The University of New South Wales
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Engineering

1988
Faculty Handbook
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Information in this Handbook has been brought up to date as at 8 September 1987, but may be amended without notice by the University Council.

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### 1988

- **22 April**: Last day for students to discontinue without failure subjects which extend over Session 1 only
- **12 August**: Last day for students to discontinue without failure subjects which extend over the whole academic year
- **23 September**: Last day for students to discontinue without failure subjects which extend over Session 2 only
Staff

Comprises Schools of Civil Engineering, Electrical Engineering and Computer Science, Mechanical and Industrial Engineering (incorporating Aeronautical Engineering, Naval Architecture and Nuclear Engineering), and Surveying; and Centres for Biomedical Engineering, Manufacturing and Automation, and Safety Science.

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Associate Professor B. C. Forster

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Vacant

Professor of Computer Science
Vacant

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Claude Anthony Sammut, BSc PhD N.S.W.

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Sir James Kirby Professor of Production Engineering
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Yefim Koltyar, BMechEng Moscow Mach. Inst.
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Russell Norman Overhall, BE N.S.W.
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Robin Arthur Julian Ford, BSc(Eng) PhD Lond., ACGI, MIE Aust
Richard Butler Frost, BE N.S.W., CEng, FIE Aust
Chakravarti Varadarajan Madhusudana, BE Mys., ME I.I.Sc., PhD Monash, MIE Aust
Hugh Lithgow Stark, BSc PhD Strath.; CEng, FIMEchE, MIE Aust
Richard Adrian Willgoss, BSc PhD S’ton., CEng, MIEE, MInstP

Lecturers
Masud Behnia, BSc ME Purdue, MASME, MIAA, MIE Aust

Department of Fluid Mechanics and Thermodynamics

Includes Aeronautical Engineering, Naval Architecture and Nuclear Engineering.

Associate Professors
Richard Douglas Archer, BSc Melb., BE Syd., MS PhD Minn., FBIS, FRAAS, MIE Aust, MIAA
Paul Robert Barrett, MSc PhD Birm., CPhys, FAIP, MInstP
Graham de Vahl Davis, BE Syd., PhD Camb., CEng, FIMEchE, FIE Aust, MASME
Lawrence Julian Doctors, BE MEngSc Syd., PhD Mich., MRINA, AMSNAME
Zdenek Josef Holy, Dipl Ing Prague, MSc Birm., MEngSc PhD N.S.W., MIE Aust
Owen Francis Hughes, SM SM(NAV Arch), M.I.T., PhD N.S.W., MIE Aust, MRINA, MSNAME
Brian Edward Milton, BE PhD N.S.W., MSc Birm., CEng, MIE Aust, MRAes
Graham Lindsay Morrison, BE PhD Melb.

Senior Lecturers
Donald Wainwright Kelly, BE Syd., PhD Lond.
Leslie George Kemeny, BE Syd., MIE Aust, FAIE, MACS
Eleonora Maria Kopaliniszky, BE PhD N.S.W.
Eddie Leonard, BSc(Eng) PhD N.S.W., MIE Aust, MA RAH, AMASHRAE
John Randall Page, BSc Hat., MSc Cran.I.T., CEng, MRAes, FBTS
Prabhat Kumar Pal, BME N.C.E., Bengal, BTech PhD Kharagpur, FRINA, FIE Aust, MIINA, MSTG(Hamburg)
John Arthur Reizes, ME PhD N.S.W., MIE Aust

Department of Industrial Engineering

Comprises Operations Research and Production Engineering.

Associate Professor
Bruce Albert Murtagh, ME Cant., PhD DIC Lond., CEng, MChemE, MIE Aust

Senior Lecturers
Leonard Edward Farmer, BE MEngSc PhD N.S.W., MIE Aust
Roger Malcolm Kerr, BSc Lond., MSc Bath, DPhil Oxf.
Grier Cheng I Lin, DipMechEng Natn. Taiwan I.T., PhD N.S.W., MIEAust
Graham Smith, BE MEngSc PhD N.S.W., ASTC, MIEAust, MACS

Lecturers
Peter Robin Gibson, BSc PhD Lough.
Daniel Goodridge, Dipl IngChem L'Aurore, Shanghai,
DipindEng N.S.W.
Philip Mathew, BE PhD N.S.W., MIEAust

Centre for Manufacturing and Automation

Director
Dr. G. C. I. Lin

Lecturer
Khoi Hoang, BE Saigon, PhD N.S.W.

Professional Officers
Jason Trihung Nhuie, BSc Nat Cheng Kung, MEngSc N.S.W., MIEAust
Alfred Win Lin Hu, BE Rangoon I.T., MIEEE, AIREEE.

School of Surveying

Professor of Surveying and Head of School
Friedrich Karl Brunner, Diplng DrTech T.U. Vienna

Professor of Surveying (on leave)
Peter Vincent Angus-Leppan, BSc(Eng) Rand., PhD DiplTP Natal,
FIAust, MILS(Natal), MAIC

Associate Professors
John Stuart Allman, AM, BServ PhD N.S.W., MISAust, MAIC
Bruce Crosby Forster, MServ Medb., MSc R'dg., PhD N.S.W.,
MISAust, LS(Vic), MASPNG
Artur Stolz, BServ PhD N.S.W., RegSurv(NSW)
John Charles Trinder, BServ PhD N.S.W., MSc I.T.C. Deift,
RegSurv(NSW), FIAust

Senior Lecturers
Arthur Harry William Kearsley, BServ MServSc PhD N.S.W., MISAust
Anthony John Robinson, BServ MBA PhD N.S.W., RegSurv(NSW),
MISAust, MAIC
Jean Marc Rueger, Dipl Ing E.T.H. Zurich, PhD N.S.W., SIA, ACSM
LS(Switz), MISAust

Lecturers
Pratap Shivabhai Amin, BSc I.T.C. Deift, MSc Lond., MISK, CLSEA,
ARICS
Leonard Berlin, BSc(LS) Cape T., BSc I.T.C. Deift
Sabapathy Ganeshan, BSc Ceyl.
Gary Alan Jeffress, BServ MServ N.S.W., RegSurv(NSW), MISAust,
MSISVS'pore
Ewan Gerald Masters, BServ PhD N.S.W., MISAust
John Richard Pollard, BSc Qld., BTech S.A.I.T.
Christopher Rizos, BServ PhD N.S.W.

Administrative Assistant
Leon Daras, BA N.S.W.

Professional Officers
Brian Edward Donnelly, BServ N.S.W., RegSurv (NSW), Grad
Basil Lai, BSc Be Syd.
Tat Ming Lau, BE N'cle.(N.S.W.)
Robert William Pascoe, BServ N.S.W.

Analyst/Programmers
Mohammad Hadi Aghakhani, BSc Sh.U.T. Tehran,
MSc Colorado State, MEngSc N.S.W.
Bernd Hirsch, BApplSc M.C.A.E.

Centre for Biomedical Engineering

Honorary Visiting Professor and Honorary Director
Peter Craig Farrell, BE Syd., SM M.I.T., PhD Wash., DSc N.S.W.,
MASAIO, MISAO

Assistant Director
Klaus Schindhelm, BE PhD N.S.W., MIEAust, MASAIO

Senior Lecturer
Christopher David Bertram, MA DPhill Oxf.
Bruce Kenneth Milthorpe, BA Macq., PhD A.N.U.

Lecturers
Alberto Pompeo Avolio, BE PhD N.S.W.
Ross Alexander Odell, BSE Princeton, PhD M.I.T.

Professional Officer
Laura Anne Poole-Warren, BSc N.S.W.
Engineering

Administrative Assistant
Rhonwen Mooney, BA DipSocWk Syd.

Honorary Visiting Fellow
Tibor Timothy Vajda, DDS Bud., FRSM, FACBS

Centre for Safety Science

Director
Associate Professor Michael Geoffrey Stevenson, BSc(Tech) PhD N.S.W.,
ASTC, CEng, FIEAust, MIProdE

Senior Lecturers
Neil Leon Adams, BSc PhD N.S.W.
*Edward Maxwell Nicholls, MD BS Adel.
Ronald Rosen, MSc N.Z., PhD N.S.W., CPhys, FInstP, FAIP, MACPSM

Lecturer
Keith Post, BE PhD N.S.W.

Honorary Visiting Fellow
Derek Broadbent, BSc Birm., MEngSc PhD Metb., SMIEEE, FIREEEAust,
MIEAust, MIIEE

*Conjoint appointment with the Faculty of Medicine.
Foreword

This handbook provides information on courses of study offered by the Faculty of Engineering, at both undergraduate and graduate levels, together with descriptions of subjects available and areas in which research may be undertaken.

The Faculty consists of the Schools of Civil Engineering, Electrical Engineering and Computer Science, Mechanical and Industrial Engineering, Surveying and the Centres for Biomedical Engineering, Manufacturing and Automation, and Safety Science. The Faculty is also closely associated with the Joint Microelectronics Research Centre and the Centres for Groundwater Management and Hydrogeology, Remote Sensing, and Waste Management. The three latter Centres are joint enterprises of the Faculties of Engineering and Applied Science.

The Faculty is dedicated to the achievement of excellence in scholarship, teaching and research in technology and its application for the benefit of the community. The goals of the Faculty are to:

1. provide undergraduate, graduate and continuing education programs, and to undertake research, in the professional fields of engineering and surveying;
2. provide formal and continuing education programs, and to undertake research, in interdisciplinary fields in which engineering science and practice play a prominent role;
3. aid the advancement, development and practical application of science and technology to satisfy the needs of industry, commerce, the infrastructure of society and the efficient management of resources.

Achievement of these goals will develop the attitudes and skills required of professional engineers operating into the twenty-first century.

Schools within the Faculty offer undergraduate courses leading to the award of the degree of Bachelor of Engineering (BE) in Aeronautical Engineering, Civil Engineering, Electrical Engineering, Industrial Engineering, Mechanical Engineering and Naval Architecture and Bachelor of Surveying (BSurv). Combined degree courses are also available which lead to the award of two degrees: Bachelor of Engineering and Bachelor of Science (BE BSc) and Bachelor of Engineering and Bachelor of Arts (BE BA).

Through its schools and centres, the Faculty offers an active graduate program. Formal graduate courses are available which lead to the award of the degrees of Master of Biomedical Engineering (MBiomedE), Master of Engineering Science (MEngSc), Master of Safety Science (MSafetySc), Master of Surveying Science (MSurvSc) and to the award of a Graduate Diploma. Supervision is also available for candidates undertaking research degrees leading to the awards of Master of Engineering (ME), Master of Science (MSc) and Doctor of Philosophy (PhD).

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

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

As part of their training for the profession, students are required to write reports and make verbal presentations. Therefore a high level of competence in written and spoken English expression is expected.

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

N.L. Svensson
Dean
Faculty of Engineering
Faculty Information

Some People Who Can Help You

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

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

School of Electrical Engineering and Computer Science: Dr. C. J. E. Phillips, Room G6, or Ms A. G. M. Johnson, School Office, Electrical Engineering and Computer Science Building.

School of Mechanical and Industrial Engineering: Associate Professor J. E. Baker, Room 105B, or Mr G. Dusan, Room 107, Mechanical and Industrial Engineering Building.

School of Surveying: Mr L. Daras, School Office, Room 529, Geography and Surveying Building.

Centre for Biomedical Engineering: Dr K. Schlindhelm, 34-36 Botany Street, Randwick, NSW 2031.

Centre for Groundwater Management and Hydrogeology: Dr. M. J. Knight, Room 810, Applied Science Building.

Centre for Manufacturing and Automation: Dr G.C.I. Lin, Room 423, Mechanical and Industrial Engineering Building.

Centre for Remote Sensing: Associate Professor B.C. Forster Room 247, Geography and Surveying Building.

Centre for Safety Science: Associate Professor M.G. Stevenson, Room G07, Mechanical and Industrial Engineering Building.

Centre for Waste Management: Mr E. Claus, Room 112, Civil Engineering Building.

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

Faculty of Engineering Enrolment Procedures

All students re-enrolling in 1988 or enrolling in graduate courses should obtain a copy of the free booklet Enrolment Procedures 1988 available from School Offices and the Admissions Office. This booklet provides detailed information on enrolment procedures and fees, enrolment timetables by Faculty and course, enrolment in miscellaneous subjects, locations and hours of Cashiers and late enrolments.

Faculty of Engineering Library Facilities

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

The Physical Sciences Library

This library, situated on Levels 6 and 7 of the Library tower, caters for the information needs of staff, graduate and undergraduate students in the pure and applied sciences, engineering and architecture. Details of the books, serials and microforms in the Physical Sciences Library are included in the microfiche monograph and serial catalogues and the items themselves are identified by the prefix 'P'.
Serial with the prefix 'PJ' are not loan, but self-service photocopying facilities are available on Level 7.

This library provides reference, reader assistance and reader education services and also, where appropriate, inter-library loan and literature-searching services. Trained staff are always available on Level 7 to assist readers with their enquiries.

Physical Sciences Librarian Marian Bate

**Undergraduate Services**

- The undergraduate collection caters for the needs of students in Years 1 and 2 and other groups where large numbers require mass teaching. Levels 3 and 4.

- The Open Reserve Section houses books and other materials which are required reading. Level 2.

- The Audio Visual Section contains cassette tapes, mainly of lectures and other spoken word material. The section has wired study carrels and cassette players for student use. Level 3.

- The Reader Education program provides orientation tours and introductory library research method lectures to students.

**Student Clubs and Societies**

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

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

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

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

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

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

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

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

**The Institution of Engineers, Australia**

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

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

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

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

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

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

The Institution of Surveyors, Australia

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

Course Transfers

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

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

General Rules for Progression

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

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

2. Students must satisfy the rules governing re-enrolment: in particular, these require students enrolled in the first year of a degree program to pass in at least half that program. Students are also required to show cause why they should be allowed to repeat a subject which has been failed more than once. Students are also required to show cause why they should be allowed to continue with their course if their average mark in a year of study falls below 50%.

3. Students must satisfy the relevant prerequisite and co-requisite requirements. This will usually necessitate students 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 students be permitted to enrol in subjects extending over more than two years of the course or for more than twenty-eight hours of course work per week if a full-time student or fourteen hours per week if a part-time student. Students repeating subjects are required to choose a program which limits their hours of course work to twenty-two per week if a full-time student, and to eleven per week if a part-time student, unless they have the express permission of the Head of School to exceed these hours.

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

Prerequisites and Co-requisites

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

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 which 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.
The Faculty of Engineering offers courses leading to the award of the degrees of Bachelor of Engineering (BE) in Aeronautical, Civil, Electrical, Industrial and Mechanical Engineering and Naval Architecture. Courses are also offered leading to the award of the degrees of Bachelor of Surveying (BSurv) and Bachelor of Surveying Science (BSurvSc). The BE courses are available on a full-time or part-time basis or in sandwich form after first-year (with the exception of courses offered by the School of Mechanical and Industrial Engineering). The BSurv and BSurvSc courses are available for full-time study and in a sandwich form. The full-time courses are designed to be taken over a period of four years, whereas part-time study usually involves a combination of day-time and evening attendance over a period of six or seven years. It may not be possible to offer evening classes in the later year subjects. The sandwich pattern provides for alternate periods of full-time study and full-time employment with part-time study.

The three major subject areas in engineering and surveying courses are basic sciences, engineering sciences and engineering applications. The basic sciences area is emphasised in Year 1 since it forms the foundation for the remainder of the course. Engineering sciences form the link between the basic sciences and engineering applications. The engineering applications area provides the opportunity for applying knowledge to the solution of problems and is consequently emphasised later in the course. A feature of the courses at the University of New South Wales is the inclusion of a program of General Studies, the requirements for which are set out below.

Basic Sciences consist of Mathematics, Physics and some Chemistry. Engineering Science subjects are those which provide the theoretical basis for engineering applications. These include Applied Mechanics, Fluid Mechanics, Electronics, Electricity, Thermodynamics, Structural Mechanics, Materials Science. Engineering Applications involve Innovation and Design, Systems and Control, Production, Technical Communication, Energy Conversion, Management. General Studies subjects serve to provide both an introduction to the environments in which human beings exercise some influence and control.

Combined Courses

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

General Studies Requirement

The University requires that undergraduate students undertake a structured program in General Studies as an integral part of studies for their degree.

Among its objectives, the General Studies program provides the opportunity for students to address some of the key questions they will face as persons, citizens and professionals.

A new General Education program, administered by the Centre for Liberal and General Studies, was introduced in 1988.

The program requires students to undertake studies in three areas:

1. An introduction in non-specialist terms to an understanding of the environments in which humans function.
2. An introduction to, and a critical reflection upon, the cultural bases of knowledge, belief, language, identity and purpose.
3. An introduction to the development, design and responsible management of the systems over which human beings exercise some influence and control.

Subjects in categories 1 and 2 are in preparation. The exact form of category 3 is still being decided and should be clearly defined by the end of 1988. This could involve, however, a slight subsequent change to the structure of the later years of degree programs.

There are differing requirements for students commencing before and from 1988:

Students who commenced their undergraduate program before 1988.

Students must complete a program of General Studies in accordance with the requirements in effect when they commenced their degree program. Students yet to complete their General Studies requirement may select subjects from any of the three categories of the new program.

Students commencing their undergraduate program in 1988 and following:

Students must complete a program of subjects selected from each of the three categories of study in accordance with the rules defined in the General Studies Handbook and in sequences specified in the requirements for individual courses.

Further information may be obtained from the office of the Centre for Liberal and General Studies, Room G56, Morven Brown Building, and the General Studies Handbook.
Entrance Requirements

Students are selected for courses offered by the Faculty according to the scaled aggregate mark obtained in the New South Wales Higher School Certificate (NSW HSC). Other students are admitted on the basis of their previous academic studies which are related to the equivalent NSW HSC aggregate mark. In addition, students are expected to have reached the following standards (or equivalent) in the NSW HSC subjects:

<table>
<thead>
<tr>
<th>Course</th>
<th>NSW HSC Prerequisites for First-Year Subjects</th>
<th>NSW HSC Score Requires</th>
</tr>
</thead>
<tbody>
<tr>
<td>Engineering:</td>
<td>2u Mathematics or</td>
<td>60 - 100</td>
</tr>
<tr>
<td>Aeronautical</td>
<td>3u Mathematics or</td>
<td>1 - 50</td>
</tr>
<tr>
<td>Civil</td>
<td>4u Mathematics</td>
<td>1 - 100</td>
</tr>
<tr>
<td>*Electrical and</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Industrial</td>
<td>2u Science (Physics) or</td>
<td>53 - 100</td>
</tr>
<tr>
<td>Mechanical</td>
<td>3u Science</td>
<td>90 - 150</td>
</tr>
<tr>
<td>Naval Architecture</td>
<td>4u Science (multistrand) or</td>
<td>1 - 150</td>
</tr>
<tr>
<td></td>
<td>2u English (General) or</td>
<td>49 - 100</td>
</tr>
<tr>
<td>Surveying</td>
<td>2u English or</td>
<td>49 - 100</td>
</tr>
<tr>
<td>Surveying</td>
<td>3u English</td>
<td>1 - 50</td>
</tr>
</tbody>
</table>

* English is not a prescribed prerequisite for courses in Electrical Engineering.

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

The University conducts Bridging Courses to assist in remedying deficiencies in subject levels. Further details are available from the Students' Information Guide published annually by the Universities and Colleges Admissions Centre (UCAC).

Introductory subjects are also available to students who do not have the New South Wales Higher School Certificate prerequisite/s in Mathematics or Physics. It should be noted that inclusion of these subjects in first-year programs could extend the duration of a course.

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

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

1. A candidate for the award of the degree of BSc(Eng) shall:
   (1) comply with the requirements for admission;
   (2) follow the prescribed course of study in the appropriate school and pass the necessary examinations;
   (3) complete an approved program of industrial training over such period as is prescribed concurrently with attendance in the course. In general, this training must be completed before 31 January in the year in which the degree is to be awarded.

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

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

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

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

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

Note: No new enrolments are being accepted into this course.

