategy.

23.044G Nuclear Engineering Optimization S2 L2½T½ C3

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 L2½ T½ C3

The theory and technology of uranium enrichment by the diffusion, ultra-centrifuge and nozzle processes; the economics of enrichment within the nuclear reactor fuel cycle, in relation to optimal reactor strategy and resources utilization.

23.909G	Project	FC	9
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23.918G	Research Project	F C18

Physics

Undergraduate Study

23.918G Research Project

The School of Physics has introduced the specialized units 1.951, 1.961, 1.971, 1.961, 1.962, 1.972, 1.982 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, 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

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F C36

	HOU EXAM
	Percentile
	Range Required
2 unit Mathematics	71-100
or	
3 unit Mathematics	31-100
or	
4 unit Mathematics	1-100★ or (for
	1.001 only)
	10.021B
and	
2 unit Science (incl. Physics and/or Chem.)	31-100
or	
4 unit Science (incl. Physics and/or Chem.)	31-100

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

Aims and nature of physics and the study of motion of particles under the influence of mechanical, electrical, magnetic and gravitational forces. Concepts of force, inertia, mass, energy, momentum, charge, potential, fields. Application of the conservation principles to solution of problems involving charge, energy and momentum. Electrical circuit theory, application of Kirchoff's Laws to AC and DC circuits. Uniform circular motion, Kepler's Laws and Rotational mechanics.

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 FL3T3

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

 \pm Results in the percentile range 1-10 at a standard acceptable to the Professorial Board.

Electrical Engineering students may be admitted after consultation with the School of Physics.

As for 1.001 with additional topics: space physics, mechanical properties of real materials, rotational dynamics, physics of biological systems, AC and charged particle dynamics, physics of energy resources and conversion.

1.951 Physics I (Mechanical Engineering) F L2T2

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

Physical properties of solids, liquids and gases: microscopic theory of elasticity, friction, fracture in solids, viscosity in liquids and kinetic theory of gases. Dynamics of solids and fluids: Newton's laws, energy and momentum conservation, rotational mechanics, fluid mechanics. Compressional waves: acoustics. Thermostatic properties of matter: concepts of thermodynamics, thermal properties of liquids and solids. Electric fields and currents: electrostatics, direct-current circuits. Electromagnetism: magnetic forces and fields, electromagnetic induction. Non-steady electric currents, transients in RC, LR and LC circuits, alternating-current circuits. Optics: geometric optics, optical Instruments, interference and diffraction, polarization.

1.961 Physics I (Electrical Engineering) F L3T3

For students in the School of Electrical Engineering.

Electrostatics in vacuum, electrostatics in dielectrics, steady state currents, magnetostatics in vacuum, ferromagnetism, electromagnetic induction, transient currents.

Vectors, motion in one dimension, motion in a^{2,} 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)

FL3T3

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

Aims of physics and its relation to civil engineering. Simple harmonic motion and its relation to wave motion. Electrical and magnetic forces, Electromagnetism DC and AC circuits, bridges. Application of waves to physical optics to explain such phenomena as diffraction, interference and polarization. Holography. Acoustic and mechanical waves, attenuation, velocity of propagation. Elastic moduli. Non-destructive testing, instrumentation, techniques and theory. Emphasis on the physics involved in non-destructive testing and the aspects of vibration important to civil engineering.

Physics Level II Units

1.962 Physics of Measurement (Surveying) S1 L1½T1½

Prerequisite: 1.971.

Resolution, accuracy and sensitivity of instruments. Errors of observation and their treatment. Experimental design. Displacement transducers. Transducers for other mechanical quantities. Thermometry. Electrical noise. Dynamic response of measuring systems. Servo-systems. Mechanical design of apparatus. Microscopes, telescopes and other optical instruments. Lenses, optical fibres and other optical components. Photometry, Colorimetry. Measurements under adverse ambient conditions. Analogue-to-digital conversion. Digital instruments. Measurements of very large and very small quantities.

1.972 Electromagnetism (Electrical Engineering)

S2 L2T2

Prerequisites: 1.961 or 1.001 or 1.011, 10.001. Co-requisites: 10.2111, 10.2112.

Electrostatics in vacuum, Electrostatics in Dielectrics, electric currents, magnetostatics in vacuum, magnetic scalar potential, magnetostatics in magnetic media, time varying fields, Maxweil's equations.

1.982 Solid State Physics (Electrical Engineering) S1 L2T2

Prerequisites: 1.961 or 1.001 or 1.011, 10.001. Co-requisites: 10.2111, 10.2112.

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

1.992 Thermal Physics and Classical Mechanics (Electrical Engineering) F L11/2 T/2

Prerequisites: 1.961 or 1.001 or 1.011, 10.001. Co-requisites: 10.2111, 10.2112.

Kinetic theory, molecular velocity distribution, elementary transport theory, first low 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.

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 L3T11/2

Introduction to computations: principles, use of calculation aids, solution of triangles, areas of plane figures, co-ordinate systems, units of measurement. Introduction to surveying: principles, types of errors, computation of mean and standard deviation. Minor instruments: prismatic compass, clinometers, plane table alidades. Methods of distance measurement: tape measurements, corrections to tape measurements. Angular measurements: construction of theodolite, observation methods for direction and zenith distance measurement.

29.002 Surveying !!

Prerequisite: 29.001.

Traversing: fieldwork, computation and adjustment. Principles of levelling, levels and associated equipment, field and reduction procedures, testing and adjustment of levels. Vertical staff tacheometry: principles, field and reduction procedures for stadia, self-reducing tacheometers. Survey methods for detail and contour surveys.

29.003 Surveying III

Prerequisite: 29.002.

Control surveys, orders of control, Integrated Survey Grid, methods of establishing control, practical considerations. Trigonometrical heighting, observation and reduction procedures. Barometric heighting, principles, field and reduction methods. Introduction to electronic distance measurement, Optical distance measurement. Introduction to single second theodolites.

29.004 Surveying IV

S2 L2T21/2

S1 L21/2 T21/2

S2 L2T3

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 crosssections, mass haul diagrams. Route surveys for roads, railways, waterways, pipe and transmission lines. Adjustments of theodolite and level.

29.005 Surveying V

Prerequisites: 29.121, 29.003.

Electronic distance measurement principles, applications and instruments, propagation of electromagnetic waves, meteorological and geometric corrections, field procedures, instrumental 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

S1 L3T2

Prerequisites: 29.005, 10.341A, 10.341B.

Error theory, expression of uncertainty, testing of observations, applications to design and analysis of surveys. Precise levelling; equipment, field procedures. Project surveys, integrated surveys, surveys for large structures, precise surveys for deformation, measurement and setting out machinery, mining and tunnel surveys, hydrographic surveys.

*Also offered in Session 1, 1980.

29.031 Electronic Distance Measurement 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 tooling, special equipment and techniques, autocollimation, laser interferometry.

29.033 Characteristics of Modern Theodolites and Levels S2 L2T1

Preregulsite: 29.006.

Construction features, sources of error and methods of testing modern optical surveying instruments. Topics selected from: circle and micrometer graduation errors, coded circles, calibration and behaviour of bubbles, automatic compensator systems, axis wobble, temperature effects.

29.034 Mine Surveying

Prerequisite: 29.006.

Statutory regulations. Mine plans and computations in three dimensions. Bore hole surveys. Surface and underground surveys. Transfer of azimuth, shaft plumbing and levelling. Subsidence surveys. Gyrotheodolite. Specialized equipment and techniques.

29.035 History of Surveying S2 L1T2

Historical development of geodesy, astronomy, cartography, photogrammetry, and geophysics. History of general surveying: mathematical aids, optics, instruments, electronic aids for surveyors. Selected topics from history of surveying and land law in Australia.

29.121 Electronics for Surveyors S2 L1T1

Prerequisite: 1.971.

Linear circuits and systems, active circuit elements. Test instruments and electronic measurements. Digital circuits and systems. Data transmissions, recording and display. Systems evaluation.

29.151 Survey Computations I S1 L2T2

Prerequisite: 29.002.

Calculation of areas. Calculations for subdivisions, roadways and curves. Traverse computations including offsets and missing data. Transformations. Spherical trigonometry and its application to survey problems. Resection and intersection: unique and redundant solutions. Computer programming applied to surveying.

29.152 Survey Computations II S1 L2T2

Prerequisite: 29.151.