Conditions for the Award of the Degree of Bachelor of Engineering

Conditions for the Award of the Degree of Bachelor of Engineering

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

2. During each year a student shall perform laboratory, drawing office and field work, attend demonstrations and excursions to such an extent and in such a manner as is prescribed from time to time by the Professorial Board on the recommendation of the Faculty. Those students who are required to undertake field work for any subject must be prepared to pay the appropriate costs and be in attendance at all scheduled examinations except in abnormal circumstances.

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

Honours Class I

Honours Class II, Division I

Honours Class II, Division II

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

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

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

   (1) comply with the requirements for admission;

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

2. During each year a student shall perform laboratory, drawing office and field work, attend demonstrations, excursions and field camps to such an extent and in such a manner as is prescribed from time to time by the Professorial Board on the recommendation of the Faculty. Those students who are required to undertake field work for any subject must be prepared to pay the appropriate costs and be in attendance at all scheduled examinations except in abnormal circumstances.

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

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

Honours Class I

Honours Class II, Division I

Honours Class II, Division II

5. In special cases the Faculty may approve the variation of any of the preceding conditions.
The School consists of five departments: Civil Engineering Materials (soil mechanics, rock mechanics, concrete technology, plastics and timber, metals and welding technology and pavement engineering); Engineering Construction and Management (civil engineering systems, engineering economy, project planning and management and civil engineering construction); Structural Engineering (structural analysis and structural design); Transport Engineering (planning, design, construction and operation of transport systems, statistical analysis, land use and transport modelling, economic evaluations and environmental impact studies); Water Engineering (hydraulics, hydrology, water resources and public health engineering).

In addition to extensive laboratory facilities on the Kensington campus, the School operates laboratories at King Street, Randwick and King Street, Manly Vale. The latter complex houses the School's Water Research Laboratory and the associated Water Reference Library. The School also uses the Fowlers Gap Arid Zone Research Station for construction camps and data collection for arid zone hydrology.

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

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

The University requires that undergraduate students undertake a structured program in General Studies as an integral part of their degree. For details of the requirements, please locate General Studies in the Contents.

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

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

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

### 3620

**Civil Engineering — Full-time Course**

**Bachelor of Engineering BE**

<table>
<thead>
<tr>
<th>Year 1</th>
<th>Hours per week</th>
</tr>
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<tr>
<td></td>
<td>S1</td>
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<tr>
<td>1.981</td>
<td>Physics*</td>
</tr>
<tr>
<td>2.991</td>
<td>Chemistry 1CE†</td>
</tr>
<tr>
<td>8.1110</td>
<td>Civil Engineering Practice</td>
</tr>
<tr>
<td>8.1120</td>
<td>Computing</td>
</tr>
<tr>
<td>8.1130</td>
<td>Engineering Drawing</td>
</tr>
<tr>
<td>8.1140</td>
<td>Statics</td>
</tr>
<tr>
<td>8.1210</td>
<td>Engineering Construction 1</td>
</tr>
<tr>
<td>8.1410</td>
<td>Dynamics and Vibration</td>
</tr>
<tr>
<td>8.1610</td>
<td>Fluid Mechanics</td>
</tr>
<tr>
<td>10.001</td>
<td>Mathematics</td>
</tr>
<tr>
<td>25.5112</td>
<td>Geology for Civil Engineers</td>
</tr>
<tr>
<td></td>
<td>24</td>
</tr>
</tbody>
</table>

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

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

#### Combined Course for BE BSc in Civil Engineering

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

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

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

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

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

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

### Geography and Environmental Chemistry

#### Year 1

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<thead>
<tr>
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#### Year 2

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<tr>
<td>27.010 and 27.030</td>
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</table>

1 General Studies elective
Undergraduate Study: Course Outlines

**Years 2.043A**

8.2220, 8.2610, 8.3110, 8.3410, 8.3420, 8.3430, 8.3440

Two of the following subjects:
27.133††, 27.143††, 27.153††, 27.183††
29.441, 29.491
2 General Studies electives

**Year 4**

8.2120, 8.2310, 8.3220, 8.3230, 8.3310, 8.3320, 8.3330, 8.3510, 8.3610, 8.3620, 8.3640
27.175, 27.176, 27.193

At least 1½ units chosen from:
27.133††, 27.143††, 27.153††, 27.183††, 27.862, 27.863

Year 4

Choose 2 units from Table 1 in the Sciences Handbook at Level II or higher

8.4110, 8.4220, 8.4320, 8.4420, 8.4430, 8.4440, 8.4520, 8.4620

Two of the following subjects:
8.4210, 8.4310, 8.4410, 8.4510, 8.4610

1½ General Studies elective

Choose 1 unit from Table 1 in the Sciences Handbook at Level II or higher

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

•See footnote at end of Course Outline

††These subjects are offered in pairs in alternate years. The two subjects offered in Year 3 are therefore excluded from those available in Year 4.

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**Physics with Mathematics**

**Year 1**

1.001
2.991**
8.1110, 8.1120, 8.1130, 8.1140
8.1210, 8.1410, 8.1610
10.001
25.5112

**Year 2**

1.012, 1.022, 1.032
8.2110, 8.2210, 8.2320, 8.2410, 8.2420, 8.2430
10.1113, 10.1114, 10.2111, 10.2112
10.381
1½ General Studies electives

**Year 3**

1.002, 1.023, 1.043
8.2220, 8.2310, 8.2610, 8.3110, 8.3410, 8.3420, 8.3430, 8.3440
10.111A
29.441, 29.491

**Year 4**

1.0333
8.2120, 8.3210, 8.3220, 8.3230, 8.3310, 8.3320, 8.3510, 8.3610, 8.3620, 8.3630, 8.3640
1 General Studies elective

Choose 1 unit from: 1.133, 1.0533, 1.0133, 1.0143
Choose 2 Level II or Level III Mathematics units from Table 1 in the Sciences Handbook.

**Year 5**

8.4110, 8.4220, 8.4320, 8.4330, 8.4420, 8.4430, 8.4440, 8.4520, 8.4620

Two of the following subjects:
8.4210, 8.4310, 8.4410, 8.4510, 8.4610

½ General Studies elective

Choose 1 unit from Table 1 in the Sciences Handbook at Level II or higher

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

•(Students are encouraged to select higher level mathematics units where applicable. See footnotes.

---

**Computing with some Mathematics**

**Year 1**

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

**Year 2**

6.621, 6.631, 6.641
8.2110, 8.2210, 8.2320, 8.2410, 8.2420, 8.2430
10.111A†, 10.1113†, 10.1114†, 10.331
1 General Studies elective

**Year 3**

6.642, 6.643
8.2120, 8.2220, 8.2310, 8.2610, 8.34k10, 8.3420, 8.3430, 8.3440, 8.3640
10.2111†, 10.2112†,
29.441, 29.491

Choose ½ Level II or Level III Mathematics unit from Table 1 in the Sciences Handbook.

**Year 4**

6.646
8.3210, 8.3220, 8.3230, 8.3310, 8.3320, 8.3330, 8.3510, 8.3610, 8.3620, 8.3630
1 General Studies elective

Choose three units, at least one of which is a Computer Science Unit, from 6.613, 6.632, 6.633 or Level II or Level III Mathematics units from Table 1 in the Sciences Handbook.

**Year 5**

8.4110, 8.4220, 8.4320, 8.4330, 8.4420, 8.4430, 8.4440, 8.4520, 8.4620

Two of the following subjects:
8.4210, 8.4310, 8.4410, 8.4510, 8.4610

1 General Studies elective

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

For Notes see overleaf
Note: All material not in italic typeface refers to the BE degree component of this combined degree course.
*Students are advised to attempt 1.981 Physics 1CE but if time-tableing difficulties arise or other exceptional circumstances prevail permission will be given to attempt 1.001 Physics 1.
**Students who have not satisfied the Chemistry prerequisite for 2.991 Chemistry 1CE are required to take 2.111 Introductory Chemistry in Session 1 and 2.991 in Session 2.
Students are encouraged to select higher level mathematics units where applicable.

School of Electrical Engineering and Computer Science

Head of School
Professor N. W. Rees

Executive Assistant to Head of School
Dr C. J. E. Phillips

Senior Administrative Officer
Mr K. J. Flynn

Administrative Assistant
Miss A.G. M. Johnson

The School comprises five departments: Communications (all aspects of theory, applied electronics and engineering relating to communication systems such as telephones, broadcasting and television); Electric Power (electrical machines and generation, distribution and utilization of electric energy); Electronics (electronic circuits, devices, micro-electronics and application of electronics to such areas as solar power generation); Computer Science (design of computer devices and the handling of information in all forms, e.g. numeric alphabetic, pictorial, verbal); Systems and Control (development of theories for the control of complex systems and the application of these theories including computer simulation). The School also houses the Joint Microelectronics Research Centre.

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. A number of inter-departmental and specialized groups (such as Digital Systems, Biomedical Engineering, Measurements, Microelectronics, etc.) are also active.

Summary of Courses

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

Note 1 Course 3640 Full-time/Part-time Sandwich
A student in course 3640 may with the approval of the Head of School complete the requirements by a combination of full-time and part-time study. To ensure that prerequisites are met and the program can be time-tabled, students should consult with the School as early as possible when a change in attendance pattern is envisaged. A part-time student must be able to attend classes one afternoon per week as not all subjects are available in the evenings. Students commencing the part-time course after 1984 may be required to attend up to two half-days per week. After Year 1 of the BE, a form of sandwich pattern is possible by arrangement with the Head of School, comprising alternate periods of full-time study and full-time employment with part-time study.

Note 2 Course 3650
No new enrolments are being accepted into course 3650. A student already enrolled in this course may complete it and graduate with a BSc (Eng) degree or may request to transfer to course 3640 and graduate with a BE degree.

Note 3 Course 3970
This course is operated by the Board of Studies in Science and Mathematics and is for students wishing to major in Computer Science in a Science and Mathematics context. For more details see the Sciences Handbook. Most of the course is available in evening classes but some day attendance is essential in Year 3.

The undergraduate curriculums are being progressively 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.

Recognition
The degrees of Bachelor of Engineering and Bachelor of Science (Engineering) are recognized by the Institution of Engineers, Australia and the Institution of Radio and Electronics Engineers, Australia, as meeting the examination requirements for admission to graduate and corporate membership. Substantial or complete recognition is also accorded to these courses by overseas engineering institutions.

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 subjects and thesis project. A student with a creditable performance in the Bachelor of Science (Engineering) course may be awarded a degree with Merit.

The award of the BA or BSc degree at honours level requires two additional sessions of study. See the Arts and Sciences Handbooks for details.

Substitution of Subjects
To suit the special abilities or needs of individual students a limited amount of substitution is permitted within each course. Any such substitution must have prior approval of the Head of School who will ensure that:
1. The replacement subject is at least the same length and level as the prescribed subject it replaced, and,
2. The resulting overall program of study is suited to the award of the degree as applicable.
Substitution is not permitted in Year 1.

Examples
(i) Replacement of General Studies subjects by subjects approved (by the Director of the Centre for Liberal and General Studies) selected from areas such as Arts, Life Sciences, Earth Sciences, Accounting and Business Administration, Law, Economics, Industrial Management.
(ii) The normal Year 4 of the BE degree program includes 5 units of Electrical Engineering IV. Students may substitute for one of these units, a subject of suitable level and difficulty from an area...
Bachelor of Engineering—Sandwich Course

After the successful completion of Year 1 of the full-time Course 3640, the following sandwich pattern is available, comprising alternate periods of full-time study and full-time employment with part-time study.

<table>
<thead>
<tr>
<th>Year 2</th>
<th>Hours per week</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>S1</td>
</tr>
<tr>
<td>1.982</td>
<td>Solid State Physics</td>
</tr>
<tr>
<td>6.021A</td>
<td>Circuit Theory 1</td>
</tr>
<tr>
<td>6.021D</td>
<td>Computing</td>
</tr>
<tr>
<td>10.111A</td>
<td>Pure Mathematics 2—Linear Algebra*</td>
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<tr>
<td>10.1113</td>
<td>Pure Mathematics 2—Multivariable Calculus*</td>
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<tr>
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<td>Applied Mathematics 2—Vector Calculus*</td>
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<tr>
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<td>Applied Mathematics 2—Mathematical Methods for Differential Equations†††</td>
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<thead>
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<td>S1</td>
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<tr>
<td>6.0314</td>
<td>Systems and Control 1</td>
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<td>6.0315</td>
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<td>Communication Systems 1</td>
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<td>One Technical Elective or Industrial Elective***</td>
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</tbody>
</table>

†††Students who have achieved a certain standard may attempt similar material at a higher level.
††See list of Technical Electives later this section.
††Students are required to complete 168 hours of General Studies electives for the BE degree. If these have not been completed by the end of Year 4, then General Studies must be included in the Year 5 program.
* Three electives are taken in Session 1 and two in Session 2. See list of Professional Electives later this section.
**6.911 Thesis is done in the last two sessions of a student's course. See subject description.
***See 6.931 Industrial Elective subject description.
Because of timetable clashes a free choice from all these electives is not possible. The program selected by each student must be approved by the Head of School. Not all electives are offered each session, nor is the full range available to part-time students. Students are advised each year of the timetable of available electives. Substitution is not permitted if it unduly restricts the range of subjects studied to only one area of electrical engineering and computer science.

### Prerequisites and Co-requisites
**Arranged in order of full-time Bachelor of Engineering Degree Course**

<table>
<thead>
<tr>
<th>Year</th>
<th>Subject</th>
<th>Prerequisites§</th>
<th>Co-requisites</th>
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<td>1.961</td>
<td>See Matriculation and Admission Requirements</td>
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<td>2.9111</td>
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<td>The Electricity &amp; Magnetism section of 1.961</td>
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<td>10.111A, 10.1113, 10.1114, 10.2112</td>
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<td>10.111A, 10.1113, 10.1114, 10.2111, 10.2112</td>
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<td></td>
<td>6.0312</td>
<td>6.021A, 6.021B</td>
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<td>6.0315</td>
<td>1.972, 6.0312**</td>
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<td>6.0316</td>
<td>6.0313</td>
<td>6.021E, 6.0311</td>
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<td>6.0311</td>
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<td>6.0318</td>
<td>6.021D, 6.021E</td>
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<tr>
<td></td>
<td>6.641</td>
<td>6.021D</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>18.091</td>
<td>10.2112, 10.361**</td>
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<td>6.041</td>
<td>6.0311, 6.0313</td>
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<td>6.042</td>
<td>10.0331, 10.0332, 10.361, 6.0311</td>
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<td>6.202</td>
<td>6.0312, 6.0315</td>
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</tr>
<tr>
<td></td>
<td>6.203</td>
<td>6.202</td>
<td></td>
</tr>
<tr>
<td></td>
<td>6.212</td>
<td>6.0312, 6.0315</td>
<td></td>
</tr>
<tr>
<td></td>
<td>6.215</td>
<td>6.0315</td>
<td></td>
</tr>
</tbody>
</table>
Combined Courses

Students in Electrical Engineering who maintain a creditable performance may qualify for the award of two degrees in five years of combined full-time study in which the requirements of the degrees have been merged. (The two degrees referred to here are the Bachelor of Engineering/Bachelor of Science BE BSc and the Bachelor of Engineering/Bachelor of Arts BE BA.)

Students wishing to enrol in a combined course may do so only on the recommendation of the Head of School of Electrical Engineering and Computer Science and with the approval of the Faculty of Engineering and either the Faculty of Arts or the Board of Studies in Science and Mathematics, as appropriate. Students wishing to enrol in, transfer into, or continue in a combined course shall have complied with all the requirements for prerequisite study, sequencing and academic attainment (a creditable performance, ie 65% average) of both the Course Authorities concerned.

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

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

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

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

3725
BE BSc in Electrical Engineering

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

Students may open up a wider choice of subjects in their Science Year by including additional Computer Science (viz 6.641), Physics (viz 1.992) or Mathematics in their Year 2 Electrical Engineering program. Any subject omitted may be required to be taken later in the course. The extra subject in Year 2 may be credited towards either the BE or BSc requirements, but not both.
In their fourth and fifth years the students do Year 3 and Year 4 of course 3640. Depending on the program followed in their year of Science they may have already completed parts of the normal third and fourth year programs of the Electrical Engineering course, and they will be required to omit these from their program and to include an equivalent amount of other courses chosen with the approval of the Head of School.

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

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

### Major Study in BA Course 3400 or BSc course 3970

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

### Course 3400

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

### Course 3970

Entry to a Computer Science major in course 3970 is normally by direct selection at University entry. Year 1 students in course 3970 who are not selected for direct entry into a Computer Science major must enrol in program 6806. For such students enrolment in Year 2 of a Computer Science program is based on academic performance in Year 1; however, transfers are possible only if places are available.

A total of 23 units is required for graduation at the pass level.

#### Year 1

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

#### Year 2

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

#### Year 3

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

Students intending to proceed to Honours should choose:
- 8 Level III units including 6.613, 6.632, 6.642 and 6.643

#### Year 4

- 6.606

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

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

<table>
<thead>
<tr>
<th>No.</th>
<th>Name</th>
<th>Level</th>
<th>Prerequisites</th>
<th>Co-requisites</th>
<th>Excluded</th>
</tr>
</thead>
<tbody>
<tr>
<td>6.611</td>
<td>Computing 1</td>
<td>I</td>
<td>As for 10.001</td>
<td>10.001 or 10.011</td>
<td>6.600, 6.620, 6.021D</td>
</tr>
<tr>
<td>6.621</td>
<td>Computing 2A</td>
<td>II</td>
<td>6.611 and 10.001</td>
<td>or 10.011</td>
<td>6.620, 6.021D</td>
</tr>
<tr>
<td>6.641</td>
<td>Computing 2C</td>
<td>II</td>
<td>6.620 or 6.021D or 6.621</td>
<td>6.021E</td>
<td></td>
</tr>
<tr>
<td>6.613</td>
<td>Computer Organization</td>
<td>III</td>
<td>6.631 or 6.021E, 6.021D or 6.620 or 6.621</td>
<td>6.0318</td>
<td></td>
</tr>
<tr>
<td>6.642</td>
<td>Design and Analysis of Algorithms</td>
<td>III</td>
<td>6.641</td>
<td>6.672</td>
<td></td>
</tr>
<tr>
<td>6.643</td>
<td>Compiling Techniques and Programming Languages</td>
<td>III</td>
<td>6.641</td>
<td>6.672</td>
<td></td>
</tr>
<tr>
<td>6.646</td>
<td>Computer Applications</td>
<td>III</td>
<td>6.620 or 6.021D or 6.621, 10.311 or both 10.311A and 10.311B or equivalent</td>
<td>6.622</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Systems</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

School of Mechanical and Industrial Engineering*

*Incorporating Aeronautical Engineering, Naval Architecture and Nuclear Engineering

Head of School
Professor R. A. A. Bryant

Executive Assistant to Head of School
Associate Professor J. E. Baker

Senior Administrative Officer
Mr G. Dusan

The School consists of three departments, Applied Mechanics (agricultural engineering, automatic control, biomechanics, engineering design, engineering mechanics and mechanics of solids), Fluid Mechanics and Thermodynamics (energy utilisation and power generation, nuclear engineering, refrigeration and air conditioning, gas and liquid handling, aeronautical engineering and naval architecture), Industrial Engineering (economic analysis, production planning and control, product and process design, methods engineering and operations research). The Centre for Manufacturing and Automation is also located within the School.

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

The courses are planned to provide the appropriate academic training for the professional engineer in the fields of aeronautical, industrial and mechanical engineering, and for the naval architect. They may be taken on a full-time basis, normally over four years, or on a combined full-time/part-time basis. Part-time students will normally take two years for each equivalent full-time year and will be required to attend day classes for the equivalent of at least 1 1/2 days per week. Students intending to enter part-time study are advised that most subjects in the later years of the course are only offered in the day-time.

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

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

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

The first halves of the courses of Mechanical, Industrial and Aeronautical Engineering and of Naval Architecture are identical, and students attend classes together. The latter halves of these four courses contain a number of common core subjects together with specific departmental requirements. In the final years, in addition to core subjects and departmental
requirements, provision is made for a limited degree of specialization in one or more elective subjects. Students with a distinguished academic record may take, subject to the approval of the Head of School, a limited number of graduate subjects offered by the School in lieu of an equivalent quantity of final year undergraduate electives. Each student is required to submit a thesis at the end of the final year and to deliver a short paper on the subject of the thesis. The University requires that undergraduate students undertake a structured program in General Studies as an integral part of their degree. For further details, please locate General Studies in the Contents. In certain instances and with permission from the Head of School and the Standing Committee on General Education students may substitute an Arts subject in lieu of two General Studies subjects.

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

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

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

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

The Institution of Engineers, Australia, recognizes the degree of BE in any of the undergraduate courses offered by the School as meeting the examination requirements for admission to graduate and corporate membership. Substantial or complete recognition is accorded to the BE courses by overseas engineering institutions.

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

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

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

• Progression in the School’s courses is by subject, although programs and timetables are arranged by year.

• In addition to the specific subject prerequisites for a particular year of a course, a general understanding of the material in the preceding year is assumed.

• Previously failed subjects must be included in a student’s current program, except that a failed elective may be replaced by another elective.

• A student who is faced with compiling a mixed year’s program must give preference to subjects from the lower year of the course.

• In the event of a student dropping one or more subjects from a mixed year’s program, the discarded subject(s) must be chosen from the higher year’s selection.

• The subjects 5.051 Thesis and 5.062 Communications can be taken only in the final year of a student’s program.

3680 Mechanical Engineering — Full-time Course Bachelor of Engineering BE

Note: The program as presented is for full-time study. Alternative programs are available for a combination of full-time and part-time study. Students wishing to commence studies on a part-time basis must, in Year 1, study the subjects: 1.951, 2.951, 5.0011, 5.0012, 10.001.

Year 1

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Subject</th>
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</thead>
<tbody>
<tr>
<td>1.951</td>
<td>Physics 1 (Mechanical Engineering)</td>
</tr>
<tr>
<td>2.951</td>
<td>Chemistry 1ME</td>
</tr>
<tr>
<td>5.0011</td>
<td>Engineering Mechanics 1</td>
</tr>
<tr>
<td>5.0012</td>
<td>Introductory Engineering Design and Materials Science</td>
</tr>
<tr>
<td>5.0300</td>
<td>Graphical Analysis and Communication</td>
</tr>
<tr>
<td>5.0303</td>
<td>Workshop Technology</td>
</tr>
<tr>
<td>5.0305</td>
<td>Manufacturing Technology</td>
</tr>
<tr>
<td>5.061</td>
<td>Technical Orientation</td>
</tr>
<tr>
<td>5.0721</td>
<td>Computing</td>
</tr>
<tr>
<td>5.421</td>
<td>Mechanics of Solids</td>
</tr>
<tr>
<td>10.001</td>
<td>Mathematics 1</td>
</tr>
<tr>
<td>10.011</td>
<td>Higher Mathematics 1</td>
</tr>
</tbody>
</table>

An alternative ‘Science/Arts compatible’ course which can be undertaken by all students, and which must be undertaken by potential combined degree students, is as follows:

1.001 Physics 1
2.121 Chemistry 1A" or 2.121 Chemistry 1ME" or 5.0011 Engineering Mechanics 1 or 5.0012 Introductory Engineering Design and Materials Science or 5.421 Mechanics of Solids or 5.0300 Graphical Analysis and Communication or 5.0303 Workshop Technology or 5.0305 Manufacturing Technology or 5.061 Technical Orientation or 5.0721 Computing or 10.001 Mathematics 1 or 10.011 Higher Mathematics 1

An alternative ‘Science/Arts compatible’ course which can be undertaken by all students, and which must be undertaken by potential combined degree students, is as follows:

<table>
<thead>
<tr>
<th>Year 1</th>
<th>Hours per week</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.951</td>
<td>S1: 4, S2: 4</td>
</tr>
<tr>
<td>2.951</td>
<td>6</td>
</tr>
<tr>
<td>5.0011</td>
<td>4</td>
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<td>5.0012</td>
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<td>5.0721</td>
<td>0</td>
</tr>
<tr>
<td>5.421</td>
<td>0</td>
</tr>
<tr>
<td>10.001</td>
<td>6</td>
</tr>
<tr>
<td>10.011</td>
<td>6</td>
</tr>
</tbody>
</table>

Note: The program as presented is for full-time study. Alternative programs are available for a combination of full-time and part-time study. Students wishing to commence studies on a part-time basis must, in Year 1, study the subjects: 1.951, 2.951, 5.0011, 5.0012, 10.001.

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

†Students planning to take higher level Computer Science subjects should also take 6.611 Computing 1 or 8.1120 Computing in Year 1. Students intending to major in another area may seek permission to take an alternative appropriate additional subject.
Undergraduate Study: Course Outlines

### Mechanical Engineering Technical Electives

#### Applied Dynamics

<table>
<thead>
<tr>
<th>Course</th>
<th>Hours per week</th>
</tr>
</thead>
<tbody>
<tr>
<td>5.348 Mechanical Vibration 2</td>
<td>3 or 3</td>
</tr>
<tr>
<td>5.3541 Engineering Noise 1</td>
<td>3 or 3</td>
</tr>
<tr>
<td>5.3542 Engineering Noise 2</td>
<td>3 or 3</td>
</tr>
</tbody>
</table>

#### Mechanics of Solids

<table>
<thead>
<tr>
<th>Course</th>
<th>Hours per week</th>
</tr>
</thead>
<tbody>
<tr>
<td>5.424 General Mechanics of Solids</td>
<td>3 or 3</td>
</tr>
<tr>
<td>5.434 Plates and Shells</td>
<td>3 or 3</td>
</tr>
<tr>
<td>5.444 Theory of Elasticity</td>
<td>3 or 3</td>
</tr>
<tr>
<td>5.454 Theory of Plasticity</td>
<td>3 or 3</td>
</tr>
<tr>
<td>5.464 Structural Instability</td>
<td>2 or 3</td>
</tr>
</tbody>
</table>

#### Mechanical Design

<table>
<thead>
<tr>
<th>Course</th>
<th>Hours per week</th>
</tr>
</thead>
<tbody>
<tr>
<td>5.1240 Design Project</td>
<td>3 or 3</td>
</tr>
<tr>
<td>5.1243 Machinery Design Project</td>
<td>3 or 3</td>
</tr>
<tr>
<td>5.1244 Project Management</td>
<td>3 or 3</td>
</tr>
<tr>
<td>5.1245 Computer-Aided Engineering</td>
<td>3 or 3</td>
</tr>
</tbody>
</table>

#### Fluid Mechanics/Thermodynamics

<table>
<thead>
<tr>
<th>Course</th>
<th>Hours per week</th>
</tr>
</thead>
<tbody>
<tr>
<td>5.633 Turbomachines</td>
<td>3 or 3</td>
</tr>
<tr>
<td>5.6341 Viscous Flow Theory</td>
<td>1 1/2</td>
</tr>
<tr>
<td>5.6342 Lubrication</td>
<td>0 or 3</td>
</tr>
<tr>
<td>5.635 Convection Heat Transfer</td>
<td>3 or 3</td>
</tr>
<tr>
<td>5.643 Thermodynamics and</td>
<td>3 or 3</td>
</tr>
<tr>
<td>Combustion</td>
<td></td>
</tr>
<tr>
<td>5.644 Solar Energy</td>
<td>3 or 3</td>
</tr>
<tr>
<td>5.654 Hydraulic Transients</td>
<td>3 or 3</td>
</tr>
<tr>
<td>5.664 Multiphase Flow</td>
<td>3 or 3</td>
</tr>
<tr>
<td>5.673 Special Fluid Mechanics 3 or 3</td>
<td></td>
</tr>
<tr>
<td>5.674 Special Thermodynamics 3 or 3</td>
<td></td>
</tr>
</tbody>
</table>

#### Industrial Engineering

<table>
<thead>
<tr>
<th>Course</th>
<th>Hours per week</th>
</tr>
</thead>
<tbody>
<tr>
<td>18.004 Manufacturing Management</td>
<td>2 or 2</td>
</tr>
<tr>
<td>18.224 Numerical Control of Machine Tools</td>
<td>3 or 3</td>
</tr>
<tr>
<td>18.303 Methods Engineering</td>
<td>2 or 2</td>
</tr>
<tr>
<td>18.403 Production Design and</td>
<td>4 or 4</td>
</tr>
<tr>
<td>Technology</td>
<td></td>
</tr>
<tr>
<td>18.404 Design for Production</td>
<td>2 or 2</td>
</tr>
<tr>
<td>18.503 Operations Research A</td>
<td>3 or 3</td>
</tr>
<tr>
<td>18.551 Operations Research</td>
<td>3 or 3</td>
</tr>
<tr>
<td>18.803 Optimization</td>
<td>3 or 0</td>
</tr>
</tbody>
</table>
Other Technical Electives

<table>
<thead>
<tr>
<th>Course</th>
<th>Hours per week</th>
</tr>
</thead>
<tbody>
<tr>
<td>4.913 Materials Science</td>
<td>S1 3  S2 3</td>
</tr>
<tr>
<td>5.074 Computing Science for Mechanical Engineers</td>
<td>3 0</td>
</tr>
<tr>
<td>5.235 Nuclear Power Technology</td>
<td>3 0</td>
</tr>
<tr>
<td>5.811 Aerodynamics 1†</td>
<td>3 3</td>
</tr>
<tr>
<td>5.831 Aircraft Propulsion</td>
<td>2 2</td>
</tr>
</tbody>
</table>

Note: The graduate subjects listed should be examined by undergraduate students; with approval, other graduate subjects from this and other Schools may be taken by students with a distinguished academic record.

3681
Mechanical Engineering — Combined Course

Bachelor of Engineering/Bachelor of Science BE BSc

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

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

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

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

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

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

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

Year 2, 3

<table>
<thead>
<tr>
<th>Course</th>
<th>Hours per week</th>
</tr>
</thead>
<tbody>
<tr>
<td>5.3022 Engineering Dynamics 2B.</td>
<td>S1 0  S2 2</td>
</tr>
<tr>
<td>5.4220 Mechanics of Solids 2§</td>
<td>4 2</td>
</tr>
<tr>
<td>5.4222 Mechanical Engineering §/Materials</td>
<td>4½ 4½</td>
</tr>
<tr>
<td>10.111A Pure Mathematics 2 —</td>
<td>2½ 2½</td>
</tr>
<tr>
<td>Linear Algebra</td>
<td></td>
</tr>
<tr>
<td>10.1113 Pure Mathematics 2 —</td>
<td>2½ 0</td>
</tr>
<tr>
<td>Multivariable Calculus</td>
<td></td>
</tr>
<tr>
<td>10.1114 Pure Mathematics 2 — Complex Analysis</td>
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</tr>
<tr>
<td>10.2111 Applied Mathematics 2 —</td>
<td>2½ 0</td>
</tr>
<tr>
<td>Vector Calculus</td>
<td></td>
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<tr>
<td>10.2112 Applied Mathematics 2 —</td>
<td>0 2½</td>
</tr>
<tr>
<td>Mathematical Methods for Differential Equations</td>
<td>8 8</td>
</tr>
<tr>
<td>4 appropriate units from Table 1* or Table 2* for course 3681§</td>
<td>20 22</td>
</tr>
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</table>

Year 3

<table>
<thead>
<tr>
<th>Course</th>
<th>Hours per week</th>
</tr>
</thead>
<tbody>
<tr>
<td>5.043 Industrial Training 1**</td>
<td>0 0</td>
</tr>
<tr>
<td>5.122 Mechanical Engineering Design 2</td>
<td>3 3</td>
</tr>
<tr>
<td>5.620 Fluid Mechanics 1</td>
<td>2 2</td>
</tr>
<tr>
<td>5.626 Thermodynamics 1</td>
<td>2 2</td>
</tr>
</tbody>
</table>

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

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

*Tables refer to the Sciences Handbook.

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

Year 2
5.3021, 5.3022, 5.4220, 5.4222
6.621, 6.6317, 6.641
10.111A (or 10.121A), 10.1113 (or 10.1213), 10.1114 (or 10.1214),
10.2111 (or 10.2211), 10.2112 (or 10.2212), 10.331 (or 10.351)

Year 3
1.002 or 1.012 or 1.022A3
5.043, 5.122, 5.620, 5.626
4 Level III units from Table 1* and Table 2* offerings of School of
Electrical Engineering and Computer Science for course
3681*: 1 General Studies elective

Materials Science Majors

Year 2
2.102A3
4.402, 4.522a
5.3021, 5.3022, 5.4221
and either (Option 1):
2.102B, 2.131
4.512 or 4.802 (recommended)
10.022
or (Option 2):
10.111A (or 10.121A), 10.1113 (or 10.1213), 10.2111 (or
10.2211),
10.2112 (or 10.2212)
1 unit from10*: 1.022, 1.982, 2.131, 4.512, 4.802, 10.1114 (or
10.1214)

Year 3
4.703
5.043, 5.122, 5.620, 5.626
10.331 (or 10.351)
1 General Studies elective
and either (Option 1):
4.433
48.403
or (Option 2):
3½ appropriate Level II or III units from Schools of Physics, Chemistry or Metallurgy offerings in Table 1* or Table 2* for course 368114:

Mathematics Majors

Year 2
Same Year 2 as for Computer Science or Materials Science (3 units of Level II mathematics option) or Physics or Statistics
majors
or
1.002 or 1.012 or 1.022 or 2.102A3
5.3021, 5.3022, 5.4220, 5.4222
10.111A (or 10.121A), 10.1113 (or 10.1213), 10.1114 (or 10.1214),
10.2111 (or 10.2211), 10.2112 (or 10.2212), 10.2115 (or 10.2215),
3 units from 10.1115, 10.1116, 10.2113 (or 10.2213), 10.2115 (or
10.2215), 10.411A (or 10.421A), 10.411B (or 10.421B) (or from any
other appropriate Level II units from Table 1* or Table 2* for
course 3681.

Year 3
5.043, 5.122, 5.620, 5.626
10.331 (or 10.351)12
4 Level III units from School of Mathematics offerings in Table 1*
1 General Studies elective

Physics Majors

Year 2
1.002, 1.012, 1.022, 1.032
5.3021, 5.3022, 5.4220, 5.4222
10.111A (or 10.121A), 10.1113 (or 10.1213), 10.1114 (or 10.1214),
10.2111 (or 10.2211), 10.2112 (or 10.2212)

Year 3
1.013311, 1.023, 1.03331, 1.0431
1 Level III unit from School of Physics offerings in Table 1*
5.043, 5.122, 5.620, 5.626
10.331 (or 10.351)
1 General Studies elective

Statistics Majors

Year 2
1.002 or 1.012 or 1.022 or 2.102A3
5.3021, 5.3022, 5.4220, 5.4222
10.111A (or 10.121A), 10.1113 (or 10.1213), 10.1114 (or 10.1214),
10.2111 (or 10.2211), 10.2112 (or 10.2212), 10.311A (or 10.321A),
10.311B (or 10.321B), 10.3111 (or 10.3211), 10.3112 (or 10.3212)

Year 3
5.043, 5.122, 5.620, 5.626
4 Level III units from Statistics offerings in Table 1*
1 Level II or III unit from School of Mathematics or School of
Physics offerings in Table1*
1 General Studies elective

*Tables refer to the Sciences Handbook.

Notes
1. Subjects 5.4220 and 5.4222 must be taken together.
2. The following considerations pertain to the choice of optional units in Years 2 and
3:
(1) They include no more than one Level 1 unit.
(2) They include at least four Level III units which satisfy the relevant major requirements.
(3) They include no more than one unit from schools other than Chemistry, Electrical
Engineering and Computer Science, Mathematics, Materials Science and Engineer-
ing, and Physics.
(4) They include at least one Level II unit from the Schools of Chemistry or Physics.
(5) They include 10.331 Statistics SS, 10.351 Statistics SM or 10.311B Basic Inference.
(6) 4.502 Mechanical Metallurgy and 4.512 Mechanical Properties of Solids are deem-
ed to have reduced unit values of 1 and ½ respectively.
2. The prerequisites of 2.121 Chemistry 1A and 2.131 Chemistry 1B may be waived
or application to the Head of the School of Chemistry.
4. Materials Science majors may omit 10.1114 Complex Analysis or substitute 10.022
Engineering Mathematics 2 for the mathematics subjects. The balance of the units
must then be made up from units from the Schools of Chemistry, Materials Science
and Engineering or Physics offerings in Table 1* or Table 2* for course 3681.
8. If 4.402 Physical Metallurgy 1 or 4.422 Metallurgical Phases 2 is taken, students
should take 5.4221 instead of 5.4220 and 5.4222.
9. Actual General Studies requirements correspond to whatever is required in the
second-year of the normal Mechanical and Industrial Engineering degree course.
1. Students intending to major in Computing Science and planning to take 6.647
Business Information systems may substitute 14.501 Accounting and Financial
Management 1A instead of 6.631 Computing 2B.

Notes continued overleaf
Engineering

8. 646 Computer Applications is excluded for students in course 3661 who should substitute a Level II or III unit from Table 2 offerings of the School of Electrical Engineering and Computer Science.

9. Provides 5.4221 is taken concurrently with 4.522, the prerequisite requirement of 4.512 for 4.522 and the corequisite requirement of 4.502 for 4.422 are assumed to be satisfied.

10. Materials Science majors who took 2.121 Chemistry 1A in Year 1 must take 2.131 Chemistry 1B. Those who took 2.951 Chemistry 1ME and wish to keep open the option of mapping in mathematics should include 10.1114 (or 10.1214) Complex Analysis in their selection; otherwise they are advised to select 1.022 Modern Physics or 1.982 Solid State Physics.

11. Under special circumstances, with permission of the Head of the School of Physics, a student may substitute alternative Physics Level III offerings of equivalent unit value.

12. Students who followed the Year 2 for Computer Science majors should substitute 1.002 or 1.012 or 1.022 or 2.102A, those that followed the Year 2 for Statistics majors should substitute one Level II or III unit from the Schools of Physics or Mathematics offerings in Table 1.

13. Quota restrictions apply to certain Computer Science Level III units and application must be made in writing to the Head of the School of Electrical Engineering and Computer Science before the end of Session 2 in the preceding year. Prospective Computer Science Majors should aim for a creditable academic attamptment (65%) over Years 1 and 2.

14. These must include either 4.403 Physical Metallurgy 2 or 4.433 Physical Metallurgy 2C. The latter is recommended together with either 2.103A Physical Chemistry or 1.023 Statistical Mechanics (for which the prerequisite of 1.012 is waived provided students have passed 2.102A).

15. The mathematics units are also offered at higher level.

*Tables refer to the Sciences Handbook.