Review of matrix algebra. General law of propagation of variances, variance factor, statistical testing, error ellipses for points and lines.

Adjustment by least squares: 1. parametric method; 2. condition method. Solution and inversion of normal equations.

29.153 Adjustment of Control Surveys S2 L11/2 T11/2

Prerequisites: 29.152, 29.212.

Adjustment of control surveys on the ellipsoid, Statistical evaluation of the adjustment. Detection of outliers. Design and optimization of networks. Requires use of School computer program library.

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

Prereauisite: 29.161.

S2 L2T1

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.

29.183 Cartography Advanced Elective*

SS L11/2 T11/2

Carlographic Technology: Drawing techniques, scribing techniques, type and symbols, photomechanical methods, screens and masks, colour registration, proofing methods, principles of lithography. Automation of cartographic techniques. Planning and organization.

29.191 Survey Camp I

A one-week field camp equivalent to 42 contact hours. A series of field surveying tasks designed to consolidate the current year's work and serve as an introduction to the following year's work. Tasks include traversing, levelling, stadia, and detail survey measurements for the production of a large-scale plan. Calculations, preparation of plans and reports.

29.192 Survey Camp II

Prerequisite: 29.191.

A one-week field camp equivalent to 42 contact hours. A series of field surveying tasks designed to consolidate the current year's work and serve as an introduction to the following year's work. Surveys for the design of a road alignment, determination of dam capacity and methods of point fixation. Calculations, preparation of plans and reports.

*Offered for the last time in 1979.

29.193 Professional Training**

A five-month period of practical experience including the submission of a report.

In special circumstances, a five-week practical project, supervised by the School, may be substituted. The project is equivalent to 160 contact hours.

29.194 Survey Camp**

A two-week field camp followed by two weeks on campus for completion of computations.

29.195 Survey Camp III

Prerequisites: 29.006, 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

S2 L2T1

S2 L3

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 computations in geodetic reference co-ordinate systems. Review of transverse cylindrical projections. Transverse Mercator projections used in Australia. Scale factor and arc-to-chord corrections on the Transverse Mercator projection.

29.212 Geodesy lif

Prerequisite: 29.211.

Principles of physical geodesy. Satellite applications in gravity determination. Principles of doppier, laser ranging to satellites and the moon, and very long base-line interferometry. Geodynamic applications. Methods of establishing a world geodetic system. Adjustment of control surveys using the condition and parametric methods of least square adjustment for measured angular and linear quantities. The role of the variance-covariance matrix, variance factors and the weight coefficient matrix. Elementary testing of observations and adjusted values.

29.313 Geodesy III

Prerequisite: 29.212.

Topics from: Time variation of geodetic position. Long-term goals of geodesy. Extension of the earth's gravity field into unsurveyed regions. The earth's variable rotation. Atmospheric refraction and its effect on survey measurement. Calculations on the ellipsoid. The conformal projection of the ellipsoid.

29.231 Geophysics for Surveyors S2 L2T1

Interrelationship of geodesy and geophysics. The earth as a celestial body. Rotation and figure of the earth. Earth's interior. Principles of seismology, geohydrology, physical oceanography, tectonophysics, physics of atmospheric processes. Interrelationship of surveying and applied geophysics. Methods of geophysical exploration. Engineering and mining geophysics. Physics of mass movements.

29.232 Atmospheric Effects on Geodetic . Measurements S2 L3

Development of refraction theory. Wave propagation in an inhomogeneous medium. Refractive properties of air. Principles of thermodynamics of gases, boundary and surface layer meterology, structure of atmospheric turbulence. Meteorological measurements. Electromagnetic wave propagation in a turbulent medium.

29.311 Astronomy J

S2 L2T1

S2 L11/2 T1/2

Prerequisites: 29.003, 29.151, 10.341A, 10.341B.

Uses of field astronomy. The solar system, the celestial sphere and the astronomical triangle. Time systems and time keeping. Latitude by circum-meridian and longitude by extra meridian methods. Prediction of observation programs, Evaluation of precision of results. Introduction to the determination of azimuth.

29.312 Astronomy II†

Prereauisite: 29.311.

Determination of azimuth from circum polar, circum-elongation and sun observations. Simultaneous determination of latitude and iongitude 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 co-ordinates, sun dials, celestial methods in navigation.

29.441 Surveying for Engineers

SS L2T4

S2 L2T1

Co-ordinate Systems. Levelling. Theodolite and angular measurements. Distance measurements: steel band, electronic. Traversing. Tacheometry. Contour and detail surveys. Horizontal and vertical curves. Area and volume computations. Control, engineering and underground surveys. Outline of photogrammetry.

**Offered for the last time in 1979. *Also offered in Session 1, 1979. †Offered in Session 1 from 1980.

29.491 Survey Camp

A one-week field camp.

29.511 Photogrammetry I*

Prerequisite: 29.151.

Photographic geometry, relief and tilt effects. Interior orientation. Stereoscogic vision, parallax and height. Collinearity equations and deviations from collinearity encountered in practice. Space resection. Relative orientation: concept, procedure, error effects. Ground control selection and absolute orientation. Stereoplotter principles.

29.512 Photogrammetry II† S2 L2T1

Prerequisite: 29.511.

Review of relative and absolute orientation. Plotting, map compilation, relief representation, map reproduction. Map revision, radial line mapping from a single photo pair. Orthophotos and mosaics. Introduction to photogrammetric control extension, use of auxiliary data. Project planning: costs, scheduling, specifications, photogrammetric production capabilities and limitations. Non-topographic photogrammetry. Analytical methods.

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. Use of auxiliary data. Problems associated with solutions of large systems of equations. Camera calibration. Non-topographic applications.

29.514 Principles of Remote Sensing S1 L2T1

Brief history. Electromagnetic radiation. Definition and physics of basic quantities. Photographic film images and sensors. Electro-optical sensors. Microwave images and sensors. Data systems—ground truth, calibration, sampling, transmission, storage, retrieval, classification enhancement, restoration. Positioning considerations. Examples of operational systems.

29.623 Land Development III**

S2 L2T1

Land and environment. Environmental impact assessment. Cost benefit analysis. Use of McHarg maps. Government environmental policy and procedures. Computers and design. Operations research, application to control and costing of land development projects. Discounted cash flow. Analysis of a major project.

29.631 Land Inventory I

Prereguisite: 27.295.

S2 L21/5 T11/5

S2 L21/2 T1/2

Land inventory surveys: role of surveyors, general procedures. Photo interpretation techniques, aerial photographs and their use and application. Spatial, spectral and temporal variations. Elements of interpretation. Systematic interpretation methods. Sampling methods, the purpose of sampling, sampling procedures. Elementary statistics for areal sampling. Classifloation systems. Reliability of mapped class boundaries. Integrated resource surveys; status of world mapping; concepts and specifications of integrated surveys. Thematic and parametric surveys.

29.632 Land Inventory II S2 L2T1

Prerequisite: 29.631.

Principles and types of spatial information systems. Land and its attributes. Geocoding: concept of a spatial identifier; external index, topological, co-ordinate. Examples of polygon and segment oriented methods. Spatial searching. Use of digitizers. Examination of typical systems. Incorporation of remotely sensed data. Forms of presentation.

29.642 Land Law and Tenure II** S2 L2T1

Development, principles of land registration. Torrens system: detailed examination. Land tenure systems throughout the world. The modern cadastre. General and fixed boundaries. Co-ordinates versus monuments.

29.651 Land Deveolpment I

S1 L2T1

The surveyor's role in land development. Variation of land use and land value and its effect on land development. Urbanization and land use. Location theory in urban areas. Public measures for directing land use. Social, economic and locational determinants of land use. Land on the urban fringe. Introduction to valuation. Factors affecting the value and valuation of land. Valuation principles for land use and subdivision.

29.652 Land Development II S2 L2T1

Prerequisite: 29.661.

Subdivision control in NSW. Broad-acre subdivisions under the Local Government Act, 1919. Procedures and legal controls. Review of subdivision design. Engineering aspects.

29.653 Land Development III S1 L1T2

Prerequisites: 8.712, 29.651, 29.652, 36.411.

Design and studio project for a neighbourhood development. Constraint and site analysis: preparation of maps for land use and vegetation, surface and soils, drainage and terrain, slopes, climate and aspect, composite maps. Structure plan: residential precincts, schools, commercial areas, industrial areas, active and passive recreation, pedestrian ways and

- *Also offered in Session 1, 1979.
- †Offered in Session 1 from 1980.
- **Offered for the last time in 1979.