3610 Aeronautical Engineering Bachelor of Engineering BE

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

Year 3

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Hours per week S1</th>
<th>Hours per week S2</th>
</tr>
</thead>
<tbody>
<tr>
<td>5.034</td>
<td>Engineering Experimentation</td>
<td>2</td>
<td>1½</td>
</tr>
<tr>
<td>5.043</td>
<td>Industrial Training 1*</td>
<td>2</td>
<td>1½</td>
</tr>
<tr>
<td>5.070</td>
<td>Optimal Engineering Strategies</td>
<td>1½</td>
<td>1½</td>
</tr>
<tr>
<td>5.079†</td>
<td>Numerical Methods</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>5.303</td>
<td>Mechanical Vibrations</td>
<td>0</td>
<td>2</td>
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<tr>
<td>5.343</td>
<td>Linear Systems Analysis‡</td>
<td>3</td>
<td>0</td>
</tr>
<tr>
<td>5.423</td>
<td>Mechanics of Solids 3</td>
<td>3</td>
<td>3</td>
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<td>5.800</td>
<td>Aircraft Design 1</td>
<td>3</td>
<td>3</td>
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<tr>
<td>5.811</td>
<td>Aerodynamics 1</td>
<td>3</td>
<td>3</td>
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<tr>
<td>5.822</td>
<td>Analysis of Aerospace Structures 1</td>
<td>2</td>
<td>2</td>
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<td>6.854</td>
<td>Electrical Engineering</td>
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<td>6.856</td>
<td>Electronics for Measurement and Control**</td>
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<tr>
<td>18.603</td>
<td>Management/Economics</td>
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<td>2</td>
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</tbody>
</table>

Total 25 23½

3611 Aeronautical Engineering — Combined Course Bachelor of Engineering/Bachelor of Science BE BSc

The description of this course is identical with that for course 3661 BE BSc in Mechanical Engineering.
**3700 Naval Architecture**

**Bachelor of Engineering BE**

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

**Year 3**

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Name</th>
<th>Hours per week</th>
</tr>
</thead>
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<tr>
<td>5.034</td>
<td>Engineering Experimentation</td>
<td>2 S1, 1½ S2</td>
</tr>
<tr>
<td>5.043</td>
<td>Industrial Training 1*</td>
<td>0 S1, 0 S2</td>
</tr>
<tr>
<td>5.070</td>
<td>Optimal Engineering Strategies</td>
<td>1½ S1, 1½ S2</td>
</tr>
<tr>
<td>5.079†</td>
<td>Numerical Methods</td>
<td>1½ S1, 1½ S2</td>
</tr>
<tr>
<td>5.303</td>
<td>Mechanical Vibrations</td>
<td>0 S1, 2 S2</td>
</tr>
<tr>
<td>5.423</td>
<td>Mechanics of Solids 3</td>
<td>2 S1, 2 S2</td>
</tr>
<tr>
<td>5.901</td>
<td>Introduction to Mathematical Modelling and Decision Making</td>
<td>3 S1, 0 S2</td>
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<tr>
<td>5.902</td>
<td>Ship Management Economics</td>
<td>0 S1, 2 S2</td>
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<tr>
<td>5.911</td>
<td>Ship Hydrostatics</td>
<td>2½ S1, 2½ S2</td>
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<td>5.921</td>
<td>Ship Structures 1</td>
<td>2 S1, 2 S2</td>
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<td>5.9311</td>
<td>Principles of Ship Design 1</td>
<td>3 S1, 0 S2</td>
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<tr>
<td>5.953</td>
<td>Ship Hydrodynamics</td>
<td>3 S1, 2 S2</td>
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<tr>
<td>6.854</td>
<td>Electrical Engineering</td>
<td>0 S1, 3 S2</td>
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<tr>
<td>6.856</td>
<td>Electronics for Measurement and Control**</td>
<td>3 S1, 0 S2</td>
</tr>
<tr>
<td></td>
<td>General Studies elective(s)</td>
<td>2 S1, 2 S2</td>
</tr>
</tbody>
</table>

**Hours per week**

- S1: 25½
- S2: 22

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

†Combined degree course students who have taken 10.2116 Applied Mathematics 2 — Continuous; Time Systems or 10.2216 Higher Applied Mathematics 2 — Continuous; Time Systems or 10.222A Numerical Analysis, should substitute a Technical Elective or a half Level II or III unit from Table 1 of the Sciences Handbook for this subject.

**Year 4**

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Name</th>
<th>Hours per week</th>
</tr>
</thead>
<tbody>
<tr>
<td>5.044</td>
<td>Industrial Training 2*</td>
<td>0 S1, 0 S2</td>
</tr>
<tr>
<td>5.051</td>
<td>Thesis</td>
<td>6 S1, 6 S2</td>
</tr>
<tr>
<td>5.062</td>
<td>Communications</td>
<td>2 S1, 2 S2</td>
</tr>
<tr>
<td>5.922</td>
<td>Ship Structures 2</td>
<td>2 S1, 2 S2</td>
</tr>
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<td>5.9321</td>
<td>Principles of Ship Design 2</td>
<td>4 S1, 2 S2</td>
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<td>5.937</td>
<td>Ship Design Project</td>
<td>3 S1, 4 S2</td>
</tr>
<tr>
<td>5.941</td>
<td>Ship Propulsion and Systems</td>
<td>4 S1, 4 S2</td>
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<tr>
<td></td>
<td>General Studies elective(s)</td>
<td>2 S1, 2 S2</td>
</tr>
</tbody>
</table>

**Hours per week**

- S1: 23
- S2: 22

*Report to be submitted in Week 1 of Session 1 detailing involvement and experience gained between Years 3 and 4.

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**3701 Naval Architecture — Combined Course**

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

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

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**Combined Courses Bachelor of Engineering/Bachelor of Arts**

**3612 BE BA in Aeronautical Engineering**

**3662 BE BA in Industrial Engineering**

**3682 BE BA in Mechanical Engineering**

**3702 BE BA in Naval Architecture**

**Introduction**

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

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

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

**Requirements**

The broad requirements of the BE BA course are given below. The details of a particular student's program will depend upon the student's interests and the Arts content which is chosen. Sample programs are available on request to show typical arrangements.

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Undergraduate Study: Course Outlines
**Engineering**

The program is to contain the Science/Arts compatible first year segment followed by the full program for one of the strands offered by the School of Mechanical and Industrial Engineering. Course variations may be permitted in some cases on application to the Head of School.

**Arts**

The Arts component of the program is to contain at least 60 Arts credit points in addition to Arts credit points allocated to components of the Engineering strand. (A session-length Arts subject normally carries 6 credit points.) The 60 must include

- no more than 30 First Level credit points (typically 5 one-session subjects)
- at least 24 Upper Level credit points forming a major sequence (typically 4 one-session subjects)
- at least 6 Upper Level credit points in a school other than that in which the major is taken.

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

**Honours**

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

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

**General**

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

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The Department of Industrial Engineering offers a course in Industrial Engineering leading to the award of the degree of Bachelor of Engineering. This course is designed for students with engineering ability whose interests lie in the planning, developing and control of manufacturing or service operations. It may be taken either on a full-time basis, normally over four years or on a part-time basis, or on a combined full-time/part-time basis subject to the approval of the Head of the School. Students intending to enter part-time study are advised that many subjects in the later years of the course are offered only in the day-time. Part-time students normally take two years for each equivalent full-time year and are required to attend day classes for the equivalent of at least 1 1/2 days per week.

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

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

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

**The Work of the Industrial Engineer**

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

1. **Industrial Economic Analysis**

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

2. **Planning and Control of Production**

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

3. Product and Process Design

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

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

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

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

4. Methods Engineering

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

5. Operations Research

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

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

3660
Industrial Engineering

Bachelor of Engineering
BE

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

<table>
<thead>
<tr>
<th>Year 3</th>
<th>Hours per week</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>$1</td>
</tr>
<tr>
<td>5.043</td>
<td>Industrial Training 1†</td>
</tr>
<tr>
<td>6.854</td>
<td>Electrical Engineering</td>
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<tr>
<td>6.856</td>
<td>Electronics for Measurement and Control</td>
</tr>
<tr>
<td>14.001</td>
<td>Introduction to Accounting A</td>
</tr>
<tr>
<td>14.002</td>
<td>Introduction to Accounting B</td>
</tr>
<tr>
<td>18.003</td>
<td>Numerical Methods/Industrial Experimentation</td>
</tr>
<tr>
<td>18.303</td>
<td>Methods Engineering</td>
</tr>
<tr>
<td>18.403</td>
<td>Production Design and Technology</td>
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<td>18.413</td>
<td>Design for Industrial Engineers</td>
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<td>18.503</td>
<td>Operations Research A</td>
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<td>Management/Economics</td>
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<tr>
<td>18.803</td>
<td>Optimization</td>
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<td>General Studies elective(s)</td>
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<tr>
<td></td>
<td>Total</td>
</tr>
</tbody>
</table>

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

<table>
<thead>
<tr>
<th>Year 4</th>
<th>Hours per week</th>
</tr>
</thead>
<tbody>
<tr>
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<td>$1</td>
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<td>Industrial training 2†</td>
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<td>Thesis</td>
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<td>5.062</td>
<td>Communications</td>
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<td>18.004</td>
<td>Manufacturing Management Technical Electives</td>
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<td></td>
<td>General Studies elective(s)</td>
</tr>
<tr>
<td></td>
<td>Total</td>
</tr>
</tbody>
</table>

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

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

†Report to be submitted in Week 1 of Session 1 detailing involvement and experience gained between Years 3 and 4.
Industrial Engineering Technical Electives

<table>
<thead>
<tr>
<th>Production Engineering</th>
<th>Hours per week</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>S1</td>
</tr>
<tr>
<td>5.454 Theory of Plasticity</td>
<td>3</td>
</tr>
<tr>
<td>18.224 Numerical Control of Machine Tools</td>
<td>3</td>
</tr>
<tr>
<td>18.404 Design for Production</td>
<td>2</td>
</tr>
<tr>
<td>18.360G Ergonomics</td>
<td>3</td>
</tr>
</tbody>
</table>

Operations Research

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

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

3661 Industrial Engineering — Combined Course

Bachelor of Engineering/Bachelor of Science BE BSC

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

3662 Industrial Engineering — Combined Course

Bachelor of Engineering/Bachelor of Arts BE BA

See description under Combined Courses: Bachelor of Engineering/Bachelor of Arts, immediately preceding the heading Department of Industrial Engineering.

School of Surveying

Head of School
Professor F.K. Brunner
Administrative Assistant
Mr. L. Daras
the student follow a particular sequence of subjects within a given subject area. Subjects offered by the University of Sydney and Macquarie University may also be taken subject to approval by the Head of School.

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

4. The University requires that undergraduate students undertake a structured program of General Studies as an integral part of studies for their degree. Please locate General Studies in the Contents.

Bachelor of Surveying students in their later years of study may elect to transfer to this course if they so desire.

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

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

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

3740 Surveying

Bachelor of Surveying BSurv

<table>
<thead>
<tr>
<th>Year 1</th>
<th>Hours per week</th>
</tr>
</thead>
<tbody>
<tr>
<td>Session 1</td>
<td></td>
</tr>
<tr>
<td>1.971  Physics 1</td>
<td>6</td>
</tr>
<tr>
<td>8.1210  Engineering Construction 1</td>
<td>2</td>
</tr>
<tr>
<td>10.001  Mathematics 1</td>
<td>6</td>
</tr>
<tr>
<td>29.1010  Surveying 1</td>
<td>.5</td>
</tr>
<tr>
<td>29.1110  Computations 1</td>
<td>2</td>
</tr>
<tr>
<td>29.1710  Professional Orientation*</td>
<td>1 1/2</td>
</tr>
<tr>
<td>General Studies Elective</td>
<td>2</td>
</tr>
<tr>
<td><strong>24 1/2</strong></td>
<td></td>
</tr>
</tbody>
</table>

*Three half-day excursions are an essential part of this subject.

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

†Senior Survey Camp will be held in Session 1.

Undergraduate Study: Course Outlines

<table>
<thead>
<tr>
<th>Session 1</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>1.962  Physics of Measurement</td>
<td>3</td>
</tr>
<tr>
<td>10.022  Engineering Mathematics 2</td>
<td>4</td>
</tr>
<tr>
<td>10.341  Statistics SU</td>
<td>2</td>
</tr>
<tr>
<td>27.295  Physical Geography for Surveyors†</td>
<td>4</td>
</tr>
<tr>
<td>29.3010  Surveying 3</td>
<td>4 1/2</td>
</tr>
<tr>
<td>29.3110  Computations 2</td>
<td>4 1/2</td>
</tr>
</tbody>
</table>

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

<table>
<thead>
<tr>
<th>Session 2</th>
<th>Hpw</th>
</tr>
</thead>
<tbody>
<tr>
<td>10.022  Mathematics 2</td>
<td>4</td>
</tr>
<tr>
<td>10.341  Statistics SU</td>
<td>2</td>
</tr>
<tr>
<td>29.4010  Surveying 4</td>
<td>5</td>
</tr>
<tr>
<td>29.4150  Electronics for Surveyors</td>
<td>2</td>
</tr>
<tr>
<td>29.4220  Introduction to Geodetic Science</td>
<td>3</td>
</tr>
<tr>
<td>29.4520  Remote Sensing and Resource Surveys</td>
<td>3</td>
</tr>
<tr>
<td>29.4710  Report Writing</td>
<td>2</td>
</tr>
<tr>
<td>29.4810  Land Management and Development 1</td>
<td>3</td>
</tr>
<tr>
<td>29.4050  Survey Camp*</td>
<td>3</td>
</tr>
<tr>
<td><strong>27</strong></td>
<td></td>
</tr>
</tbody>
</table>

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

<table>
<thead>
<tr>
<th>Session 3</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>8.6140  Engineering for Surveyors 1</td>
<td>3</td>
</tr>
<tr>
<td>29.5010  Surveying 5</td>
<td>4 1/2</td>
</tr>
<tr>
<td>29.5110  Computations 3</td>
<td>4</td>
</tr>
<tr>
<td>29.5220  Geodetic Positioning</td>
<td>2 1/2</td>
</tr>
<tr>
<td>29.5230  Map Projections</td>
<td>2 1/2</td>
</tr>
<tr>
<td>29.5610  Cadastral Surveying and Land Law 1</td>
<td>3 1/2</td>
</tr>
<tr>
<td>36.411  Town Planning</td>
<td>2</td>
</tr>
<tr>
<td><strong>22</strong></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Session 2</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>8.6150  Engineering for Surveyors 2</td>
<td>3</td>
</tr>
<tr>
<td>29.6010  Surveying 6</td>
<td>4 1/2</td>
</tr>
<tr>
<td>29.6220  Field Astronomy</td>
<td>3</td>
</tr>
<tr>
<td>29.6510  Photogrammetry 1</td>
<td>3</td>
</tr>
<tr>
<td>29.6610  Cadastral Surveying and Land Law 2</td>
<td>6</td>
</tr>
<tr>
<td>29.6810  Land Management and Development 2</td>
<td>3</td>
</tr>
<tr>
<td><strong>22 1/2</strong></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Year 4</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Session 1</td>
<td></td>
</tr>
<tr>
<td>29.7010  Surveying 7</td>
<td>4 1/2</td>
</tr>
<tr>
<td>29.7120  Computer Graphics</td>
<td>2</td>
</tr>
<tr>
<td>29.7220  Geodetic Computations</td>
<td>3</td>
</tr>
<tr>
<td>29.7510  Photogrammetry 2</td>
<td>4</td>
</tr>
<tr>
<td>29.7810  Land Management and Development 3*</td>
<td>2</td>
</tr>
<tr>
<td>29.7050  Survey Camp†</td>
<td>3</td>
</tr>
<tr>
<td>Technical Elective††</td>
<td>3</td>
</tr>
<tr>
<td>General Studies Elective</td>
<td>4</td>
</tr>
<tr>
<td><strong>31 1/2</strong></td>
<td></td>
</tr>
</tbody>
</table>

*One day field tutorial is an essential part of this subject.

†Senior Survey Camp will be held in Session 1.

††Technical electives (each of 3 hours per week) are chosen from those listed below.
The mandatory program consists of the following subjects:

### Mandatory Program

<table>
<thead>
<tr>
<th>Course</th>
<th>Hours per week</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.971 Physics 1</td>
<td>12</td>
</tr>
<tr>
<td>10.001 Mathematics 1</td>
<td>12</td>
</tr>
<tr>
<td>29.1010 Surveying 1</td>
<td>5</td>
</tr>
<tr>
<td>29.2010 Surveying 2</td>
<td>4</td>
</tr>
<tr>
<td>29.2050 Survey Camp 1</td>
<td>3</td>
</tr>
<tr>
<td>29.1710 Professional Orientation</td>
<td>1½</td>
</tr>
<tr>
<td>29.1010 Seminar</td>
<td>1½</td>
</tr>
<tr>
<td>29.8720 Management</td>
<td>2</td>
</tr>
<tr>
<td>29.8810 Land Management</td>
<td>2</td>
</tr>
<tr>
<td>and Development 4</td>
<td>2</td>
</tr>
</tbody>
</table>

Technical Elective††

- 3

General Studies Elective

- 4

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**Total**: 23

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††Technical electives (each of 3 hours per week) are chosen from those listed below.

### Year 4 Electives

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

- 29.9010 Advanced Surveying Instruments
- 29.9020 Hydrographic Surveying
- 29.9030 Precise Engineering Surveying
- 29.9210 Adjustment of Control Networks
- 29.9220 Advanced Geodetic Positioning
- 29.9520 Remote Sensing
- 29.9530 Land Information Systems
- 29.9610 Modern Cadastral Concepts
- 29.9090 Project
- 29.9910 Special Topic A
- 29.9920 Special Topic B

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

### 3760 Surveying Science

**Bachelor of Surveying Science BSurvSc**

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

### General Studies Program

This program consists normally of 3 General Studies subjects of 4 hours each per week over a single session (or their equivalent) and may be undertaken at any time during Years 2-4 of the Course, subject to the total load for a session, which, as a rule, should not exceed 24 hours.

### Elective Program

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

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

Illustrative examples of programs that could be taken are available from the School.
A subject is defined by the Professorial Board as 'a unit of instruction approved by the University as being a discrete part of the requirements for a course offered by the University'.

Each approved subject of the University is identifiable both by number and by name as this is a check against nomination of subject other than the one intended.

Subject numbers are allocated by the Registrar and the system of allocation is based on the following guidelines:

1. The authority offering the subject, normally a School of the University, is indicated by the number before the decimal point.

2. Each subject number is unique and is not used for more than one subject title.

3. Subject numbers which have previously been used are not used for new subject titles.

4. Graduate subjects are indicated by a suffix 'G' to a number with three digits after the decimal point. In other subjects three or four digits are used after the decimal point.

Subjects taught are listed in full in the handbook of the faculty or board of studies responsible for the particular course within which the subjects are taken. Subject descriptions are contained in the appropriate section in the handbooks.

The following pages contain descriptions for most of the subjects offered for the courses described in this book, the exception being the General Studies subjects. For General Studies subjects see the General Studies Handbook which is available free of charge.

HSC Exam Prerequisites

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

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

<table>
<thead>
<tr>
<th>Information Key</th>
</tr>
</thead>
<tbody>
<tr>
<td>The following is the key to the information which may be supplied about each subject:</td>
</tr>
<tr>
<td>S1 Session 1, S2 Session 2</td>
</tr>
<tr>
<td>F Session 1 plus Session 2, ie full year</td>
</tr>
<tr>
<td>S1 or S2 Session 1 or Session 2, ie choice of either session</td>
</tr>
<tr>
<td>SS single session, but which session taught is not known at time of publication</td>
</tr>
<tr>
<td>CCH class contact hours</td>
</tr>
<tr>
<td>L Lecture, followed by hours per week</td>
</tr>
<tr>
<td>T Laboratory/Tutorial, followed by hours per week</td>
</tr>
<tr>
<td>hpw hours per week</td>
</tr>
<tr>
<td>C Credit or Credit Units</td>
</tr>
<tr>
<td>CR Credit Level</td>
</tr>
<tr>
<td>DN Distinction</td>
</tr>
<tr>
<td>W weeks of session</td>
</tr>
<tr>
<td>School, Department etc</td>
</tr>
<tr>
<td>------------------------</td>
</tr>
<tr>
<td>1 School of Physics</td>
</tr>
<tr>
<td>2 School of Chemistry</td>
</tr>
<tr>
<td>3 School of Chemical and Industrial Engineering (New Course)</td>
</tr>
<tr>
<td>4 School of Materials Science and Engineering</td>
</tr>
<tr>
<td>5 School of Mechanical and Industrial Engineering</td>
</tr>
<tr>
<td>6 School of Electrical Engineering and Computer Science</td>
</tr>
<tr>
<td>7 School of Mines* (Mineral Processing and Extractive Metallurgy and Mining Engineering)</td>
</tr>
<tr>
<td>8 School of Civil Engineering</td>
</tr>
<tr>
<td>9 School of Fibre Science and Technology (Wood Science)</td>
</tr>
<tr>
<td>10 School of Mathematics*</td>
</tr>
<tr>
<td>11 School Architecture</td>
</tr>
<tr>
<td>12 School of Psychology</td>
</tr>
<tr>
<td>13 School of Fibre Science and Technology (Textile Technology)</td>
</tr>
<tr>
<td>14 School of Accountancy*</td>
</tr>
<tr>
<td>15 School of Economics*</td>
</tr>
<tr>
<td>16 School of Health Administration*</td>
</tr>
<tr>
<td>17 Faculty of Biological and Behavioural Sciences</td>
</tr>
<tr>
<td>18 School of Mechanical and Industrial Engineering (Industrial Engineering)</td>
</tr>
<tr>
<td>21 Department of Industrial Arts</td>
</tr>
<tr>
<td>25 School of Mines* (Applied Geology)</td>
</tr>
<tr>
<td>26 Department of General Studies</td>
</tr>
<tr>
<td>27 School of Geography*</td>
</tr>
<tr>
<td>28 School of Marketing*</td>
</tr>
<tr>
<td>29 School of Surveying</td>
</tr>
<tr>
<td>30 Organizational Behaviour Unit*</td>
</tr>
<tr>
<td>31 School of Optometry</td>
</tr>
<tr>
<td>32 Centre for Biomedical Engineering</td>
</tr>
<tr>
<td>34 Faculty of Arts</td>
</tr>
<tr>
<td>35 School of Building*</td>
</tr>
<tr>
<td>36 School of Town Planning</td>
</tr>
<tr>
<td>37 School of Landscape Architecture</td>
</tr>
<tr>
<td>38 School of Biological Technologies (Food Science)</td>
</tr>
<tr>
<td>39 Graduate School of the Built Environment*</td>
</tr>
<tr>
<td>40 Professional Board</td>
</tr>
<tr>
<td>41 School of Biochemistry</td>
</tr>
<tr>
<td>42 School of Biological Technologies (Biotechnology)*</td>
</tr>
<tr>
<td>44 School of Microbiology</td>
</tr>
<tr>
<td>45 School of Biological Science</td>
</tr>
<tr>
<td>46 Faculty of Applied Science</td>
</tr>
<tr>
<td>47 Centre for Safety Science</td>
</tr>
<tr>
<td>48 School of Chemical Engineering and Industrial Chemistry* (Old Course)</td>
</tr>
<tr>
<td>49 School of Biological Technologies</td>
</tr>
<tr>
<td>50 School of English</td>
</tr>
<tr>
<td>51 School of History</td>
</tr>
<tr>
<td>52 School of Philosophy</td>
</tr>
<tr>
<td>53 School of Sociology</td>
</tr>
<tr>
<td>54 School of Political Science</td>
</tr>
<tr>
<td>55 School of Librarianship, Professional Studies</td>
</tr>
<tr>
<td>56 School of French</td>
</tr>
<tr>
<td>57 School of Theatre Studies</td>
</tr>
<tr>
<td>58 School of Education</td>
</tr>
<tr>
<td>59 Department of Russian Studies</td>
</tr>
<tr>
<td>60 Faculty of Arts</td>
</tr>
<tr>
<td>61 Department of Music</td>
</tr>
<tr>
<td>62 School of Science and Technology Studies</td>
</tr>
<tr>
<td>63 School of Social Work</td>
</tr>
<tr>
<td>64 School of German Studies</td>
</tr>
<tr>
<td>65 School of Spanish and Latin American Studies</td>
</tr>
<tr>
<td>66 Subjects Available from Other Universities</td>
</tr>
<tr>
<td>67 Faculty of Science</td>
</tr>
<tr>
<td>68 Board of Studies in Science and Mathematics</td>
</tr>
<tr>
<td>70 School of Anatomy*</td>
</tr>
<tr>
<td>71 School of Medicine</td>
</tr>
<tr>
<td>72 School of Pathology*</td>
</tr>
<tr>
<td>73 School of Physiology and Pharmacology*</td>
</tr>
<tr>
<td>74 School of Surgery</td>
</tr>
<tr>
<td>75 School of Obstetrics and Gynaecology</td>
</tr>
<tr>
<td>76 School of Paediatrics</td>
</tr>
<tr>
<td>77 School of Psychiatry</td>
</tr>
<tr>
<td>78 School of Medical Education</td>
</tr>
<tr>
<td>79 School of Community Medicine</td>
</tr>
<tr>
<td>80 Faculty of Medicine*</td>
</tr>
<tr>
<td>81 Medicine/Science/Biological Sciences</td>
</tr>
<tr>
<td>85 Australian Graduate School of Management</td>
</tr>
<tr>
<td>90 Faculty of Law</td>
</tr>
<tr>
<td>97 Faculty of Engineering</td>
</tr>
</tbody>
</table>
Physics

The School of Physics has introduced the specialized units 1.951, 1.961, 1.971, 1.981, 1.992 and 1.993 for students in the Faculty of Engineering. The first-year units 1.951, 1.961, 1.971 and 1.981 are not available at night. Part-time students will be catered for by the Science Course unit 1.001.

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

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

Physics Level I Units

1.001 Physics 1 F L3T3
Prerequisites:
* HSC Exam Score Range
  2 unit Mathematics * or 67-100
  3 unit Mathematics or 1-50
  4 unit Mathematics and 1.100 or
  1.021 (for 1.001 only) 10.021B
  2 unit Science (Physics) or 57-100
  2 unit Science (Chemistry) or 60-100
  3 unit Science or
  4 unit Science or 31-100
  1.021 Co-requisite: 10.021C or 10.001 or 10.011.

*This refers to the 2 Unit Mathematics subject which is related to the 3 Unit Mathematics subject. It does not refer to the subject 2 Unit Mathematics (Mathematics in Society).

Aims and nature of physics and the study of motion of particles under the influence of mechanical, electrical, magnetic and gravitational forces. Concepts of force, inertial mass, energy, momentum, charge, potential, fields. Application of the conservation principles to solution of problems involving charge, energy and momentum. Electrical circuit theory, application of Kirchhoff's laws to AC and DC circuits. Uniform circular motion, Kepler's laws and rotational mechanics. Properties of matter: solids, liquids, gases. The wave theories of physics, transfer of energy by waves, properties of waves. Application of wave theories to optical and acoustical phenomena such as interference, diffraction and polarization.

1.951 Physics 1 (Mechanical Engineering) F L2Ts
Prerequisites: As for 1.001 Physics 1.
For students in the School of Mechanical and Industrial Engineering.


1.961 Physics 1 (Electrical Engineering) F L3T3
Prerequisite: As for 1.001 Physics 1.
For students in the School of Electrical Engineering.

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

1.971 Physics 1 (Surveying) F L3T3
Prerequisite: As for 1.001 Physics 1.
For students in the School of Surveying.

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

1.981 Physics 1 (Civil Engineering) S1 L2T2 and S2 L2T1
Prerequisite: As for 1.001 Physics 1.
For students in the School of Civil Engineering.


Physics Level II Units

1.002 Mechanics, Waves and Optics S1 L3T1
Prerequisites: 1.001 or 1.011, 10.001 or 10.011. Co-requisite: 10.2111. Excluded: 1.992, 10.4111, 10.4211.

Harmonic motion, systems of particles, central force problems, Lagrange's equations, coupled oscillations, travelling waves, pulses, energy and momentum transfer, polarization, birefring-
1.012 Electromagnetism and Thermal Physics S2 L3T1
Prerequisites: 1.001 or 1.011, 10.001 or 10.011. Co-requisite: 10.2111. Excluded: 1.972, 1.982.

Electric field strength and potential, Gauss’ law, Poisson’s and Laplace’s equations, capacitance, dielectrics and polarization, magnetism, electro-magnetic induction, Maxwell’s equations, electromagnetic waves. Laws of thermodynamics, kinetic theory, micro-sopic processes, entropy, solid state defects, Helm- holtz and Gibbs functions, Maxwell’s relations, phase diagrams, chemical and electrochemical potential.

1.022 Modern Physics F L1½T½
Prerequisites: 1.001 or 1.011, 10.001 or 10.011. Co-requisite: 10.2112. Excluded: 1.9322, 1.982.

Special theory of relativity: time dilation, length contraction, simultaneity, Lorentz transformations, energy and mass. Photon properties, de Broglie relations, Uncertainty principle, operators in quantum mechanics, postulates of quantum mechanics, potential wells, steps and barriers, harmonic oscillator, H atom, angular momentum, magnetic moment, electron spin, nuclear spin. Atomic and molecular spectra, lasers, quantum statistics, free electron model of a metal, band theory; nuclear size, density, mass; nuclear models, fission and fusion, nuclear forces.

1.032 Laboratory F T3
Prerequisites: 1.001 or 1.011, 10.001. Excluded: 1.9222.

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

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

For students in the School of Surveying.


1.972 Electromagnetism (Electrical Engineering) S1 or S2 L2T2
Prerequisite: 1.961 or 1.001 or 1.011, 10.001. Co-requisites: 10.2111, 10.2112. Excluded: 1.012.

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

1.982 Solid State Physics (Electrical Engineering) S1 or S2 L½T2
Prerequisite: 1.961 or 1.001 or 1.011, 10.001. Co-requisites: 10.211, 10.2112. Excluded: 1.022, 1.9322.

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

1.992 Mechanics and Thermal Physics (Electrical Engineering) F L1½T½

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

Physics Level III Units

1.023 Statistical Mechanics and Solid State Physics S1 L3T1
Prerequisites: 1.012, 1.022, 10.2112.

Canonical distribution, paramagnetism, Einstein solid, ideal gas, equipartition, grand canonical ensemble, chemical potential, phase equilibria, Fermi and Bose statistics, Bose condensation, blackbody radiation. Crystal structure, bonding, lattice dynamics, phonons, free-electron models of metals, band theory, point defects, dislocations.

1.0333 Electromagnetism S1 L1½T½
Prerequisites: 1.012, 10.2111, 10.2112. Excluded: 1.022C.

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

1.043 Experimental Physics A F T4
Prerequisite: 1.032.

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

1.0133 Quantum Mechanics S1 L1½T½
Prerequisites: 1.022, 10.2112. Excluded: 2.023A, 10.222F.

Revision of basic concepts, harmonic oscillator systems, spherically symmetric systems, angular momentum, H atom, first-order

1.0533 Experimental Physics B1  S1 T4
Prerequisite: 1.032.
Selected experiments and projects. Advanced experimental techniques and open ended projects in the areas covered in 1.043 Experimental Physics A together with projects involving electron and nuclear magnetic resonances, low temperature physics and super-conductivity. Fourier optics, holography.

1.133 Electronics  S1 L2T4
Prerequisites: 1.9222 or 1.032.

Chemistry

Level I Units

2.121 Chemistry 1A  S1 or S2 L2T4
Prerequisites:
- 2 unit Mathematics* or 3 unit Mathematics or 4 unit Mathematics and
- 2 unit Science (Physics) or 3 unit Science (Chemistry) or 4 unit Science or
- 2 unit Science or

2.111

*This refers to the 2 Unit Mathematics subject which is related to the 3 Unit Mathematics subject. It does not refer to the subject 2 Unit Mathematics (Mathematics in Society).


Note: Students who have passed 2.121 or 2.131 may not enrol in 2.111 or 2.141. Students meeting the 2.121 or 2.141 prerequisite are not permitted to enrol in 2.111 without the permission of the Head of the School of Chemistry. Students who enrol in 2.111 must pass 2.111 before they can proceed to 2.121 or 2.131 or 2.141.

2.131 Chemistry 1B  S1 or S2 L2T4
Prerequisite: 2.121.
Chemical equilibrium, equilibrium constants, quantitative calculations applied to acid-base and solubility equilibria; buffers, titrations, chemical analysis. Oxidation and reduction reactions, electrode potentials. Chemical thermodynamics, entropy, free energy. Chemistry of carbon compounds, stereoisomerism; alkenes, alkynes, aromatic compounds, alcohols, ethers, aldehydes, ketones, carboxylic acids and derivatives, amines.

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

2.951 Chemistry 1ME  S1 L3T3
Prerequisite: As for 2.121.
A treatment of chemistry which illustrates the application of the principles of chemistry to problems of concern to mechanical engineers. Topics: chemistry of materials, thermochemistry, chemical kinetics and equilibrium, radioactivity and nuclear power, electrochemistry and corrosion of metals. Introduction to organic chemistry, structure and properties of polymers, fuels and lubricants. Surface chemistry.

2.991 Chemistry 1CE  S2 L3T3
Prerequisites: As for 2.121.

For further information regarding the following subject see the Faculty of Medicine Handbook.

Level II Units

2.102A Physical Chemistry  S1 or S2 L3T3
Prerequisites: 2.121 and 2.131, or 2.141, and 10.011 or 10.001 or 10.021B and 10.021C. Excluded 2.002A.

2.102B Organic Chemistry  F or S2 L3T3
Prerequisite: 2.131 or 2.141. Excluded: 2.002B
Discussion of the major types of organic reaction mechanisms (eg addition, substitution, elimination, free-radical, molecular rearrangement) within context of important functional groups (eg aliphatic hydrocarbons, monocyclic aromatic hydrocarbons, hal-
ides, organometallic compounds, alcohols, phenols, aldehydes, ketones, ethers, carboxylic acids and their derivatives, nitro compounds, amines and sulfonic acids). Introduction to application of spectroscopic methods to structure determination.

2.102C Inorganic Chemistry and Structure S1 or S2 L3T3
Prerequisites: 2.121 and 2.131, or 2.141. Excluded: 2.042C.

2.102D Chemical and Spectroscopic Analysis S1 or S2 L3T3
Prerequisites: 2.121 and 2.131, or 2.141; and 10.011 or 10.001 or 10.021B and 10.021C. Excluded: 2.002D and 2.003H.

Level III Units

2.043 A
Servicing

2.9111

Materials Science and Engineering

4.964 Materials Science and Engineering for Electrical Engineers S2 L3T1
Prerequisite: 1.982 Solid State Physics.
Metallic, ceramic, organic, polymeric and composite materials and their technology for electrical engineering applications. Structures and structure property relations, phase equilibria and their effect on mechanical, electrical, magnetic, thermal and chemical properties. The shaping, treating and joining of materials. Aqueous and gaseous corrosion. Metallic glasses, superconductors, fast ion conductors. The role of materials science in the development of electrical energy systems.

Mechanical and Industrial Engineering

5.0011 Engineering Mechanics 1 S1 or S2 L2T2
Prerequisite:

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<tr>
<th>HSC Score</th>
<th>Either</th>
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<tbody>
<tr>
<td>53-100</td>
<td>2 unit Science (Physics) or 3 unit Science</td>
</tr>
<tr>
<td>90-150</td>
<td>4 unit Science (multistrand)</td>
</tr>
<tr>
<td>1-50</td>
<td>or 2 unit Industrial Arts (Engineering Science) or 3 unit Industrial Arts (Engineering Science)</td>
</tr>
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</table>

Excluded: 5.010, 5.0101, 5.0201.

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


5.0012 Introductory Engineering Design and Materials Science S1 or S2 L2 T0
Excluded: 5.0016, 5.010.

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: Structure and properties of main types of engineering materials, with emphasis on the way in which properties may be controlled by controlling structure.

5.0016 Introductory Engineering Design and Drawing Practice S1 L/T2
Excluded: 5.0012, 5.030, 5.0302, 5.010.

This subject is intended specifically for Electrical Engineering students, and is to be taken in conjunction with 5.0011.

Introduction to engineering design: Engineering method, prob-
lem identification, creative thinking, mathematical modelling; computer-aided design; materials and processes; communication of ideas; the place of engineering in society.


5.0300 Graphical Analysis and Communications S2 L1T2
Excluded: 5.0016, 5.030, 5.0302.

Descriptive geometry as the basis of analysis and synthesis of spatial relationships: points, lines, plans, solids, intersections. Orthographic and other projection systems. Engineering drawing as a means of definition and communication, selection of views, construction of drawings, conventions, dimensions and tolerancing. Introduction to computer-based drafting systems.

5.0302 Engineering Drawing and Descriptive Geometry S1 or S2 L1T3
Excluded: 5.0016, 5.030.


5.0303 Workshop Technology SS L1T2

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

5.0305 Manufacturing Technology S2 L/T3

Description of the processes classified as: forming from liquid or solid, material removal, material joining. Elementary mechanics of forming and cutting processes. Analysis of the primary functions of machine tool structures and their operation. Relationship between product design and manufacture processes. Elementary functional analysis of product designs, including linear loop equations, limits and fits, dimensional accuracy of processes and alternate design and manufacturing strategies.

5.034 Engineering Experimentation S1 L1 T1 S2 L4T1
Prerequisites: 5.300, 5.422, 5.622, 10.351. Co-requisites: 5.343, 6.856.

Analog and digital instrumentation. Transducers, computer communication interfaces, computer control of experiments.

Scientific method, engineering method, report writing, errors in experiments. Nineteen experiments and demonstrations.

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

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

5.044 Industrial Training 2 SS
Practical work in industry at the professional level to gain experience in design, development, investigation or management control systems areas in collaboration with professional engineers. (Report submitted in Week 1 of session detailing responsibilities and experience gained in vacation period between Years 3 and 4.)

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

5.051 Thesis F T6
Co-requisite: 5.062.

To be taken in year of completion of course.

For students in the BE degree courses in the School of Mechanical and Industrial Engineering.

5.061 Technical Orientation F L1
Prerequisite:

<table>
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<tr>
<th>HSC Score</th>
<th>53-100</th>
<th>49-100</th>
<th>1-50</th>
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</thead>
</table>

Introduction to engineering and its profession. Students are encouraged to develop their skill in observing and reporting on technical matters.

5.062 Communications F L2
Co-requisite: 5.051.


5.065 Mechanical Engineering SS L3/T1
Prerequisites: 1.961, 10.2111, 10.2112 or equivalent.

Properties of matter. Laws of Thermodynamics for non-flow and flow processes, entropy, efficiency and availability. Air standard

5.070 Optimal Engineering Strategies
Prerequisites: 5.0721, 5.300, 10.022. Co-requisite: 5.122. Excluded: 5.073.
Optimization: introduction to the calculus of variations; Euler-Lagrange equations and Hamilton’s principle; introduction to geometric programming and network analysis. Strategies for design and analysis: system structure; variable classification; procedure generation; recycle optimization; the adjacency matrix.

5.0721 Computing S1 or S2 L2T1
Co-requisite: 10.001 or 10.011.

5.074 Computing Science for Mechanical Engineers S1 L2T1
Prerequisite: 5.0721.

5.079 Numerical Methods F L1T½
Prerequisites: 5.0721, 10.022. Excluded: 5.073.

5.122 Mechanical Engineering Design 2 F L1T2
Prerequisites: 5.010, 5.030. Co-requisites: 5.0201, 5.061, 5.422, 5.620, 5.626.
Design of basic engineering elements and simple systems. Selection and specification of materials and manufacturing processes for engineering items. Communication by means of engineering drawings (including tolerances) of manufacturing information for simple structures and assemblies. Application of standards and trade literature to design. Simple design-and-make project to meet a published specification and to demonstrate the product's performance.

5.123 Mechanical Engineering Design 3 F L2T1
Prerequisite: 5.122. Co-requisites: 5.301, 5.423.
Mathematical modelling and decision making in design with applications. More advanced design analyses, component design and drawing with individual and group projects of an interdisciplinary nature.
5.3021 Engineering Mechanics 2A  S1 or S2 L2T1
Prerequisites: 1.001 or 1.951, 5.0201 or 5.0011, 10.001 or 10.011. Excluded: 5.300.

Kinetics of system of particles, plane steady mass flow. Plane kinematics and kinematics of rigid bodies, mass moment of inertia, differential equations of motion, work, energy, impulse and momentum. One degree of freedom vibrations, free, forced, undamped, damped, transmissibility.

5.3022 Engineering Mechanics 2B  S1 or S2 L/T2
Prerequisites: 1.001 or 1.951, 5.3021, 10.001 or 10.0011.

Transverse vibrations of beams. Whirling of shafts. Motion relative to a rotating and moving frame. Virtual work for static and dynamic systems. Kinematics and kinetics of simple mechanisms.