S2 L1T1

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.

Detailed study of the land development process. Role of local government. Alternative design concepts. Environmental problems associated with land development. Environmental impact statements, theory and methodology. Legal aspects and authorities. Economics as a constraint on development, costs, ranking of investment proposals. Application of quantitative management methods to staging and analysis of development projects.

29.661 Cadastral Surveying and Land Law | S1 L1½T½

The legal system in NSW as it affects the land surveyor. Forms of titles: Old System titles, Torrens titles and Crown lands titles. Land law: legislation, real and personal property, interests and estates in land, riparian rights and conveyancing. The status of roads In NSW. Maritime law. The operation of the cadastre in NSW: an historical introduction, the role of the boundary surveyor and boundary control.

29.662 Cadastral Surveying and Land Law II S2 L2T1

Prerequisite: 29.661.

Practical and legal aspects of cadastral surveying in NSW including: survey and title searching; survey investigation; re-determination of artificial and natural boundaries; related statutes, regulations and case law; the preparation of plans for title surveys; and subdivisions under the Strata Titles Act, 1973 as semended.

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

Prerequisite: 29.662.

Past, present and future of group housing title concepts, Strata and cluster titles in NSW. Strata Titles Act, 1973. The development process related to group housing. Management of strata schemes. Feasibility studies for group housing.

29.700 Professional Orientation S1 L1T1/2

Introduction to the total field of surveying activities and their relationship to associated disciplines. Surveying as the collection, measurement, management and inventory of land related data within a temporal and spatial framework. The provision of a framework within which land and its resources can be located and measured. Introduction to geodesy and position fixing from celestial bodies. Map projections and co-ordinates. Introduction to the use of aerial photographs. Angles and distances in a three-dimensional co-ordinate system. Maps and aerial photographs and their application to resource surveys. Role of consulting surveyor. Brief introduction to cadastral, engineering and land development surveys. Mining and hydrographic surveys. Includes a visit to several surveying establishments.

29.701 Seminar I

S2 L0T1

S1 L0T1

Basic writing and speaking, introduction to the literature of the profession. Oral presentation by individual students on assigned topics in selected areas of surveying.

29.702 Seminar II

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 L1/2 T1/2

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 It

S2 L2T0

Introduction to the social framework of business. Financial accounting methods and interpretation of financial statements. Finance and financial planning with emphasis on projects and small business. General management functions. Introduction to quantitative management methods and their application.

29.705 Management II \$2 L2TO

Prerequisite: 29.704.

S2 L2T1

Professional responsibilities, legal aspects of professional practice. Principles of management and organization. Management functions. Quantitative management methods. Project planning. Introduction to cost benefit analysis. Project and office management.

†Offered in Session 1 from 1980.

29.800 Survey Draughting

S1 L1/2 T21/2

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.

Mapping signs and symbols recommended by the National Mapping Council. Drawing practice in boundary surveying. State regulations.

29.801 Cartography I

S2 L11/2 T11/2

S1 L1%T1%

Mathematical cartography, principles of map projections, characteristics of surveying projections and grids: Universal Transverse Mercator, Australian Map Grid, Integrated Survey Grid. Topographic cartography, representation of features, toponymy, map series, cartometry. Thematic cartography concepts. History of cartography.

29.802 Cartography II

Prereguisite: 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 L11/2 T11/2

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 Builders	and SS L1T1½
29.431	Surveying and Cartograp	ohy SS L2T2½

Graduate Study

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.

C6

C3

C3

29.154G Adjustment of Observations

Choice of the mathematical model. Transformation of the model. Variance/covariance matrix for the observations. Variance factor. Weight of coefficient matrix. Condition method of least squares. Parametric method of adjustment. Statistical tests for the adjustment. Precision of adjusted variates. Error ellipses. Optimization of control surveys. Adjustment in phases. Parametric adjustment with conditions between the observations. Parametric adjustment with conditions between the parameters. Adjustment of minor order control to major control by means of transformations.

29.163G Mathematical Methods I — Numerical Analysis C3

Finite and divided differences, Interpolation formulae, curve fitting. Computational error analysis. Quadrature, numerical integration. Orthogonal polynomials. Fourier analysis. Exponential approximations, Iterative solutions of large blocks of linear equations.

29.164G Mathematical Methods II — Statistics of Observations C3

Advanced applications to survey observations and least square adjustments of frequency distributions, variance, minimum variance, unbiased estimation, central limit theorem, multivariate distributions and statistical testing.

29.165G Mathematical Methods III — Ellipsoidal Harmonics

Vector theorems. Theory of spherical and ellipsoidal harmonics.

29.215G Geometrical Geodesy

Geometry of the ellipsoid. Calculation of geodesics and normal sections of the spheroid: various solutions and their merits. Computation in three dimensions. Atmospheric refraction: wave propagation in a heterogeneous medium, physics of lower atmosphere, calculation of corrections.

29.216G Geodetic Surveying

Review of methods of geodetic surveying. Electronic distance measurement, angle measurement, characteristics of instruments, corrections to observations. Principles of satellite triangulation.

29.223G Dynamic Geodesy

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C3

Orbital motion of near earth satellites; the analysis of satellite orbits for low degree harmonics of the earth's gravitational field; the application of results at the surface of the earth.

29.224G Physical Geodesy

Fundamental equations for the solution of the boundary value problem; telluroid; solutions to the order of the flattening. The gravitational field of the rotating spheroid. The analysis of gravity; extension techniques. Astro-geodetic levelling; comparison of gravimetric and astro-geodetic solutions. The determination of the earth's gravitational field from satellite orbital analysis. The combination of satellite and surface gravity data. Computational data.

29.314G Geodetic Astronomy

Some aspects of precise determinations of latitude, longitude and azimuth. PZT and Danjon astrolabe. The Laplace equation (implications of Black and Gregerson methods). Personal error. Precise timing; radio time signals and recording. Simultaneous determinations. Equal altitude techniques.

29.516G Mathematical Model of the imaging Process

Fundamental relationships, image and object space. Coordinate systems, collinearity equations. Interior orientation, camera calibration methods, direct linear transformation. Deviations from collinearity, use of reseaus. Generation of fictitious photographs. Realtime equations for analytical plotters, trade-offs in formulation. Simple exterior orientation of a single Image. Non-frame sensors, unconventional imagery. Co-ordinate measuring devices,

29.517G Stereophotogrammetry

C3

C3

Fundamental projective relationships, observation procedures, stereoscopic pointing. Relative orientation: empirical and numerical solutions. Absolute orientation; instrumental, numerical, and graphic solutions. Model deformations from errors of interior, relative and absolute orientation. Composite spatial errors. Special cases: partial overlaps, mountainous terrain.

29.518G Analytical Photogrammetric Orientation

Prerequisite: Prior knowledge of FORTRAN computer programming is assumed.

Review of method of least squares. General orientation determination for one and two images. Direct formation of

reduced normal equations. Parameter estimates as observations. Use of constraints. Exterior orientation for analytical plotters. Relative and absolute orientation as special cases. Computer programs.

29.519G Photogrammetric Instrumentation C3

Theory of instruments: comparators, restitution instruments, approximate instruments, ancillary equipment. Testing and calibration of instruments.

29.520G Photogrammetric Production Process C3

Automation. Orthophotography. Physical aspects of photography. Photogrammetric planning, applications of photogrammetry. Digital terrain models.

29.521G Control Extension A

C3

C3

Prerequisite: 29.517G or consent of the instructor.

Early methods of photogrammetric control extension: radial triangulation, stereotemplets, bridging. Strip triangulation by picture connection in space. Method of independent bases. Independent models, perspective centre calibration. Graphic and numerical strip adjustment by polynomials. Analytical strip triangulation. Adjustment of blocks by iterated strip adjustment.

29.522G Control Extension B

Prerequisite: 29.518G.

Simultaneous adjustment of strips and blocks: Anblock, general independent models, bundle method. Combining model and bundle concepts. Solution of large systems of symmetric, strongly diagonal, linear equation arrays: recursive partitioning, relaxation methods. Trade-offs in processing methods for different computer configurations. Computer programs.

29.909G Project

C9

See Graduate School of Engineering Handbook for details of research areas in the School.

29.918G Research Project

C18

See Graduate School of Engineering Handbook for details of research areas in the School.

29.936G Research Project

C36

See Graduate School of Engineering Handbook for details of research areas in the School.

Town Planning

Undergraduate Study

36.411 Town Planning

SS L2T0

7

The urban planning process. Appearance of cities. Historical outline of cities. Levels of planning and types of plans. Ecological land use planning. Regional planning. Metropolitan planning. Neighbourhood planning. Planning law and administration. Social objectives in planning. Environmental Impact assessment. Aspects of housing, new towns, the city centre, and transportation. Futuristic concepts.

Transport and Highways

Graduate Study

The individual subject descriptions are set out below. In a number of cases, the same word or phrase, eg parking, appears in more than one description. Where this occurs, the item should be read in the context of the subject structure, which deals with the same problem from several aspects, eg planning, design, constructions.

24.001G Human Factors in Transport

C3

Human capabilities, ergonomic principles, attitudes to new concepts, planning, the law; application to transport planning, design and implementation. The human as a processor of information, influence on design of transport facilities particularly information displays; signals, signs and lighting.

24.002G Transport, Environment, Community C6

Effect of transport on public health, environment and communities. Analysis of unwanted effects of transport activity: accidents, noise, pollution, intrusion; causation, measurement, preventative and remedial action. Community reaction to transport activity: government, bureaucracy and public involvement in transport policy and environment impact statements.

24.003G Theory of Land Use/Transport

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-, longterm; action planning, strategic planning; local, urban, regional, national).

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C3

C3

24.004G Local Area Transport Planning C3

Application of theoretical methods to local area planning. Local government planning and engineering: pedestrian planning, frontage land use problems, analysis of residential areas, industrial estates, shopping centres and recreational facilities, accessibility studies, environmental studies, parking studies.

24.005G Urban Transport Planning Practice C3

Analytical techniques for urban land use, transport planning practice. Planning methodology: traffic generation, trip distribution, modal-choice, traffic assignment, evaluation. Land use forecasting: calibration and verification of behavioural models, application of mathematical programming models, case studies, public transport problems.

24.006G Regional Transport Planning

The role of transport in economic and social development in regions including Third World countries; historical and contemporary analysis. Analytical techniques for regional planning. Planning practice, feasibilities studies, evaluation methods. Case studies.

24.007G Transport System Design (Non-Urban) C3

Process of location of road, railway and airport facilities. Data collection, alternative routes, public discussion, methods, techniques, aids, plans and diagrams produced. Geometric form: differences between road, railway and airport carriageway layout. Optical guidance, design models, landscape, provision for surface-water signposting, fencing and posts.

24.008G Transport System Design (Urban)

Types of urban transport facilities. Distributors, streets, bicycle routes, walk-oriented areas, bus lanes and rapid transit lanes, stops and change terminals, noise control. Minimum geometric form; speed range controls, provision for surface water on urban roads, landscape. Design of intersections and parking areas.

24.009G Interchange Design

Central projection theory and application to alignment design; perspective drawing methods, introduction to aerial and terrestrial photogrammetry, photomaps and photomontage as applied to transport facilities. Speed change lanes, exit and entrance terminals, ramp types, ramp speeds and design. Interchange location and layout, provision for surface water, signposting. Computer use. Safety measures during maintenance.

24.010G Highway Engineering Practice Part 1 C3

Highway systems and organization. Roles and interaction of public and statutory highway and transportation authorities and research organizations. Sources and administration of highway finance. Highway programming. Feasibility studies. Engineering investigation and planning of highways and interchanges. Factors affecting long-term performance of transport facilities. Definition of design parameters. Factors

24.011G Highway Engineering Practice Part 2 C3

Selection, comparison and critical evaluation of design procedures. Roles of ICES and other computer-oriented engineering systems in highway planning, design and construction. Maintenance systems. Economic modelling, investment costs. Prediction of performance. Implementation and revision of design decisions. Optimal use of resources. Project management for roads and interchanges. Choice of construction techniques. Upgrading of existing facilities, stage construction.

24.012G Economics for Transport Studies

Introductory macro and micro economic theory. The pricing mechanism in transport and distinctive characteristics of transport demand and costs. National income and social accounts with particular reference to the transport sector. Economics of public enterprise. Cost-benefit analysis and modelling. Engineering economics (compound interest) and budget determination. Econometrics. Selected special problems in the economics of transport modes.

C3

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24.013G Transport Economics

Cost and price analysis of each of the transport modes (road, rail, air and sea). Welfare analysis and taxation theory with respect to transport. Economics of location; economics of land use models; regional trade model.

24.014G Transport Systems Part 1

Definition of basic traffic elements, zero flow travel time, capacity, impedance/flow relationship. Transport Networks. The determination of shortest path, maximum flow, in networks. The topological description of networks. System parameters, performance. Application of network analysis to existing road, rail and air transport systems.

24.015G Transport Systems Part 2

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 traffle. Terminals and mode transfer facilities. Development of system operational models. Energy consideration, new systems.

24.016G Traffic Engineering

Road Inventory: traffic measurements; flow, speed, origindestination, accidents, road structure. Road capacity: controlled and uncontrolled Intersections, highways and freeways. Signal systems. Traffic operations and control; arterial and network systems. Parking. Hazard analysis and safety improvements. Enforcement. Bus service operation.

24.017G Transport and Traffic Flow Theory C6

Analysis of deterministic and stochastic models of the traffic stream. Topics covered include the following: Definition and measurement of traffic stream parameters. Space and time distribution of speed. Overtaking models and the movingobserver method. Fundamental diagram of traffic. Carfollowing theory. Headway and counting distributions. Introduction to queueing theory. Simulation techniques. Signalized and unsignalized intersections.

24.018G Statistics for Transport Studies Part 1 C3

Data collection and processing. Probability, variates, sampling of values. Standard distributions, sampling distributions. Inference: point estimation, hypothesis testing and interval estimation; power, confidence, sample size. Regression. Generating functions. Sums of random variables. Distribution-free inferences.

24.019G Statistics for Transport Studies Part 2 C3

Linear models. Analysis of variance and co-variance. Simple and multiple regression. Design of experiments, interpretation of results. Sample survey design and analysis.

24.020G Mathematical Techniques for Transport Studies

Review of special techniques relevant to studies in the transport field including mathematical programming, network analysis, critical path and PERT, decision theory, queueing theory, probability theory.

24.021G Law and Administration

C3

C3

The law relating to the planning and construction of roads and highways and associated works, transport law and regulations, commonwealth, state and local government responsibilities. Relevant sections of acts and ordinances.

24.022G Pavement Materials I C3

As for 8.748G Pavement Materials I.

24.023G Pavement Materials II C3

As for 8,749G Pavement Materials II.

24.024G Pavement Design and Evaluation I C3

As for 8.750G Pavement Design and Evaluation I.

24.025G Pavement Design and Evaluation II C3

As for 8.751G Pavement Design and Evaluation II.

24.026G Bridges and Highway Structure Part I

C3

Systems analysis in the choice of location and structure type of bridges, site investigation, foundation, waterways, aesthetics of design, design and planning constraints, optimum criteria, bridge structure analysis, orthotropic plate theory, articulated plate theory, theories of load distribution, matrix methods of analysis.

24.027G Bridges and Highway Structure Part II C3

Bridge design: concrete, steel, prestressed concrete, culvert design and construction under high fills, foundation, substructure and retaining-wall design, computer programs for design and optimization.

24.028G Transport and Highway Elective C3

An occasional offering in a specialized Transport and Highways topic selected according to current demand and/or availability of a local or visiting specialist.

24.101G Characteristics of Transport

Historical introduction to sea and land transport systems. Description and methods of measurement of performance characteristics of different transport modes: rail, road, sea, air, pipeline, eg capacity, speed range, unit operation costs. Coperating characteristics of terminal and transfer facilities. Cargo and passenger systems, description of cargo characteristics. Inventory, insurance and packaging costs. Criteria for distribution and assignment of cargo and passenger traffic.

24,102G Fundamentals of Transport Economics C6

Introductory economics and economic theory. The pricing mechanism in transport and the distinctive characteristics of transport demand and costs. Economic policy and practices in transport: road, rail, air, sea. Public enterprise economics. Costs and benefits of public investments in transport. Investment criteria, Selected special problems in the economics of transport.