5.303 Mechanical Vibrations  S2 L1½T½
Prerequisites: 5.300, 10.022.


5.3040 Plane Mechanism Kinematics  S2 L2T1
Prerequisites: 5.301 or 5.3022 or 5.333. Excluded: 5.318G.

Algebraic displacement, velocity and acceleration analyses of simple and complex planar mechanisms. Instantaneous kinematics: centroids; inflection and Bresse circles; Euler-Savary equation; cubic of stationary curvature; centring point curve. Coupler curves and their properties; curve cognates. Constraint and freedom; mobility; velocity closure of a loop, special configurations; singularities. Various methods of synthesis.

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

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

5.348 Mechanical Vibrations 2  SS L2T1
Prerequisites: 5.303, 5.423. Excluded: 5.334, 5.338G.

Means of controlling inertia-induced vibration in machinery. Frequency response functions of damped and undamped systems; laboratory demonstrations. Eigenvalues and eigenvectors for multi-degree of freedom systems, including geared shaft systems. Beam and plate vibration via finite element analysis and laboratory demonstrations.

5.350 Principles of Control of Mechanical Systems  S1 L2T1
Prerequisite: 5.343. Excluded: 5.344.

Introduction to modern systems analysis. Review of modelling; nonlinear systems. Digital and analogue representations. Stability; regulation; control and optimal control. Instrumentation; actuators; interfaces; control computers; programmable logic controllers. Implementation; various case studies, including microprocessor applications.

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


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


5.419 Engineering Applications of Finite Elements  SS L2 T1
Prerequisite: 5.423. Excluded: 5.414G.


5.421 Mechanics of Solids 1  S1 or S2 L2T1
Co-requisite: 5.010 or 5.0011.


5.4220 Mechanics of Solids 2  ½S1S2L1½T2
Prerequisites: 5.421 or 8.171, 10.001 or 10.011. Excluded: 5.422, 5.4221.

5.4221 Mechanics of Solids 2  F L1½T2

Intended for Materials Science Majors in combined BE BSc degree course.
Prerequisites: 5.421 or 8.171, 10.001 or 10.011. Excluded: 5.422, 5.4220, 5.4222.


5.4222 Mechanical Engineering Materials  ½S1 L1½T2FL1

Prerequisite: 5.010. Excluded: 5.422, 5.4221.

Mechanical properties of materials: tensile and compressive behaviour; hardness; testing machines. Solidification. Mechanical processing of metals. Phase equilibrium and its application to engineering materials. Fracture; creep; corrosion.

5.423 Mechanics of Solids 3  F L1½T½

Prerequisites: 5.422 or 5.4220, 5.422 or 5.4221, 10.022.

Deflections of beams and structures. Statically indeterminate beams and structures. Introduction to theory of elasticity; stress, strain, torsion. Membrane analogy. Finite element stress analysis. Basic concepts; structural stiffness method; bar, triangular, rectangular and brick finite elements; force and displacement methods; development and use of computer programs.

5.424 General Mechanics of Solids  SS L2T1

Prerequisite: 5.423. Excluded: 5.417G.

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

5.434 Plates and Shells  SS L2T1

Prerequisite: 5.423. Excluded: 5.415G.

Bending of rectangular and circular plates under normal loading; thermal stresses. Shells; membrane stresses, bending stresses, discontinuities at juncture of ends; design of pressure vessels.

5.444 Theory of Elasticity  SS L2T1

Prerequisites: 5.300, 5.423, 5.622.

Mathematical foundations; analysis of stress; deformation and strain; equilibrium, motion and flow; fundamental laws of continuum mechanics; linear elasticity; viscoelasticity; applications.

5.454 Theory of Plasticity  SS L2T1

Prerequisite: 5.423 or 18.413.

Analysis of stress, strain, strain rate; plastic stress/strain relations with description of experimental verification. Application of plasticity theory to a selection of problems including metal working processes such as extrusion and rolling and metallic friction and wear.

5.464 Structural Instability  S1 L1½T½

Prerequisite: 5.423.

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

5.620 Fluid Mechanics 1  F L1T1

Prerequisites: 1.001 or 1.951, 5.010, 10.001 or 10.011. Co-requisite: 5.300. Excluded: 5.622.


5.626 Thermodynamics 1  FL1T1

Prerequisites: 1.001 or 1.951, 5.010, 10.001 or 10.011. Excluded: 5.622.


5.630 Fluid Mechanics 2  FL1T½

Prerequisites: 5.300, 5.620, 5.626, 10.022. Excluded: 5.653, 5.663.

Dimensional analysis; similitude and modelling. Characteristics of pumps, fans and compressors; non-dimensional characteristics of turbomachines; specific speed; cavitation. Fields; dilatation vorticity; mass and momentum conservation; the Bernoulli equation; stream and potential functions; superposition. Velocity of sound; compressible flow in nozzles; Fanno and Rayleigh lines; applications to duct flows; normal shocks.
5.633 Turbomachines
Prerequisites: 5.630, 5.663, 10.022. Co-requisite: 5.073.

Dimensional analysis and experience charts, cavitation, thermodynamics of a stage, blade element theory of axial machines, thin wing theory, cascade data and design procedures, aero-dynamic design of an axial machine, theory of centrifugal machines, design of a centrifugal machine.

5.6341 Viscous Flow Theory
Prerequisites: 5.620, 5.626, 10.022.


5.6342 Lubrication
Prerequisites: 5.620, 10.022. Excluded: 5.631G.

History of lubrication, types of bearings and bearing operation, nature of surfaces and their contact, modes of lubrication, properties of lubricants, viscous flow in pipes and channels, measurement of viscosity, infinitely long and short bearing approximations, one-dimensional analysis of short bearing, other slider bearing geometries, the effect of end leakage, hydrostatic or externally pressurized bearings, squeeze films.

5.635 Convection Heat Transfer
Prerequisite: 5.623. Excluded: 5.717G, 5.602G.


5.636 Thermodynamics 2
Prerequisites: 5.300, 5.620, 5.626. Excluded: 5.623, 5.624.

Steady and unsteady conduction heat transfer; convection heat transfer; radiation heat transfer; combined modes of heat transfer; heat exchangers. Non-reactive gas mixtures; psychrometrics; refrigeration and air conditioning.

5.641 Thermal Power Plant
Prerequisites: 5.620, 5.626 or equivalent. Exclusions: 5.732G.


5.643 Thermodynamics and Combustion
Prerequisites: 5.636, 10.022.

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

5.644 Solar Energy
Prerequisites: 5.630, 5.636, 10.022. Excluded: 5.722G.


5.654 Hydraulic Transients
Prerequisites: 5.630, 10.022.

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

5.664 Multiphase Flow
Prerequisites: 5.630, 5.636, 10.022.


5.800 Aircraft Design 1
Prerequisites: 5.122, 5.300, 5.422. Co-requisite: 5.423.

**5.801 Aircraft Design 2**  

Aerodynamics, structures and operations leading to detailed design, calculation and drawing of an original aircraft configuration.

**5.811 Aerodynamics 1**  
Prerequisites: 5.300, 5.620, 10.022. Excluded: 5.653, 5.663.

One dimensional compressible flow. Low speed aerodynamics: boundary layers, drag; industrial aerodynamics, wind tunnels, airfoils for wings, cascades, propellers, fans; potential flow for airfoils; Prandtl lifting lines, vortex induced drag. Flight mechanics; performance; static stability.

**5.812 Aerodynamics 2**  
Prerequisites: 5.073, 5.811, 5.303, 5.343.

Compressible flow: subsonic, transonic and supersonic two-dimensional flows; viscous boundary layers and heat transfer. Dynamic stability and control: characteristic solutions for rigid aircraft. Hypersonic, high enthalpy flows.

**5.822 Analysis of Aerospace Structures 1**  
Prerequisites: 5.300, 5.4220, 10.022. Co-requisite: 5.423.

Equilibrium of forces: aerospace applications of plane frames and space structures. Beams; shear and bending stress distribution in thin-webbed beams, close-section thin-wall beams, tapered beams, beams with variable flange areas. Semi-monocoque structures; ribs and bulkheads. Deflection of structures: stresses due to torsion and shear in multicell tubes. Statically indeterminate structures; beams, trusses and frames. Structural instability; buckling of perfect and imperfect columns; bending and buckling of thin flat plates.

**5.823 Analysis of Aerospace Structures 2**  
Prerequisites: 5.423, 5.822.

Structural instability; local instability and crippling of thin-walled columns; buckling of stiffened panels, curved panels and monocoque cylinders; tension field beams. Stress functions. Shear lag. Warping of thin-walled open and closed section tubes. Torsional buckling. Advanced applications of finite elements; introduction to commercial f.e.m. systems. Thermal stresses. Vibrations and aeroelasticity. Fatigue.

**5.831 Aerospace Propulsion**  
Prerequisites: 5.620, 5.626, 5.653 or 5.811.


**5.901 Introduction to Mathematical Modelling and Decision Making**  
Prerequisite: 5.122.

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

**5.902 Ship Management Economics**  
Prerequisite: 10.022. Co-requisite: 5.073.


**5.911 Ship Hydrostatics**  
Prerequisites: 5.010, 10.001 or 10.011.

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

**5.921 Ship Structures 1**  
Prerequisites: 5.4220, 5.4222, 10.022.


**5.922 Ship Structures 2**  
Prerequisites: 5.423, 5.921.


**5.9311 Principles of Ship Design 1**  
Prerequisite: 5.921.

5.9321 Principles of Ship Design 2

Prerequisite: 5.9311.


5.937 Ship Design Project

Prerequisites: 5.901, 5.911, 5.953. Co-requisites: 5.902, 5.9311, 5.9321.

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

5.941 Ship Propulsion and Systems

Prerequisites: 5.911, 5.953.


5.953 Ship Hydrodynamics

Prerequisites: 5.300, 5.620, 10.022. Co-requisite: 5.073.


Undergraduate Study: Subject Descriptions

Electrical Engineering and Computer Science

6.010 Electrical Engineering 1

Prerequisite: Electricity and magnetism section of 1.961.


6.011 Introduction to Electrical Engineering


6.021A Circuit Theory 1

Prerequisites: 1.961 or equivalent, 6.010, 10.001.


6.021B Power

Prerequisite: 6.021A attempted at an acceptable level.

Topics in electric power engineering including analysis of AC power circuits (single phase, three phase, steady state and transient), magnetic circuits, transformers, fundamentals of electro-mechanical energy conversion and electrical safety.

6.021C Electronics 1

Prerequisites: 1.982, 6.021A (one of these to be passed, the other to be attempted at an acceptable level and to be repeated concurrently).

Principles of operation and low-frequency characteristics of PN diodes, bipolar and field effect transistors, thyristors and various optoelectronic devices. Transistor low-frequency small-signal equivalent circuits. Design and analysis of low frequency Class A transistor amplifiers. Temperature effects. Device ratings and use of data sheets.
6.021D Computing S1 or S2 L3T1
Assembler programming and simple machine architecture. The Unix operating system: file system, processes, pipes, programming in the Shell command language. Data structures: lists, trees, recursion. Sorting: some basic algorithms for sorting arrays. Engineering applications of computers.

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

6.0311 Circuit Theory 2 S1 or S2 L2T2
Prerequisites: 6.021A, 10.111A (10.111A if attempted at an acceptable level may be taken as a co-requisite), 10.1113, 10.1114, 10.2111, 10.2112 (two of these may be taken as co-requisites), 6.021B, 6.021C (one of 6.021B or 6.021C may be taken as a co-requisite).
Basic circuit concepts followed by basic system ideas such as order, state, linearity and typical system waveforms. Typical linear time invariant systems modelled and described by differential equations leading to use of Laplace transforms. Partial fractions, poles, zeros and stability. Transfer functions and circuit responses both in time and frequency domain. Basic signal analysis. Fourier series. Fourier Transform. Modern filter design. Butterworth and Chebyshev filters. Transformation of low pass filter to high pass, bandpass and band stop filters.

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

6.0313 Electronics 2 S1 or S2 L2T2

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

6.0315 Electrical Energy S2 L2T2
Prerequisite: 1.972; 6.0312 attempted at an acceptable level.
Aspects of the supply, control and utilization of electrical energy. Choice of voltage and supply configuration. Transmission line characteristics and calculations. Dielectric and thermal considerations of power equipment. Protection considerations for medium voltage (up to 600V) systems — circuit breakers, fuses, relays, earthing, surge suppression. Electrical methods of industrial heating: direct, induction, dielectric, etc. Light sources, their operation and efficacy. AC-DC conversion, power switching devices, their characteristics and uses. Energy management.

6.0316 Electronics 3 S1 or S2 L2T2
Prerequisite: 6.0313. Co-requisites: 6.0311, 6.021E.
Large-signal and nonlinear circuits and devices. Models of diodes and transistors for large-signal analysis. Basic nonlinear circuits: wave-shapers, multipliers and gain-control circuits. Astables and monostables, sinewave oscillators (RC, LC, crystal), tuned amplifiers and power amplifiers. Both discrete component and integrated circuit realizations are treated. The laboratory program involves the design and study of several large-signal functional circuits.

6.0317 Communication Systems 1 S2 L2T2
Overview of information acquisition, transmission and processing. Aims to enable students not specializing in this field to understand the communication problems they are likely to meet in their career, and to provide a background if they intend to specialize in communications. Topics: analogue to digital conversion (sampling, quantizing, aliasing, pulse code modulation, delta modulation, time and frequency division multi-plexing). Modulation and demodulation (amplitude, frequency and phase modulation, signal to noise ratio, noise figure, error probability, bandwidth, spectrum, intersymbol interference). Communication systems (radio wave propagation, antennas and arrays, modems, repeaters, equalizers, line and error coding).

6.0318 Microprocessor Systems and Applications S1 or S2 L2T2
Basic computer architecture: fetching and executing instructions; Motorola 6809 registers and instructions; assemblers, addressing modes; bus waveforms; interfacing to a bus; parallel interfacing — the PIA; handshaking; interrupts; critical regions; buffered I/O; stack data frames; recursion; serial interfacing — the ACIA; direct memory access (DMA); dynamic memory; Microprocessor examples.

6.042 Digital and Analogue Signals SS L2T3
Prerequisites: 6.0311, 10.0331, 10.0332, 10.1113, 10.1114, 10.2111, 10.2112 (two of these may be taken as co-requisites), 10.361.
Analysis and processing of continuous-time and discrete-time (digital) signals: Generalized Fourier analysis; convolution, correlation, energy and power density spectra. Signal distortion (linear and nonlinear) Hilbert transforms; analytic signals, sig-
Transforms (FFT), algorithm. Design of finite and infinite impulse signals; the discrete Fourier transform (DFT), the fast Fourier algorithm. Sampling and digital processing of analogue devices, signal-to-noise ratios, matched filters. Estimation and measurement of power density spectra.

6.202 Power Engineering — Systems 1 SS L2T3
Prerequisites: 6.0312, 6.0315.
An elective emphasizing parameters and performance of power system components; transmission lines and cables, transformers, synchronous machines; power system overvoltages; fault calculations; circuit interruption; protection; distribution systems; power system economics.

6.203 Power Engineering — Systems 2 SS L2T3

6.212 Power Engineering — Utilization SS L2T3
Prerequisites: 6.0312, 6.0315.
Topics include: Power electronics; scope of power electronics, commutation, filtering and harmonics, thyristor protection, AC phase control, integral cycle control, rectification, inversion, bridge converters, converter control, dual converter, cyclo-converter, DC switching and regulation. Electrical machines; application and control; unified machine theory; application of symmetrical component theory to the operation of induction motors. Electrical equipment for hazardous atmospheres. A program of experimental projects and design applications accompanies the lectures.

6.215 Industrial Electrical Systems S2 L2 T3
Prerequisite: 6.0315.
The design, operation, maintenance and efficiency of large industrial electric power systems. Protection and maintenance, detailed fault calculations, choice and use of protective equipment, including circuit interrupters, surge diverters and personnel protection. Testing of equipment and relevance of Standards (including loading specifications, safety and general wiring procedures). Problems caused by power factor correction, lighting system harmonics, rectifier harmonics, protection of electronic equipment, static voltages, effects of electric and magnetic fields. Uninterruptible power supply systems. Economic considerations of industrial electrical systems including present and future energy use and its effect on the design of efficient power systems. Energy management schemes for economic use of existing plant.

6.222 High Voltage Technology SS L2T3
Prerequisite: 6.0315.
An elective concerned with the high voltage design and testing of electrical equipment used in the power industry. The practical applications of relevant materials, with emphasis on properties of insulation systems (gases, liquids and solids) and the interaction of the materials in non-uniform fields. Methods of testing under steady state — AC and DC — and surge conditions are incorporated in the laboratory work. Design examples are taken from insulator, bushing, cable, power capacitor, transformer, rotating machine and switchgear technologies.

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

6.313 Signal Propagation at Microwave and Optical Frequencies SS L2T3
Prerequisite (or co-requisite): 6.303.
Maxwell's equations, waveguides, single mode optical fibres, free space propagation, antennas. Microwave sources. Light emitting diodes, lasers and optical detectors.

6.322 Electronics 4 S1 or S2 L2 T3
Prerequisites: 6.0313, 6.0316.
Theory and applications of electronic devices, circuits and systems employing microelectronics technology. Active filters, voltage-controlled oscillators, phase-locked loops, switching regulators. Additional topics chosen from: digital ICs using MOS logic, charge-coupled devices, voltage references and optical links. Laboratory: a series of projects to design, construct and study circuits based on the above topics.

6.323 Communication Systems 2A SS L2T3
Prerequisites: 6.0317, 10.0331, 10.361.
Theory and practice of modern analogue and digital communication techniques. Topics selected from: digital communications; bandlimited signalling, Nyquist and partial response shaping, non-binary transmission, receiver optimization and matched filters, line coding, spectrum with line coding, adaptive equalization, error control coding information theory (entropy, discrete and continuous channel capacity); linear and nonlinear analogue modulation (AM, SSB, FM etc, signal to noise ratios, characterization and effect of nonlinearities on transmitters and receivers, comparison); aspects of transmission media relevant to telecommunication systems.

6.333 Communication System 2B SS L2T3
Prerequisites: 6.0316, 6.0317.
Modern digital and analogue communications systems from a systems point of view. Topics selected from: television, teletext and viewdata; acoustic systems; broadcast systems covering AM, FM, stereo; radar, sonar, electronic navigation aids; satel-
lite communication systems; point-to-point and mobile terrestrial communication systems.

6.402 Introductory Physiology for Engineers
SS L2T2

Prerequisite: 6.0314, 6.0316, 6.402.

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

6.412 Systems and Control 2
SS L2T3

Prerequisites: 6.0311, 6.0314.

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

6.413 Digital Control
SS L2T3

Prerequisites: 6.0314, 10.0331, 10.0332, 10.361.

The design and analysis of digital control systems. Sampling, aliasing, pulse transfer function, discrete state-space, z-transform, transform methods of control design, digital PID, analog redesign. On-line digital identification and adaptive control techniques as illustrated by the self-tuning regulator, minimum variance and dead beat control structures. Linear quadratic regulator and observers.

6.432 Computer Control and Instrumentation
SS L2T3

Prerequisites: 6.0314, 6.0316, 6.0318.

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

6.512 Semiconductor Devices
SS L2T3

Prerequisite: 6.0313.

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

6.522 Transistor and Integrated Circuit Design
SS L2T3

Prerequisites: 6.0313, 6.0316.


6.532 Integrated Digital Systems
SS L2T3

Prerequisite: 6.021E, 6.0316.

Integrated circuit logic families with emphasis on MOS technologies, structured chip design, custom and semi-custom approaches, system architecture, computer aided design, layout considerations, timing estimates, circuit failures, faults, fault modelling, testing, design for testability.

6.606 Computing Science Honours

6.611 Computing 1
S1 or S2 L3T3


Introduction to programming: design and correctness of algorithms and data structures; programming in a high-level algorithmic language which provides simple, high level program control and data structuring facilities. Problem solving: basic ideas of problem solving; introduction to abstract structures used for computing solutions to problems. Introduction to propositional logic, computing machinery, computer arithmetic, artificial intelligence, and operating systems.