24.103G Introduction to Statistics

C6

Introduction to probability theory. Random variables and distribution functions: binomial, normal and Poisson. Standard sampling distributions χ^2 , t and F. Estimation of confidence intervals. Tests for significance based on above distributions. Introduction to linear regression and least squares adjustment of data.

24.104G Introduction to Traffic Theory C6

Introduction to queueing and congestion theory. Demand and service characteristics. Maintenance and inventory theory. Scheduling and timetabling. Introduction to computer programming and simulation. Traffic patterns. Traffic flow and control: road, rail, air, sea. Traffic capacity: flow-velocitydensity relationships.

24.105G Fundamentals of Transport Planning C6

Generation of traffic, estimation of traffic growth and assignment of traffic to competing traveling modes, Land use and transport interaction.

24.106G Traffic Operation and Control C6

Traffic measurements and data handling. Studies of capacity of roads and intersections, levels of service, delay. Accident analysis and treatments. Traffic service — street lighting and guidance. Principles of traffic design, improvements.

24.107G Soil Mechanics Applied to Road Engineering

Nature and origins of soil. Site investigation, sampling and in-situ testing techniques. Soil classification and its engineering significance. Failure criteria for soils. Stress-strain properties of soils. Consolidation and settlement, improvement of weak soils. Bearing capacity. Movement of water in saturated and unsaturated soils. Design of embankments, slopes and cuttings. Design of earth retaining structures. Foundations for highway structures.

C8

C8

Compaction and soil stabilization. Material specifications. Soil water potential under covered areas. Climatic and topographical factors. Traffic factors. Distribution of wheel loads in layered systems. Response of pavement materials to traffic loading. Design methods for flexible and rigid pavements and overlays for highways and airfields. Evaluation of pavement serviceability.

24.108G Road Engineering Practice

Bituminous Construction: Standard tests for bitumens and tars. Theoretical design of bituminous concrete mixes. The importance of air voids and analysis of constituents of bituminous concrete. Grading of aggregates. Tests for road aggregates. Method of bituminous mix design. The Hubbard Fleid method of bituminous mix design. The Hveem method of bituminous mix design, Difficulties inherent in stability testing. Determination of the proportions of the constituents of a sample of bituminous road material. The forms of road bitumens. Straight run bitumens. Cutback bitumens. Bituminous emulsions. Open textured bitumen.

Highway Law: Highway Law, the law of contracts, definition of a contract, five necessary elements for a valid contract. Operation and interpretation, fundamental principles and established practice, time for performance, discharge or dissolution, remedies for breach of contract, variations. Powers and duties of the engineer, agency, commercial arbitration, approvals, scope of obligations and authority, both legal and ethical, related contracts, carriage of goods by land, insurance, master and servant (contracts of employment), sale of goods, arbitration act.

Contract Documents: Engineering contracts, types of contract, contract documents, general conditions of contract, drawings, specification, schedule or Bill of Quantities, tenders, leiter of acceptance, the agreement, mechanics of execution of a contract, contract law in other countries. Specifications, purpose and relationship to other contract documents, principles of specification writing, basic layout, method of approach and composition, bills of quantities, purpose and relationship to other contract documents, methods of presentation, principles of preparation and standard procedures, units.

Critical Path Planning and Use of Computers in Highway Engineering: Need for construction planning. Introduction to Operations Research. The Critical Path Method, PERT. Use of CPM and PERT in planning, control and supervision. Problem oriented computer languages for CPM and PERT (ICES-PROJECT). Introduction to computers and programming.

Aggregates: Types of aggregates, properties of aggregates, review of available tests, difficulties of testing, relationship between results of arbitrary and fundamental tests, effect of various factors on the result obtained with Los Angeles and aggregate crushing tests, importance and determination of surface texture of aggregate, crushing and preparation of aggregate and factors affecting particle shape, importance of free silica content in crushing, presence of secondary minerals and other factors affecting durability, alkali aggregate reaction, proportioning (blending) aggregates. Quarrying and Plant Selection: Acquisition and administration of plant. Estimating plant productivity: Estimating plant cost. Quarrying, crushing and screening.

24.109G Road Location and Design - Part I C7

Preliminary and final survey, geometric designs of roads for rural and urban conditions, sight distances, stopping distances, passing distances, road gradients, super-elevation horizontal curves, vertical curves, appreciation of visual effects of combinations of horizontal and vertical curves, design models, types of cross section, speed change lanes, median lanes, median openings, design of at grade road junctions, expressways and parkways, types of and design road capacity and level of service. Drawing office examples in design for rural and urban conditions.

24.110G Road Location and Design - Part II C7

Traffic Engineering: Traffic measurements, relation between flow and concentration, speed, sampling, headway distributions and gap acceptance, delays to conflicting streams, car following behaviour, traffic signals (isolated and linked), street lighting, accident studies and traffic control warrants. *Photogrammetry:* Drawing office methods of photo measurement and interpretation, radial line plotting, parallax bar measurements, controlled mosaic assembly.

Town Planning and Landscape Architecture: Analysis of the 20th century town, principles of land use zoning, planning for traffic and transport, public open spaces, the planning of residential areas, planning for industry, visual quality of urban and rural environment, the city centre, vegetation and environment, plant materials, principles of landscape design, examples of landscape design, street and roadside planting, urban sociology.

Hydrology: Urban drainage design, hydraulic design of highway structures, introduction to run off process and estimates, review of and discussion of the theoretical basis for the most important existing methods of calculating culvert and gully sizes.

24.111G Road Construction

C6

Specifications, bills of quantities, engineering drawings for roadworks, feasibility and cost-benefit analyses, supervision of construction, progress payments, cost estimation, construction and personnel management, report writing.

Construction planning, use of critical path methods, setting out roadworks, selection and use of roadmaking plant including fixed and mobile units, quality control.

24.112G Highway Materials

C6

Selection, evaluation and specification of materials for flexible and rigid pavements and for road embankments. Forms and origins of bituminous materials and road tars, laboratory tests, seal-coats, primes and 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 exposives, 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.

24.909G	Project		C9
24.918G	Research	Project	C18
24.936G	Research	Project	C36

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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.

Donor	Value	Year/s of Tenure	Conditions
General			
Bursary Endowment Board*	\$150 pa	Minimum period of approved degree/ combined degree course	Merit in HSC and total family income not exceeding \$4000.
Sam Cracknell Memorial	Up to \$3000 pa payable in fortnightly instalments	1 year	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.

*Apply to The Secretary, Bursary Endowment Board, Box 460, PO, North Sydney 2060 immediately after sitting for HSC.

Undergraduate Scholarships (continued)			
Donor	Value	Year/s of Tenure	Conditions
General (continued)			
Girls' Realm Guild Scholarship	Up to \$1500 pa	1 year renewable for the duration of the course subject to satisfactory progress and continued demonstration of need	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.
Engineering			
Electrical Engineering			· · · · · · · · · · · · · · · · · · ·
The Tyree Electrical Company Pty Ltd	Up to \$4000 over 4 years	1 year renewable for the duration of the course, subject to satisfactory progress	Eligibility for admission to the full-time degree course in Electrical Engineering.
Mechanical Engineering			
The Fox Manufacturing Company	Up to \$1500 pa	1 year renewable for the duration of the course, subject to satisfactory progress	Eligibility for admission to the full-time degree course in Mechanical Engineering.
James Howden & Co Australia Pty Ltd	Up to \$400 pa	1 year	
Surveying			
The Institution of Surveyors, NSW Division	Up to \$250 per session	In parts 4, 5, 6 and 8 of the full-time course	Permanent residence in Australia and eligibility for admission to the full-time degree course in Surveying.

Graduate Scholarships

Application forms and further information are available from the Student Employment and Scholarships Unit, which is located on the ground floor of the Chancellery. This Unit produces the booklet *Graduate Awards*, and also provides information on additional scholarships which may become available from time to time, mainly from funds provided by organizations sponsoring research projects.

Where possible, the scholarships are listed in order of schools within the faculty.

Donor	Value	Year/s of Tenure	Conditions
General			
University of New South Wales Research Awards		1-2 years for a Masters and 3-4 years for a PhD degree	Applicants must be honours graduates (or equivalent). Applications to Registrar by 31 October (30 November in special cir- cumstances).
Commonwealth Postgraduate Research Awards		As above	Applicants must be honours graduates (or equivalent) or scholars who will graduate with honours in current academic year, and who are domiciled in Australia.
	Living allowance of \$4200 pa. Other allowances may also be paid		
Commonwealth Postgraduate Course Awards		1-2 years; minimum duration of course	Preference is given to applicants with employment experience. Applicants must be graduates or scholars who will graduate in current academic year, and who have not previously held a Commonwealth Post- graduate Award. Applications to Registrar by 30 September (in special circumstances applications will be accepted by 30 Nov- ember).
Australian American Educational Foundation Travel Grant*			Applicants must be graduates, senior scholars or post-doctoral Fellows. Appli- cations close 30 September.
Australian Federation of University Women	A total of \$500-\$3200	Up to 1 year	Applicants must be female graduates from any accredited Australian or overseas university.

*Application forms are available from: The Secretary, Department of Education, AAEF Travel Grants, PO Box 826, Woden, ACT 2606.

Donor	Value	Year/s of Tenure	Conditions
General (continued)			
The British Council Commonwealth University Interchange Scheme	Cost of travel to UK or other Commonwealth country university		Applicants must be: 1. University staff on study leave. Applications close with Regis- trar by 30 November, for visits to com- mence during ensuing financial year 1 April to 31 March. 2. Graduate research workers holding research grants. Applications close with Registrar by 31 January for visits to commence during ensuing 1 April to 31 March.
The Caltex Woman Graduate of the Year Scholarship	\$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	2 years	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 quali- ties of character, and accomplishments in cultural and/or sporting/recreational ac- tivities.
Canadlan Pacific Airlines Award for Travel to Canada for University Graduates	One free economy class return flight a year to Canada		Graduates of an Australian University who are Australian citizens or permanent resi- dents. Candidates must have been accepted by a Canadian University, be able to support themselves on a full-time basis, and intend to return to Australia. Applica- tions close with Redistrar by 31 May.
Commonwealth Scholarship and Fellowship Plan	Varies for each country. Generally covers travel, living, tuition fees, books and equip- ment, approved medical expenses. Marriage allowance may be payable.	Usually 2 years, sometimes 3	Graduates who are Commonwealth citizens or British Protected Persons, and who are not older than 35 years of age. Applica- tions close with Registrar by 1 October.
Gowrie Graduate Research Travelling Scholarship	Maximum \$2000 pa	2 years	Applicants must be members of the Forces or children of members of the Forces who were on active service during the 1939-45 War.
Harkness Fellowships of the Commonwealth Fund of New York*	Living and travel allowances, tuition and research expenses, book and equipment and other allowances	Between 12 to 21 months	Candidates must be either: 1. Members of the Commonwealth or a State Public Service or semi-government Authority. 2. Staff or graduate students at an Aus- tralian university. 3. Individuals recom- mended for nomination by the Local Cor- respondents. The candidate will usually have an honours degree and be between 21-30 years of age. Applications close 23 July.

*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.

Graduate Scholarships (continued)			
Donor	Agine		
General (continued)			
Frank Knox Memorial Fellowships at Harvard University	Stipend of \$3600 plus tuition fees pa	2 years	Applicants must be British subjects and Australian citizens, who are graduates or near graduates of an Australian University.
Nuffield Foundation Commonwealth Travelling Fellowships†	Living and travel allowances	1 year	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 Febru- ary.
The Rhodes Scholarship**	£3000 stg pa	2 years, may be extended for a third year	Unmarried male and female British sub- jects, 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.
Rothmans Fellowships Award‡	\$12000 pa	Up to 3 years	The field of study is unrestricted. Applica- tions close early September each year.

Engineering

Harold G. Conde Memorial Fellowship	\$4700	1 year. Renewable up to 3 years	Candidate should be honours graduate permanently domiciled in Australia. The Fellowship is for graduate study or re- search in a field related to the electricity industry.
University Fellowships in Highway Engineering	\$4200 pa plus allowances	Course Work: 1 year Research: 1 year, renewable	The Feilowship enables scholars to com- plete a Master of Engineering Science Course in Highway Engineering, or alterna- tively undertake research leading to a Master of Engineering or PhD degree.
Kenneth W. Craig Memorial Fellowship		1 year	The Fellowship enables scholars to under- take the degree of Master of Engineering Science in the School of Nuclear Engineer- ing.

†Applications to the Secretary, The Nuffleld Foundation Australian Advisory Committee, PO Box 783, Canberra City 2601.
**Applications to Mr H. McCredie, Secretary of the NSW Committee, University of Sydney, NSW 2005.
‡Applications to The Secretary, Rothmans University Endowment Fund, University of Sydney, NSW 2006.

Graduate Scholarships (continued)			
Donor	Value	Year/s of Tenure	Conditions
Engineering (continue	d)		
Australian Institute of Nuclear Science and Engineering Studentships	Single students \$4641 pa. Dependent spouse allowance \$1632 pa, \$390 for each dependent child, plus some University expenses.	1-3 years	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.
Australian Institute of Nuclear Science and Engineering Research Fellowship†	\$11000- \$16 000 pa plus certain travel and supporting grants	Minimum of 2 years. Maximum of 3 years	To enable graduates holding a PhD or similar qualification to undertake graduate work in Nuclear Science and Engineering.
Shell Scholarship in Science and Engineering	£1750 stg pa plus travelling expenses	2 years	Applicants must be unmarried, male, British subjects, 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 success- ful candidate will undertake 2 years ⁻ graduate research leading to the MSc or PhD degree, at a British university.

†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.

Donor/Name of Prize	Value \$	Awarded for
General		
Sydney Technical College Union Award	50.00	Leadership in the development of student affairs, and academic proficiency throughout the course
University of New South Wales Alumni Association	Statuette	Achievement for community benefit — students in their final or graduating year

Undergraduate University Prizes (continued)			
Faculty of Engineering		ವರ್ಷದಿ ಪ್ರಕ್ರಿಧಿಕರು ಕಾರಿಗ ್	
Institution of Engineers, Australia	Medal and 100.00	The most proficient final year (or last 2 years part-time) student in the Bachelor of Engineering (or Bachelor of Science (Engineering)) Degree courses offered by the following Schools: Civil Engineering Electrical Engineering Mechanical and Industrial Engineering Chemical Engineering Mining Engineering Textile Technology (Textile Engineering option only)	
The John Fraser Memorial Award	Advised annually	Excellence in the first year or equivalent part- time years of a bachelor's degree course offered by the Faculty of Engineering	
School of Civil Engineering	***************************************	· · · · · · · · · · · · · · · · · · ·	
Australian Conservation Foundation	50.00	Outstanding performance in subjects which deve- lop environmental management concepts	
Australian Welding Institute	30.00	Best design using a welding process for students in Years 2, 3 or 4	
The Association of Consulting Structural Engineers of New South Wales	20.00 and books to the value of 30.00 20.00 and books to the value of 30.00	General proficiency — Structures in the Bachelor of Engineering degree course in Civil Engineering General proficiency — Structures in the Bachelor of Science (Engineering) degree course in Civil Engineering	
BMI Ltd Systems Engineering	50.00	8.301 Systems Engineering	
Chamber of Manufactures of New South Wales	15.00	Subject selected by Head of School	
Crawford Munro Memorial	150.00	Highest proficiency in 8.582 Water Resources II staken for the first time	
Department of Civil Engineering Materials Staff	50.00	Best aggregate marks in the subjects 8.273 Civil Engineering Materials II and 8.274 Civil Engineering Materials III	
Dillingham Corp of Australia Ltd Prize	100.00	Academic and professional excellence shown in the field of Construction Estimating	
Harbin Polytechnical Alumni Association	50.00	Subject selected by Head of School Contraction	
James Hardie Co Pty Ltd	100.00	Highest proficiency, in 8.571 Hydraulics ${\bf I}_{\rm e}$ taken for the first time	
Hornibrook and a set to a	100.00	Proficiency in Engineering Construction and Man- agement	

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Undergraduate University Prizes (continued)

Donor/Name of Prize	Value \$	Awarded for
School Civil Engineering (continued)		
Rural Bank of NSW	50.00	Outstanding performance in 8.673 Planning and Management II
Water Board Gold Medal	Medal	Public Health Engineering
School of Electrical Engineering		Cold in second
Austral Bronze Crane Copper Ltd	25.00	Bachelor of Engineering Course in Electrical
e mana ser la companya de la company La companya de la comp	25.00	Engineering, Year III Power or Control elective
Chamber of Manufactures of New South Wales	15.00	Subject selected by Head of School
Electricity Supply Engineers Association of New South Wales	40.00	Overall performance including proficiency in Elec- ric Power Distribution in third year full-time or equivalent part-time course.
J. Douglas Maclurcan	30.00	Control Systems
The Wilfred Holmes Memorial Award	120.00	A student eligible to enter the final year of the course and who is deemed to be in necessitous circumstances