6.612 Computer Organization and Architecture
SS L3T2

Prerequisite: 6.0318 or 6.613. Excluded: 6.654G

The structural organization and hardware design of digital computer systems, basic computer organization, control and microprogramming, arithmetic algorithms and processor design, memory management and organization, input-output systems, parallel processing and multiprocessor systems, use of algorithmic state machines for digital system description, specification and design.
6.613 Computer Organization and Design  SS L3T2
Prerequisites: 6.631 or 6.021E, 6.021E, 6.021D or 6.620 or 6.621 (Pass Conceded (PC) awarded prior to Session 2, 1983, is not acceptable for these subjects). Excluded: 6.031B.

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

6.621 Computing 2A  S1 or S2 L3T2
Prerequisites: 6.611, 10.001 or 10.011. Excluded: 6.620, 6.021D.

For those students who intend to take further subjects in computer science.

Expansion and development of material introduced in 6.611 Computing 1. Systematic program development: introduction to programming language semantics, reasoning about programs, program derivation, abstract programs, realization of abstract programs (conversion from abstract to concrete). Practice in programming in a high-level programming language. Data structures arrays, lists, sets, trees; recursive programming. Introduction to computer organization: a simple machine architecture. Introduction to operating systems.

6.622 Computer Applications  SS L3T2


6.631 Computing 2B  S1 or S2 L3T2
Prerequisite: 6.620 or 6.621 or 6.021D, Excluded: 6.021E.

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

6.632 Operating Systems  SS L2T3

Introduction to operating systems via an intensive case study of a particular system, namely the UNIX Time-sharing systems 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 systems design.

6.633 Data Bases and Networks  SS L3T2

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

6.641 Computing 2C  S1 or S2 L3T2
Prerequisites: 6.620 or 6.021D or 6.621.

Design of data structures: abstraction, representation, manipulation and axiomatization. Key transformations (hashing), balanced and multiway trees, introduction to graphs. Files: sequential access, random access, merging, sorting and updating. File organizations and introduction to data base systems. Programming in logic: descriptive programming languages, symbolic manipulation, pattern matching and associative programming. Software engineering: a survey of some current techniques in problem specification and program design.

6.642 Design and Analysis of Algorithms  SS L3T2
Prerequisite: 6.641.

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

6.643 Compiling Techniques and Programming Languages  SS L3T2

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

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


Operating systems: principles of operating systems; multiprocessing; resource sharing and deadlock; interprocess communication; CPU scheduling; memory management including segmentation and virtual memory; file systems. Laboratory component covers C programming, polled input/output, interrupt driven input/output, multiprocessing, and real-time control of a simple system. Compilers: language description, Backus-Naur form, lexical analysis, semantic analysis, code generation. There is a project which involves modification of a simple compiler.

Extensive introduction to the theory and application of heavy current electrical engineering. Commences with the requisite circuit theory and then proceeds to consideration of the distribution of electrical power and the characteristics and selection of electrical machinery. DC power supplies, three-phase AC supply, voltage regulation, transformers, AC and DC machines and their rating; a project illustrating the application of electrical engineering to various aspects of industry. Consists of one 2-hour tutorial or laboratory sessions per week each commencing with a structured mini-lecture. Detailed lecture notes are provided.

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

Students enrolled in courses 3640, 3725 and 3720 must complete a minimum of 60 days' industrial training. At least some of this must be obtained in Australia. Overseas employment must have prior approval. Students are required to submit to the School evidence from their employers confirming completion of the prescribed training and a report, typically 500 words long, summarising the work done and training received. Experience claimed as an industrial elective covers requirements for this subject.

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

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

6.931 Industrial Elective

6.932 Industrial Elective

6.933 Industrial Elective

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

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

A maximum of three such electives can be taken and they may be substituted for certain subjects in course 3640 requirements. The substitution is not available for work done during the first year of employment if this coincides with the first year of part-time enrolment. The period of employment claimed must precede the completion of the thesis 6.911. An Industrial Elective cannot be claimed for work submitted for credit as 6.911 Thesis. Details of the procedure for registering and the requirements to be met can be obtained from the School of Electrical Engineering and Computer Science.

## Civil Engineering

### 8.1110 Civil Engineering Practice

**Prerequisite:**

| HSC Score | 2 unit English (General) or 2 unit English or 3 unit English | 53-100 | 49-100 | 1-50 |

**S2 L2T1**

### 8.1120 Computing

**S1 L2T1**

Introduction to programming and the development of skills in the use of computers in problem solving. Development of effective and correct algorithms and data structures. Introduction to higher-level languages and the use of Pascal for program design and implementation.

### 8.1130 Engineering Drawing

**S1 L1T2**

Fundamental concepts of descriptive geometry, orthographic drawing, first and third angle drawing, isometric and perspective drawing, Australian standard engineering and drawing practice, application of descriptive geometry to common problems in civil engineering, graphic communications, introduction to computer graphics.

### 8.1140 Statics

**S1 L1T2**

Co-requisite: 10.001


### 8.1210 Engineering Construction 1

**S1 L1T1**

Identification of the basic processes that comprise construction activity. Detailed technological analysis of plant, processes and techniques involved in engineering construction activities including earthmoving, rock excavation and placement, concreting etc. Introduction to construction site organization and control. Preparation of a major report based on field observations.

### 8.1410 Dynamics and Vibration

**S2 L2T1**

Prerequisite: 8.1140.

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

### 8.1610 Fluid Mechanics

**S2 L1T1**

Co-requisites: 8.1410, 10.001.

8.2110 Systems Engineering 1
Prerequisite: 10.001.


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


8.2210 Engineering Construction 2
Prerequisite: 8.1210.


8.2220 Engineering Construction 3
Prerequisite: 8.2210

Vehicle mobility science, grade resistance and rimpull cycle time and productivity. Drilling processes in rock, concrete and soil. Compressed air science, gas flow in pipes, design of compressed air pipeline systems. Fragmentation science, crushing and screening, blasting and demolition.

8.2310 Materials Technology
Co-requisite: 8.2420.


8.2320 Concrete Technology 1
Prerequisite: 8.2220.


8.2410 Mechanics of Solids 1
Prerequisite: 8.1410.


8.2420 Mechanics of Solids 2
Prerequisite: 8.2410.


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


8.2610 Hydraulics 1
Prerequisites: 8.1410, 8.1610, 10.001.


8.3110 Engineering Computations
Prerequisite: 8.1120, 10.022.


8.3210 Engineering Management 1
Prerequisite: 8.2220.

8.3220 Engineering Management 2  S2 L3T1
Prerequisite: 8.3210.


8.3230 Engineering Construction 4  S2 L1½T½
Prerequisite: 8.2220.

Specialised construction processes. Grouting, piles and pile driving, coffer dams and caissons, paving and surfacing, tunnelling and formwork design.

8.3310 Soil Mechanics  S1 L1½T½
Prerequisite: 8.2610.


8.3320 Geotechnical Engineering  S2 L2T1
Prerequisite: 8.3310.


8.3330 Concrete Technology 2  S2 L1T1
Prerequisite: 8.2320. Co-requisite: 8.3430.


8.3410 Structural Analysis 1  S1 L2T1
Prerequisite: 8.2420.


8.3420 Structural Analysis 2  S2 L2T1
Prerequisite: 8.3410.


8.3430 Structural Design 2  S1 L3T1
Prerequisites: 8.2420, 8.2430.

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

8.3440 Structural Design 3  S2 L3T1
Prerequisite: 8.3430.


8.3510 Traffic Flow Theory  S1 L2T1
Prerequisite: 10.381.


8.3610 Hydraulics 2  S1 L1½T½
Prerequisite: 8.2610.


8.3620 Hydraulics 3  S2 L1½T½t
Prerequisite: 8.3610.

8.3630 Water Supply and Wastewater Disposal S1 L2T1
Prerequisite: 8.2610.

8.3640 Engineering Hydrology S2 L2T1
Prerequisite: 10.381.

8.4110 Industrial Training
Requirement for the Bachelor of Engineering Degree.
Students are required to complete a minimum of 60 working days of approved industrial training and submit a report on this training before the fourth week of Session 1.

8.4210 Construction Major S2 L/T1
Prerequisites: 8.3230, 8.4220.
Construction camp: a one week field camp involving several construction procedures and associated performance measurements. Construction planning and design, organisation, management, and control to support the conduct of the construction camp. Either construction technology or construction management. Construction and/or management project.

8.4220 Engineering Management 3 S1 L1½ T½
Prerequisite: 8.3220.
Human resources: conflict management, industrial relations, work groups in construction practice. Legal systems: contracts and their administration, professional liabilities and duties. Financial management: corporate entities and legal forms of enterprises, financial reporting, accounting systems, project finance, cash flow, taxation, depreciation of fixed assets.

8.4310 Materials Major S2 L/T11
Prerequisites: 8.3320, 8.3330, 8.4330.

8.4320 Metals Engineering S1 L2
Prerequisite: 8.2310. Co-requisite: 8.3440.
Metals used in structures: types, applications and developments in steels, aluminum alloys etc. Corrosion: causes, prevention and control in structural, reinforcing and piling steels. Fatigue and brittle fracture: factors leading to increased risk, significance of welding; empirical and fracture mechanics approaches to design against failures in service.

8.4330 Pavement Engineering S1 L1½ T½
Prerequisite: 8.3310.
Pavement materials: subgrades, gravels, crushed rock, mechanical and chemical stabilisation, concrete, interlocking blocks, bituminous concrete, sprayed seals. Pavement design: traffic and environmental effects, loading spectra, design of flexible, rigid and block pavements. Pavement construction: construction processes and control.

8.4410 Structures Major S2 L/T1
Prerequisites: 8.4420, 8.4430, 8.4440.
A design or research project and the following strands: bridge engineering, concrete structures, and structural behaviour which will include computer methods, stability and dynamic analysis, and classical methods.

8.4420 Structural Analysis 3 S1 L1T1
Prerequisite: 8.3420.
Approximate analysis and structural form. Brief discussions of cable structures, arches, plates and shells.

8.4430 Structural Design 4 S1 L1T1
Prerequisite: 8.3440.
Slab design: two-way edge supported slabs, idealized frame and simple design methods, punching shear, moment transfer at column connections, serviceability approach, detailing. Design of reinforced concrete footings and retaining walls. Plastic design of steel frames.

8.4440 Timber Engineering S1 L2
Prerequisite: 8.2420.
8.4510 Transport Major

Prerequisites: 8.3510, 8.4520.

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

8.4520 Transport System Analysis

Prerequisite: 8.2120.

Description and analysis of transport system interactions: feedback, steady state performance, sensitivity analyses. Travel demand: traffic generation, distribution and assignment. Transport supply: capacity and operational measures of different transport modes. Land use and transport planning: economic, social and environmental evaluation. Optimization methods.

8.4610 Water Major

Prerequisites: 8.3620, 8.3630, 8.4620.

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

8.4620 Water Resources Engineering

Prerequisites: 8.3640. Co-requisite: 8.3620.


8.6140 Engineering for Surveyors 1


8.6150 Engineering for Surveyors 2

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

Servicing Subjects

These are subjects taught within courses offered by other faculties. For further information regarding the following subjects see the Faculty of Applied Science Handbook.

8.6110 Structures


8.6130 Properties of Materials


Mathematics

10.001 Mathematics 1

Prerequisite:

HSC Exam Score Range Required

2 unit Mathematics* or

67-100

*2 unit Mathematics
3 unit Mathematics or 1-50
4 unit Mathematics 1-100
or 10.021B.

Excluded: 10.011, 10.021B, 10.021C.

*This refers to the 2 Unit Mathematics subject which is related to the 3 Unit Mathematics subject. It does not refer to the subject 2 Unit Mathematics (Mathematics in Society).

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

10.011 Higher Mathematics 1 F L4T2
Prerequisite:

HSC Exam
Score Range
Required
120-150
or
1-100

Excluded: 10.001, 10.021B, 10.021C.

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

10.021B General Mathematics 1B S1 L4T2
Prerequisite:

HSC Exam
Score Range
Required
60-100
or
1-100

Excluded: 10.011, 10.001.

*This refers to the 2 Unit Mathematics subject which is related to the 3 Unit Mathematics subject. It does not refer to the subject 2 Unit Mathematics (Mathematics in Society).

Functions (and their inverses), limits, asymptotes, continuity; differentiation and applications; integration, the definite integral and applications; inverse trigonometric functions; the logarithmic and exponential functions and applications; sequences and series; mathematical induction; the binomial theorem and applications; introduction to probability theory; introduction to 3-dimensional geometry; introduction to linear algebra.

10.021C General Mathematics 1C S2 L4T2
Prerequisite: 10.021B. Excluded: 10.001, 10.011.

Techniques for integration, improper integrals; Taylor’s theorem, first order differential equations and applications; introduction to multivariable calculus; conics; finite sets; probability; vectors, matrices and linear equations.

10.022 Engineering Mathematics 2 F L2T2
Prerequisite: 10.001.

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

10.0331 Electrical Engineering Mathematics 3 — Transform Methods S1 L1½T½


10.0332 Electrical Engineering Mathematics 3 — Numerical Methods S2 L1½T½
Prerequisites: 10.111A, 10.1114, 10.2111, 10.2112. Exclusions 10.212A, 10.222A.


10.111A Pure Mathematics 2 — Linear Algebra F L1½T1
Prerequisite: 10.001 or 10.011. Excluded: 10.121A.


10.1113 Pure Mathematics 2 — Multivariable Calculus S1 or S2 L1½T1
Prerequisite: 10.001 or 10.011. Excluded: 10.1213.

Multiple integrals, partial differentiation. Analysis of real valued functions of one and several variables.

10.1114 Pure Mathematics 2 — Complex Analysis S1 or S2 L1½T1
Prerequisite: 10.001 or 10.011. Excluded: 10.1214.

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

10.1115 Pure Mathematics 2 — Finite Mathematics A S1 L1½T½
Prerequisite: 10.001.

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

10.1116 Pure Mathematics 2 — Finite Mathematics B  S2 L1½T½
Prerequisite: 10.1115 (or any other Year 2 Mathematics half-unit).
Introduction to combinatorial computing, recurrence relations, examples of divide and conquer strategies, backtrack and branch and bound algorithms. Finite Fourier transforms, roots of unity, convolutions, application to fast multiplication and the analysis of pseudo-random numbers. Boolean algebra, switching circuits.

10.121A Higher Pure Mathematics 2 — Algebra  F L2T½
Prerequisite: 10.011 or 10.001 (DN). Excluded: 10.111A, 10.1111.

10.1212

10.1214 Higher Pure Mathematics 2 — Complex Analysis  S2 L2T½
Prerequisite: 10.1213. Excluded: 10.1114.
As for 10.1114 Pure Mathematics 2 — Complex Analysis, but in greater depth.

10.2111 Applied Mathematics 2 — Vector Calculus  S1 or S2 L1½T½
Prerequisite: 10.001. Excluded: 10.2211.
Properties of vectors and vector fields: divergence, gradient, curl of a vector; line, surface, and volume integrals. Gauss' and Stokes' theorems. Curvilinear co-ordinates.

10.2112 Applied Mathematics 2 — Mathematical Methods for Differential Equations  S1 or S2 L1½T½
Prerequisite: 10.001. Excluded: 10.2212.

10.2113 Applied Mathematics 2 — Linear Programming  S1 or S2 L1½T½
Mathematical modelling and solution techniques for linear optimization problems. Feasible regions, graphical methods, the standard problem, basic solutions, fundamental theorem, simplex and revised simplex methods, duality and the dual simplex method, sensitivity analysis, the transportation problem.

10.2115 Applied Mathematics 2 — Discrete-Time Systems  S1 or S2 L1½T½
Applications selected from problems of importance in engineering, biological, social, management, and economic systems.

10.2211 Higher Applied Mathematics 2 — Vector Analysis  S1 L2T½
Prerequisite: 10.011 or 10.001 (CR). Excluded: 10.2111.
As for 10.2111 but in greater depth.

10.2212 Higher Applied Mathematics 2 — Mathematical Methods for Differential Equations  S2 L2T½
Prerequisite: 10.011 or 10.001 (CR) Excluded: 10.2112.
As for 10.2112 but in greater depth.

10.2213 Higher Applied Mathematics 2 — Linear Programming  S1 or S2 L1½T½
As for 10.2113 but in greater depth.

10.2215 Higher Applied Mathematics 2 — Discrete-Time Systems  S2 L1½T½
As for 10.2115, but in greater depth.

10.2922 Applied Mathematics 3 — Applied Time Series Analysis  S2 L1½T½
Prerequisites: 10.2112 or 10.031 or 10.022. Co-requisites: 10.331 or equivalent, 10.2921 or 10.212D or equivalent. Excluded: 10.4129.
Techniques for analyzing time-varying data. Classification of random processes, sampling for discrete analysis, Fourier analysis, spectra, filtering. Cross-spectra, estimation and hypothesis testing, confidence limits, application to experiment planning. Emphasis on computer analysis of actual data.
10.311A Theory of Statistics 2 —
Probability and Random Variables  S1 L3T1
Prerequisite: 10.001 or 10.011 or 10.021(CR). Excluded: 10.321A, 10.301, 10.331, 45.101.
Probability, random variables, standard discrete and continuous distributions, multivariate distributions, transformations, random sampling, sampling distributions, limit theorems.

10.311B Theory of Statistics 2 —
Basic Inference  S2 L3T1
Prerequisite: 10.311A. Excluded: 10.321B, 10.301, 10.331, 45.101.
Point estimation: general theory, estimation by moments, maximum likelihood, interval estimation with general theory and application, hypothesis testing using Neyman Pearson theory, linear regression and prediction, analysis of variance.

10.3111 Theory of Statistics 2 —
Statistical Computing and Simulation  S1 L1½T½
Prerequisite: 10.001 or 10.011 or 10.021(CR). Co-requisite: 10.311A.
Introduction to APL, random variables, univariate transformation, simulation of random variables, APL programming, integer value random variables, random walks — theory and simulation, introduction to Markov chains.

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

10.3112 Theory of Statistics 2 —
Nonparametric Statistical Inference  S2 L1½T½
Prerequisite: 10.311A. Co-requisite: 10.311B.
Order statistics, exact and approximate distributions, multinomial distributions, goodness of fit, contingency tables, one-sample and two-sample estimation and inference problems.

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

Probability and Random Variables  S1 L3T1
Prerequisite: 10.001 or 10.011. Excluded: 10.311A, 10.301, 10.331, 45.101.
As for 10.311A but in greater depth.

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

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

10.341 Statistics SU  F L1½T½
Prerequisite: 10.001 or 10.011.
For students in the School of Surveying.
Introduction to probability theory, random variables and distribution functions, sampling distributions, including those of \( t \), \( F \) and \( F \). Estimation procedures, including confidence interval estimation with an emphasis on least squares and surveying problems, and computer based exercises.

10.351 Statistics SM  F L1½T½
Prerequisite: 10.001 or 10.011.
For students in Aeronautical, Industrial and Mechanical Engineering and Naval Architecture.
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: \( t \), \( F \) 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  F L1½T½
Prerequisite: 10.001 or 10.011.
For students in the School of Electrical Engineering.
Introduction to probability theory, random variables and distribution functions; the binomial, Poisson and normal distributions in particular. Standard sampling distributions, including those of \( t \) and \( F \). Estimation by moments and maximum likelihood; confidence interval estimation. The Standard tests of significance based on the above distribution with a discussion of power where appropriate.

10.381 Statistics SC  
S1 or S2 L1½T½
For students in the School of Civil Engineering.

Accountancy
14.501 Accounting and Financial Management 1A  
S1 or S2 L2T2½
Prerequisite: Nil.
The basic concepts of financial model building and information systems, including the double-entry recording system, the accounting cycle, income measurement and financial reporting, and an introduction to basic elements of auditing.

14.605 Information Systems Implementation  
S2 L2T1
Prerequisite: 14.603.
Supervised implementation of an information systems project in a commercial programming language. Advanced program design and structured techniques, interface with systems software at application implementation level, comparison of a range of programming languages, test data specification, implementation procedures.

Health Administration
16.711 Quantitative Methods 1  
S1 L4
Prerequisite: 16.540.