School of Mechanical and Industrial Engineering

Atlas Copco	75.00	General proficiency in Bachelor of Engineering course in Mechanical Engineering
Austral Crane Ltd	50.00	Full-time Year III Mechanical Engineering
Babcock & Wilcox Aust Ltd	21.00	ן
Chamber of Manufactures of New South Wales	15.00	Subject selected by Head of School
CSR Limited	50.00	۲۰۰۰ د. ا
Ford Motor Co of Aust Ltd	20.00	Subject selected by Head of School
David Carment Memorial Action	350.00 including medal	Highest proficiency in final year of Naval Archi- tecture course
Harbin Polytechnical Alumni Association	50.00	5.113 Mechanical Engineering Design III
Jeremy Hirschhorn	20.00	Theory of Machines
Royal Institution of Naval Architects	40.00	Bachelor of Engineering or Bachelor of Science (Engineering) degree course in Naval Architecture, final year or stage
Staedtler (Pacific) Pty Ltd	50.00 (order)	General proficiency in Bachelor of Engineering Course in Mechanical Engineering, Year II

Donor/Name of Prize	Value \$	Awarded for
School of Mechanical and Industri	al Engineering	g (continued)
Department of Industrial Engineering		
Austral Crane Ltd	50.00	Bachelor of Engineering degree course in Indus- trial Engineering, Year III
Chamber of Manufactures of New South Wales	15.00	Subject selected by Head of School
R. É. Jefferies Memorial	100.00	Performance in final year/stage of Bachelor o Engineering degree course in Industrial Engineer Ing
TRW Australia Ltd	20.00	Bachelor of Science (Engineering) degree course in Industrial Engineering, Stage 6
School of Surveying		
	141	

Graduate University Prizes

The following table summarizes the graduate prizes awarded by the University.

·		
General		
The Thistlethwayte Memorial Prize	100.00	Best essay in the field of water waste water treatment or water quality management, by MEngSc, MAppSc, ME, MSc student
Maria Constantia		
School of Transport and Highw	ays	
Veteran Motorists of Australia	20.00	Traffic Planning and Control
Wabco Aust Pty Ltd	300.00	Most distinguished graduate in Highway Engin- eering course leading to MEngSc degree
Faculty of Engineering

Staff

Comprises Schools of Civil Engineering, Electrical Engineering, Mechanical and Industrial Engineering, Nuclear Engineering, Surveying, and Transport and Highways.

Dean

Professor H. R. Vallentine

Chairman Professor N. L. Svensson

Administrative Assistant Margaret Leonard, MA III. Professor of Civil Engineering and Head of Department of Engineering Construction and Management Ronald William Woodhead, BE Syd., ME N.S.W., FIEAust, FAIB, MASCE, MAIC, MPMI, MACI, MIQ

Professor of Civil Engineering and Head of Department of Structural Engineering Robert Falcon Warner, ME N.S.W., PhD Lehigh, MIEAust,

MASCE

Professor of Civil Engineering Harold Rupert Vallentine, BE Syd., MS lowa, ASTC, FIEAust

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 Honorary Associates Lance Aubrey Endersbee, BCE ME Melb., FIEAust, FASCE, MAusIMM Desmond Ford Glynn, BCE Melb., MIEAust, MASCE Alexander Wargon, MSc Harv., CE, FIEAust, FASCE, MNZIE

Administrative Officer Robert William Prior

Department of Civil Engineering Materials

Includes Soil Mechanics, Rock Mechanics, Concrete Technology, Plastics and Timber, Pavement Engineering, Continuum and Statistical/Mechanics, Metals and Welding Technology.

Associate Professor and Acting Head of Department Owen Graeme Ingles, BA MSc Tas., CEng, CChem, FRIC, MIEAust, MinstF

Associate Professors

Somasundaram Valliappan, BE Annam, MS Northeastern, PhD Wales, MASCE

Geoffrey Baldwin Welch, BE Svd., ME N.S.W., CEng, MICE, FIEAust

Senior Lecturers

William Henry Cogill, MS Cape 7, and Camb., PhD N.S.W., FIEAust MICE

David John Cook, BE W.Aust., MSc PhD Calg., MIEAust, AMASCE, APIA

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, William Otho Yandell, ME PhD N.S.W., MIEAust

Lecturers (時時人)学長 ほうずい ちみつう

Stephen John Hain, BE Syd., PhD N.S.W. Arthur William Manton-Hall, BE MEngSc N.S.W., MIEAust Harry Taylor, BSc(Eng) Birm., DipNA&AC Syd. John Maurice Wheatley, MA PhD Camb., FIM, FAusWI, MAusIMM, MWeld(Lond), AFAIM Weeks White, BSc BE Syd., MIEAust Stephen Ross Yeomans, BSc PhD N.S.W., CEng, MIM

Teaching Fellow

Angelo Cipullo, DrGeolSci Rome

Professional Officers

Parameter States and States David Edwin Hattersley, MSc N.S.W., ASTC Trinh Cao. BE Monash Ghodratoliah Tamaddoni, BEngAg Tehran, DAgSc Gembloux

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Department of Engineering Construction and Management

Includes Systems Engineering, Engineering Economy, Project Planning and Management.

Associate Professor Alan Frank Stewart Nettleton, BSc BE Syd., ME N.S.W., DIC Senior Lecturers

Arthur Gordon Douglas, ME N.S.W., PhD Mich.State, MIEAust Lawrence Vincent O'Neill, BE Syd. Victor John Summersby, BE MEngSc N.S.W., ASTC, MIEAust

Lecturers

Graham Rush Easton, BSc BE Syd., MEngSc Birm. Jonathan Brian O'Brien, BE N.S.W., MASc Tor., MIEAust Stephen Joseph Symonds, BSc BE MTCP Syd., MEngSc N.S.W., MIEAust

Tutors

Ian Robert McIntyre, BE N.S.W., GradiEAust, AMASCE Michael John McMahon, BBuild N.S.W., AAIB

Professional Officer

Frederick Adrian John Stein, ED, BE N.S.W., GradlEAust, AMASCE

Analyst Programmer Eleanor Ruth Langley, BA Svd., MACS 1.2.2.2

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Department of Structural Engineering

a na hara waa Includes Structural Analysis, Structural Design, Stress Analysis and Solid Mechanics. - 8 - 18 - ¹²

Associate Professora

Horace Joseph Brettle, BE Svd., PhD N.S.W., DIC, ASTC. FIEAust Kenneth Alan Faulkes, ME N.S.W., MS III., PhD N.S.W., MIEAust Robert Alexander Frisch-Fay, DiplEng Bud., ME N.S.W., MIEAust Algis Kabaila, MEngSc PhD N.S.W., FRMTC, MIEAust, MASCE Rupert Whitfield Traill-Nash, BE W.Aust., PhD Brist., CEng,

Senior Lecturers

MIEAust, MRAeC

Peter Stephen Balint, DiplEng Bud., ME N.S.W., MIEAust Donald John Fraser, MEngSc PhD N.S.W., ASTC Alex Cuthbert Heaney, BE MEngSc Melb., PhD Wat., MIEAust, MASCE, AMICE Jack Lachlan Jenkins, BE Syd., ME N.S.W., DIC, ASTC, MIEAust Victor Andrada Pulmano, BSCE Philippines, MEng A.I.T. PhD Northwestern B. Vijaya Rangan, BE Madr., PhD I.I.S.B'lore, MASCE, Contract States MIFAust and the second $(1,1) \in \{1,2\}$ Ian James Somervaille, BE PhD N.S.W., ASTC

Lecturers

Raymond Ian Gilbert, BE N.S.W. 2000 (2010) 2010 (2010) Peter Walder Kneen, BE Melb., PhD Wat., MIEAust Raymond Eric Lawther, BE PhD N.S.W. 2010, 2010 (2010) 2010 (2010) (2010) (2010) (2010) (2010) (2010)

Teaching Fellows

Henry Edward Ah Cann, BE N.S.W. Maria Attard, BE N.S.W. Russell Forester Staley, BSc *Leeds*

Professional Officers

Kim Small, BSc Syd. John Wesley Carrick, BE N.S.W.

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Department of Water Engineering

Includes Hydraulics, Hydrology, Public Health Engineering, Water Resources Engineering, and the Water Research Laboratory.

Associate Professor and Head of Department Bernard William Gould, BE Tas., ME N.S.W., MIEAust

Associate Professors

Douglas Neil Foster, BE Syd., MIEAust				
David Herbert Pilgrim, BE PhD N.S.W., FIEAust		÷.,-	÷	
Keith Kingsford Watson, BE Syd., ME PhD DSc.	N.S.	W.,		
	т 	1979. 1980.		
Senior Lecturers				
David Barnes, BSc PhD Birm., MIWSE, AMICE				

Ian Cordery, ME PhD N.S.W., MIEAust Colin Raymond Dudgeon, ME N.S.W., MIEAust, MASCE Trevor Regis Fletz, ME N.S.W. David Trewhella Howell, BE Syd., ME N.S.W., MIEAust, MAIAS John Robert Learmonth, BE Syd., ME N.S.W.

David Lyon Wilkinson, BE Syd., PhD N.S.W., MIEAust

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Tutor

Roger Benson Tomlinson, BE N.S.W., GradlEAust

Teaching Fellowick and Automatical States and Automatical Periods and Periods

Professional Officers

David George Doran, BE DipCompSc *Qld.*, MEngSc *N.S.W.* Kenneth Brian Higgs, MSc *Aston*, MAIP

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School of Electrical Engineering

Professor of Computer Science and Head of School Murray William Allen, BE Adel., PhD Syd., CEng, FIREE, MIEE, MIEEE

Professor of Electrical Engineering—Communications Antoni Emil Karbowiak, DSc(Eng) Lond., CEng, FIEAust, FTS, FIREE, MIEE

Professor of Electrical Engineering—Systems and Control Neville Waller Rees, BSc PhD Wales, FIEAust

Tyree Professor of Electrical Engineering—Electric Power Engineering Frederic John Evans, BSc BE Syd., CEng, FIEE, FIEAust

Visiting Professor—Solid State Electronics Louis Walter Davies, AO, BSc Syd., DPhil Oxf., SMIEEE, FinstP, FAIP, FIREE, FTS, FAA

VeBalls of Mickel Contact And Algebra Alexandra Professor of Electrical Engineering—Electronics Vacant Vacant

Professor of Electrical Engineering Rex Eugene Vowels, ME Adel., SMIEEE, CEng, FIEAust, MIEE

Executive Assistant to Head of School Colin Arthur Stapleton, BSc BE Syd., CEng, MIEAust, MIEE, MIEEE

Senior Administrative Officer Halsey George Phillips for a first first for the senior of the senior

DUA: Report source to object Senior Tutor SERVICEN AND AND DUAL SOURCE Geoffrey Nicholas Horton Weistley, BEng L/v., MIEEE

Tutors

Stuart William Britton, BE N.S.W. David Athol Carrington, BSc N.S.W. Brian Louis Cohen, BSc N.S.W. Harvey Albert Dillon, BE N.S.W. Douglas James Follett, BE N.S.W. Peter Garde, BE MEngSc Monash Gregory Charles Hurst, BSc BE N.S.W. Graham Reginald Hellestrand, BSc N.S.W. Peter Anthony White, BE N.S.W.

Teaching Fellow Sui Cheong Albert Poon, BE N'c/e.(N.S.W.), HDip H.K.Poly

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The Bao Vu, BE PhD Adel., SMIEEE

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Israel Korn, MSc DSc Technion, Haifa

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Christopher John Elliott Phillips, BSc BE PhD Syd., MIEE, MIEEE, MIREE

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Gregory Joseph Johnson, MSc Syd., SMIEEE, CEng, MIEE, AAIP

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School of Mechanical and Industrial Engineering

Nuffield Professor of Mechanical Engineering, Head of School and of Department of Fluid Mechanics/Thermodynamics Raymond Alfred Arthur Bryant, ME N.S.W., ASTC, CEng, FIMechE, FIEAust, MRAeS

Professor of Mechanical Engineering (on leave) Peter Thomas Fink, CBE, BE Syd., CEng, FTS, FIEAust, FIMechE, FRAeS, FRINA, MAIAA

Sir James Kirby Professor of Production Engineering and Head of Department of Industrial Engineering Peter Louis Brennan Oxley, BSc PhD Leeds, CEng, FIProdE, FIEAust, MIMechE

Professor of Operations Research George Bennett, BA Syd., PhD N.S.W., ASTC, CEng, FIProdE

Professor of Mechanical Engineering and Head of Department of Applied Mechanics Noel Levin Svensson, MMechE PhD Melb., CEng, FIEAust, MIMechE, AMIM, MSESA

Department of Systems and Control

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Honorary Associate Cyril Arthur Gladman, BSc(Eng) Lond., ACGI, CEng, FIProdE, MIMechE, MIED

Tutor Hoong Gheow Wong, BE N.S.W.

Teaching Fellows Thao Doan, BE N.S.W. See Seng Leong, BE N.S.W. Lyle John McLean, BSc(Eng) MEngSc N.S.W., GradlEAust Nan Hung Pan, BE N.S.W.

Engineering

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Lecturers

John Edward Baker, MSc Syd., BE MEngSc PhD N.S.W. Kerry Patrick Byrne, BE MEngSc Qld., BSc Melb., PhD S'ton Raymond Albert Vincent Byron, BE Syd., CEng, MRAeS, MAIAA George Crawford, BE BSc N.S.W., ASTC, CEng, FIEAust, ARACI

Ronald Arthur Dennis, MSc *Nott.*, CEng, MIMechE Robin Arthur Julian Ford, BSc(Eng) PhD *Lond.*, ACGI Richard Butler Frost, BE *N.S.W.*, GradIEAust

Knut Kjorrefjord, BSc Durh., CEng

Farrokh Mistree, BTech I.I.T. Kharagpur, MS PhD Calif. Donald Jabez Stephen Mudge, BSc Lond., CEng, MIMechE, MIEAust, WhSc

Hugh Lithgow Stark, BSc PhD Strath., CEng, MIMechE, MIEAust

Jae Lin Woo. BSc Seoul, SM M.I.T., PhD N.S.W.

Department of Fluid Mechanics and

Department of Agricultural Engineering

Senior Lecturer

Harold Glenn Bowditch, ME N.S.W., ASTC, MIEAust

Associate Professors

Thermodynamics

Richard Douglas Archer, BSc Melb., BE Syd., MS PhD Minn., FBIS, MIEAust, MAIAA, MRAeS

Includes Aeronautical Engineering and Naval Architecture.

Graham de Vahl Davis, BE Syd., PhD Camb., CEng, FlMechE, FlEAust, MASME

Senior Lecturers

Michael Richard Davis, BSc(Eng) PhD S'ton, CEng, MRAeS Lawrence Julian Doctors, BE MEngSc Syd., PhD Mich., AMCASI, AMSNAME

John Newton Hool, BE Syd., DPhil Oxf., ASTC, CEng, FIMechE, MIEAust

Owen Francis Hughes, SB SM(NavArch) M.I.T., PhD N.S.W.,. MIEAust, MRINA, MSNAME

Robert Taggart Black McKenzie, MS ME Purdue, CEng, ARCST(Glas), FIMechE

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This Handbook has been specially designed as a source of reference for you and will prove useful for consultation throughout the year.

For fuller details about the University—its organization, staff membership, description of disciplines, scholarships, prizes, and so on, you should consult the Calendar.

The Calendar and Handbooks also contain a summary list of higher degrees as well as the conditions for their award applicable to each volume.

For detailed information about courses, subjects and requirements of a particular faculty you should consult the relevant Faculty Handbook.

Separate Handbooks are published for the Faculties of Applied Science, Architecture, Arts, Commerce, Engineering, Law, Medicine, Professional Studies, Science (including Biological Sciences and the Board of Studies in Science and Mathematics), the Australian Graduate School of Management (AGSM) and the Board of Studies in General Education.

The Calendar and Handbooks are available from the Cashier's Office. The Calendar costs \$3.50 (plus postage and packing, 90 cents). The Handbooks vary in cost. Applied Science, Arts, Commerce, Engineering, Professional Studies and Sciences are \$2.50. Architecture, Law, Medicine and AGSM are \$1.50. Postage is 40c in each case. The exception is General Studies, which is free.