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

18.003 Numerical Methods/Industrial Experimentation  
S1 L1½T S2 L1½T½
Prerequisites: 5.0721, 10.022, 10.351.

18.004 Manufacturing Management  
S1 L2T2
Prerequisites: 14.001, 14.002, 18.503, 18.603.
Production control: modes of manufacture; information flow in multi-stage production systems; classical production and inventory models and control techniques; material requirements planning; just-in-time production; flexible manufacturing systems and their control. Quality control: sampling inspection, economic aspects, control charts, management of QC. Project control: critical path scheduling, PERT. Computers in manufacturing management: systems design.

18.091 Industrial Management  
S1 LT5
Prerequisites: 10.2112, 10.361.
Engineering economy: economic objectives of the firm. Economic measures of performance: net present value, annual equivalent value and the DCF rate of return (including the incremental rate of return) and their application in the selection and replacement of processes and equipment. Introduction to operational research: The formation and optimization of mathematical models of industrial processes. The development of decision rules. Some techniques of operational research and applications, eg mathematical programming, queuing theory, inventory models, simulation, critical path networks. The use of human and physical resources: Methods engineering, ergonomics, motion and time study, financial incentives, applications to machine controlled processes, work sampling and data collection. Plant location, factory layout. Production and quality control: Control of jobbing, repetitive batch and continuous production. Manufacturing organizations, functions, inter-relationships and information flow. Sampling techniques in quality control, control charts. Introduction to inventory control: Analysis of some engineering planning decisions.

18.224 Numerical Control of Machine Tolls  
S1 L2T1
Prerequisite: 5.0721. Excluded: 18.260G.
Overview of numerical control systems; machine specification and selection; manual part programming; process planning and sequencing; selection of operating conditions; work holding devices and tooling; introduction to computer assisted part programming.
18.303 Methods Engineering F L1T1
Prerequisite: 10.351.


18.403 Production Design and Technology F L2T2
Prerequisite: 5.422, 10.351.

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

18.404 Design for Production F L1T1
Prerequisite: 5.123 or 18.413.

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

18.413 Design for Industrial Engineers S1 L1T1 S2 L1T2
Prerequisites: 5.122, 5.422.

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

18.503 Operations Research A F L2T1

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

18.551 Operations Research F L2T1
Prerequisites: 5.0721, 10.022, 10.351. Excluded: 6.646.

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

18.603 Management/Economics F L/T2
Prerequisite: 5.0721.


18.803 Optimization S1 L2T1
Prerequisite: 10.022.


Servicing Subjects

These are subjects taught within courses offered by other faculties.

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

18.121 Production Management F L2T1
Prerequisites: 10.031, 10.331.

Engineering economy: Economic objectives of the firm. Economic measure of performance: net present value, annual equivalent value and the DCF rate of return (including the incremental rate of return) and their application in the selection and replacement of processes and equipment. The use of human and physical resources: Methods engineering, ergonomics, motion and time study, financial incentives, applications to machine controlled processes, work sampling and data collection. Plant location, factory layout. Production and quality control: Control of jobbing, repetitive batch and continuous production. Manufacturing organizations, functions, inter-relationships and information flow. Sampling techniques in quality control, control charts. Introduction to inventory control: Analysis of some engineering planning decisions. Introduction to operational research: The formation and optimization of mathematical models of industrial processes. The development of decision rules. Some techniques of operational research and applications, eg mathematical programming, queueing theory, inventory models, simulation.

18.1211 Production Management A S1 L3
Prerequisites: 10.031, 10.331 or 10.021B, 10.021 C, 13.200.

Use of human and physical resources: Methods engineering, ergonomics, motion and time study, financial incentives, appli-
cations 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 organisations, functions, inter-relationships and information flow. Sampling techniques in quality control, control charts. Introduction to inventory control: Analysis of some engineering planning decisions.

18.1212 Production Management B S2 L3
Prerequisites: 18.1211.

Engineering economy: Economic objectives of the firm. Economic measure of performance: net present value, annual equivalent value and the DCF rate of return (including the incremental rate of return) and their application in the selection and replacement of processes and equipment. Introduction to operational research: Formation and optimization of mathematical models of industrial processes. Development of decision rules. Some techniques of operational research and applications, eg mathematical programming, queueing theory, inventory models, simulation.

18.131 Operations Research

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

Applied Geology

25.5112 Geology for Civil Engineers S1 L2T1
An introduction to mineralogy, petrology, structural geology, stratigraphy and geomorphology. Weathering of rocks and development of soils. The role of the geologist in civil engineering.

Geography

27.010 Land Studies S1 L2T2
Concepts, significance and problems of land. Land as territory and land as resource in Australia. Constraints imposed by the physical environment on human occupancy and settlement patterns, the variety of conflicts that result and management strategies. Practical work involves study of the ways in which the attributes and characteristics of land are displayed on maps, air photos and satellite imagery, and introduces these as basic information sources and research tools in applied geography.

27.030 Environmental Processes S2 L2T2
Essential and continuing links between components of the physical environment. Movement of energy and matter in the physical environment, including consideration of Earth's energy balance, the hydrological cycle, nutrient cycles in vegetation and soil, imbalances leading to land degradation and instability, alternatives to and movement of materials.

27.133 Pedology S2 L2T3
Prerequisites: 27.010 and 27.030 or 27.111 or any two units from 2.111, 2.121, 2.131, 2.141, and 27.811, 27.828 or 27.311 or 25.012 or 25.022.

Methodology of pedogenic studies and the application of these studies to the understanding of soil-landform relationships. Soil physical and chemical properties and their interrelationships, emphasizing clay-mineral structure and behaviour, soil solution chemistry, soil water movement and the application of these properties to elements of soil mechanics. Soil properties in natural, rural and urban landscapes, including assessment of soil fertility, swelling characteristics, dispersibility, erodibility and aggregate stability. Laboratory analysis of soil physical and chemical characteristics with emphasis on properties associated with land capability assessment. Statistical analysis of soil data and its application to mapping. The use of soil micromorphological and mineralogical studies in pedology.

27.143 Biogeography S1 L2T3
Prerequisites: 27.010 and 27.030 or 27.811 or 27.828 or 17.031 and 17.041 or 27.111 or 27.172.


27.153 Climatology S1 L2T3
Prerequisites: 1.001 or 27.811 or 27.828 or 25.110 and 25.120 or 17.031 and 17.041 or 27.111.

27.175 Introduction to Remote Sensing

Prerequisite: Successful completion of a Year 1 program in Applied Science, Science or Arts (or equivalent) as approved by the Head of School.

Principles and technical aspects of remote sensing. Forms of available imagery, their utility and facilities for interpretation. Basic airphoto interpretation techniques relevant to environmental assessment. Introduction to principles of the electromagnetic spectrum, photometry and radiometry. Sensor types, image formation and end products associated with selected satellite programs, including Landsat. Land-cover and land-use interpretation procedures in visual image analysis. Basic procedures in machine-assisted image enhancement.

27.176 Remote Sensing Applications

Prerequisite: 27.175 or 27.1711, 29.514 or 29.511 and 29.631. Excluded: 27.1712

Spectral characteristics of natural phenomena and image formation. Ground truthing, collection and calibration. Introduction to computer classification procedures. Multitemporal sampling procedures, image to image registration and map to image registration. Major applications of remote sensing in the investigation of renewable and non-renewable resources to include: soils, geology, hydrology, vegetation, agriculture, rangelands, urban analysis, regional planning, transportation and route location and hazard monitoring.

27.183 Geomorphology

Prerequisites: 25.110 and 25.120 or 27.010 and 27.030 or 27.811 or 27.828 or 27.171 or 27.172. Excluded: 27.860.


27.193 Environment Impact Assessment

Rationale and basic objectives; standardized types of environmental impact assessment (EIA), including matrix approach, adopted methods of EIA in Australia. Frequently used assessment and predictive techniques for meteorological, hydrological, biological, socio-economic impacts. Techniques of impact evaluation in terms of socio-economic criteria. Environmental decision making and planning under conditions of uncertainty. Case studies exemplifying procedures, techniques and issues. Trends, changes and possible future developments in EIA. Practical exercises representing components of typical EIAs.

27.295 Physical Geography for Surveyors

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.

27.642

27.862 Australian Environment and Natural Resources

Prerequisite: 27.010 and 27.030 or 27.811 or 27.828 or 27.829. Excluded: 27.872.

Continental and regional patterns of land, water and energy resources in Australia and its territorial waters, and natural factors affecting their development, including climate, soils and terrain; problems of limited surface and underground water resources and of conflicting demands, exemplified through particular basin studies; comparable reviews of energy, minerals and forest resources, human resources and development.

27.863 Ecosystems and Man

Prerequisite: 27.010 and 27.030, or 27.111 or 27.811 or 27.828 or 27.829. Excluded: 27.873, 27.363.

The structure and functioning of ecosystems, human interaction with ecosystems; Australian case studies of ecosystem management, including pastoral, cropping, forestry, coastal and urban ecosystems.

Surveying

Note: Electronic Calculators.

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

29.1010 Surveying 1


29.1110 Computations 1

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

29.1710 Professional Orientation

Prerequisite: HSC Score

<table>
<thead>
<tr>
<th>Unit Type</th>
<th>Score</th>
</tr>
</thead>
<tbody>
<tr>
<td>2 unit English (General) or 2 unit English</td>
<td>53-100</td>
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<tr>
<td>3 unit English</td>
<td>49-100</td>
</tr>
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<td>1-50</td>
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</tbody>
</table>
The scope of surveying activities and their relationship to associated disciplines. Introduction to: geodesy and positioning from stars and satellites; map projections and coordinates; aerial photographs, maps and remote sensing, applications in resource surveys; cadastral, engineering and land development surveys, role of the consulting surveyor; mining and hydrographic surveys. Includes visits to surveying organizations.

29.2010 Surveying 2  
**S2 L1\frac{1}{2}T2\frac{1}{2}**  
Theodolites; principles and construction. Horizontal and vertical angle measurement. Areas of regular and irregular figures. Traversing and traverse computations.

29.2040 Survey Draughting  
**S2 L\frac{1}{2}T2\frac{1}{2}**  
Fundamentals of surveys 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. Drawing practice in boundary surveying State regulations. Mapping signs and symbols recommended by the National Mapping Council. Topographic cartography; representation of features, toponomy, map series, cartometry. Thematic cartography concepts.

29.2050 Survey Camp  
**S2**  
Detail survey. Setting out using steel band and theodolite. Levelling. Theodolite and steel band traversing between control points.

29.3010 Surveying 3  
**S1 L2\frac{1}{2}T2**  
Theodolite errors; testing and adjustment. Control surveys. Traversing; errors and miscellaneous problems. Trigonometric and barometric heighting. Hydrostatic levelling. Error propagation, precision, accuracy and testing.

29.3110 Computations 2  
**S1 L3T1\frac{1}{2}**  
Co-requisite: 29.1110.  
Programming strand: Operating systems, library programs, file structures, data base management, programming examples. Computations strand: Algorithm development for traverse adjustment by Bowditch's method. Intersection and resection (unique solution and solution with redundant data), trilateration, semigraphic solution of mixed observations, missing data problems, road intersections, sub-division calculations, transformations. Spherical trigonometry.

29.4010 Surveying 4  
**S2 L2\frac{1}{2}T2\frac{1}{2}**  
Co-requisites: 29.3010, 29.3110.  

29.4050 Survey Camp  
**S2**  
Point recovery. Damsite survey by stadia. Road survey; setting out of horizontal and vertical curves, long section and cross section.

29.4150 Electronics for Surveyors  
**S2 L1T1**  
Co-requisite: 1.962.  
Introduction to digital circuits and systems. Data transmission, recording and display.

29.4220 Introduction to Geodetic Science  
**S2 L2T1**  
Co-requisites: 1.971, 10.022.  
Historical development of geodesy. Scope and goals of contemporary geodesy. The earth's gravity field. The earth's motions in space. Foundation of celestial observations for position and azimuth determination. Time and time keeping. Co-ordinate systems and transformations. Earth satellite motion.

29.441 Surveying for Engineers  
**S1 or S2 L2T4**  

29.4520 Remote Sensing and Resource Surveys  
**S2 L1\frac{1}{2}T1\frac{1}{2}**  

29.4710 Report Writing  
**S2 L1T1**  
Requirements and purposes of technical reports. Introduction to the literature of surveying, literature searches. Characteristics of effective writing: structure, style, vocabulary. Citations and references. Exercises in technical writing, criticism and editing.

29.4810 Land Management and Development 1S2 L2T1  
Surveyor’s role in land development. Variation of land use and land value: effect on land development. Urbanization and land use. Location theory. Public measures for directing land use; social, economic and locational determinants of land use; land on urban fringe. Introduction to valuation; factors affecting value of land; valuation principles for land use and subdivision.

29.491 Survey Camp  
A one-week field camp for students studying 29.441 Surveying for Engineers.
<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Credits</th>
<th>Prerequisites</th>
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<tbody>
<tr>
<td>29.5010</td>
<td>Surveying 5</td>
<td>5</td>
<td>29.3010</td>
</tr>
<tr>
<td></td>
<td>Precision theodolites; construction, errors and testing. Precise horizontal angle measurement. Electronic theodolites. Precise levelling; instruments, staves, errors. Field methods, marking and accuracy.</td>
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<td>29.5110</td>
<td>Computations 3</td>
<td>3</td>
<td>29.3110</td>
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<tr>
<td>29.5220</td>
<td>Geodetic Positioning</td>
<td>1½</td>
<td>29.4220, 29.3110</td>
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<tr>
<td>29.5230</td>
<td>Map Projections</td>
<td>1½</td>
<td>29.4220, 29.3110</td>
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<tr>
<td></td>
<td>Principles of map projections. Surveying projections and grids. Transverse mercator projections used in Australia. Scale-factor and arc-to-chord corrections on the transverse mercator projection.</td>
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<tr>
<td>29.5610</td>
<td>Cadastral Surveying and Land Law 1</td>
<td>1½</td>
<td>29.4220, 29.3110</td>
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<tr>
<td></td>
<td>The legal system in Australia and NSW; the nature of land law including land tenure, estates in land, interests in land; title systems in land; land administration in Australia and NSW Boundary surveying — controlling principles; cadastral mapping in NSW.</td>
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<td>29.6010</td>
<td>Surveying 6</td>
<td>2½</td>
<td>29.3010, 29.5010, 29.5110, 29.5220, 29.5230, 29.6220, 29.6610, 29.6810</td>
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<td>29.6220</td>
<td>Field Astronomy</td>
<td>1½</td>
<td>29.4220</td>
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<td>Introduction to the determination of latitude and longitude from meridian and prime vertical observations. Determination of azimuth from the sun and close circum-polar and circum elongation stars. Simultaneous determination of latitude and longitude by position lines.</td>
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<tr>
<td>29.6510</td>
<td>Photogrammetry 1</td>
<td>1</td>
<td>29.5010</td>
</tr>
<tr>
<td>29.6610</td>
<td>Cadastral Surveying and Land Law 2</td>
<td>2</td>
<td>29.5610</td>
</tr>
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<td></td>
<td>Survey investigation for both artificial and natural boundaries; survey and title searching; field note preparation for cadastral surveying; survey marking; preparation of plans of survey; study of appropriate statutes and regulations; cadastral survey techniques for urban and rural properties; the role of co-ordinates in cadastral surveying. The status of roads in NSW; identification surveys; consents for MHWM, railways, rivers, kerbs in Sydney, strata plan surveys including plan preparation; the surveyor as a professional; contract, partnership and corporations, liability; surveyors and the law, limitation periods, insurance, loss prevention; software packages for cadastral surveying.</td>
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<tr>
<td>29.6810</td>
<td>Land Management and Development 2</td>
<td>2</td>
<td>29.5610</td>
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<tr>
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<td>Subdivision control in NSW; broad-acre subdivisions under Local Government and Planning and Environment Legislation; procedures and legal controls; review of subdivision design; engineering aspects.</td>
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<td>29.7010</td>
<td>Surveying 7</td>
<td>1½</td>
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<td>29.7050</td>
<td>Survey Camp</td>
<td>S1</td>
<td>29.5010, 29.6010, 29.5110, 29.5220, 29.5230, 29.6220, 29.6610, 29.6810</td>
</tr>
<tr>
<td></td>
<td>Cadastral surveying including astronomic observa tions for azimuth, land use survey including air photo and Landsat imagery interpretations. Photo control survey by traverse and resection,</td>
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</tr>
</tbody>
</table>
precise traverse and heighting with EDM. Preparation of reports based on field tasks completed.

29.7120 Computer Graphics
Prerequisite: 29.3110.

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

29.7220 Geodetic Computations
Prerequisites: 29.5110, 29.5230.

Elements of geodetic methodology; classes of mathematical models. Least squares solution of overdetermined models; assessment of results. Adjustment of control surveys. Solution of direct and inverse geodetic problems.

29.7510 Photogrammetry 2
Prerequisite: 29.6510.


29.7810 Land Management and Development 3
Prerequisite: 36.411.

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

29.8010 Surveying 8
Prerequisite: 29.5010.


29.8220 Global Geodesy
Co-requisite: 29.7220.


29.8510 Photogrammetry 3
Co-requisite: 29.7510.


29.8710 Seminar
Prerequisite: 29.4710.

Introduction to characteristics of effective speaking. Oral presentation by individual students on topics in selected areas of surveying. Participation in colloquia by invited speakers on current topics in surveying. Student assessment of degree course.

29.8720 Management


29.8810 Land Management and Development 4
Prerequisites: 8.6140, 8.6150. Co-requisite: 29.7810.

Continuation of design and studio project for a residential neighbourhood development. Plan of detailed lot layout: consideration of access, grades, drainage reserves, parks and pedestrian ways. Engineering design and plans: catchment details, road longitudinal and cross-sections, drainage layout, flow schedule, hydraulic grade line calculations, longitudinal sections of kerb profiles.

29.9010 Advanced Surveying Instruments
Prerequisites: 29.5010, 29.6010.


29.9020 Hydrographic Surveying
Prerequisite: 29.7010.

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

29.9030 Precise Engineering Surveying S1 or S2 L2T1
Prerequisites: 29.5010, 29.6010.

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

29.9090 Project S1 or S2 T3
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 or her experiences.

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


29.9220 Advanced Geodetic Positioning S1 or S2 L2T1
Prerequisite: 29.5220.

Precise aspects of terrestrial and extraterrestrial reference frames; units, constants, coordinate systems and transformations used in satellite positioning; modelling of measurements. Orbit determination. Positioning with GPS; field procedures. Inertial surveying systems; inertial frame; sensors; mathematical and error models; filtering and smoothing processes; post-mission adjustment techniques; inertial positioning methods and applications.

29.9520 Remote Sensing Principles S1 or S2 L1½T1½
Prerequisite: 29.4520.

Definition and physics of basic electromagnetic quantities, atmospheric effects, photographic film images and sensors, thermal infra-red sensing, radar, radar sensing, electro-optical sensors. Choice of sensor and data processing. Remote sensing project.

29.9530 Land Information Systems S1 or S2 L2T1

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

29.9610 Modern Cadastral Concepts S1 or S2 L2T1
Prerequisite: 29.6610.

An analysis of the operation and components of a modern cadastral survey system, especially the relationship between title, conveyancing, surveying and mapping. Components of land tenure and cadastral systems; statewide parcel based land information systems; cadastral models. Horizontal and vertical subdivision, trends in group housing in Australia and overseas, ownership alternatives including strata titles, management of strata schemes, the development process related to strata subdivision.

29.9910 Special Topic in Surveying A S1 or S2 L2T1

A special subject to be lectured on by visiting professors or other visiting staff. Details of syllabus and lecturer to be communicated to Faculty on each occasion when the subject runs.

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

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

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

29.411 Surveying for Architects and Builders S1 L1T1½ C2
A compulsory subject. Prerequisites: nil.

29.901 Introduction to Mapping


Town Planning

36.411 Town Planning

Architecture prerequisite: 11.4308 and 100 credit points.


Chemical Engineering and Industrial Chemistry

48.302 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 calculation and the technology of boilers and other fuel plant. Other energy sources including solar energy and nuclear energy are discussed. The national and global situation is reviewed.

Anatomy

70.011C Introductory Anatomy

Prerequisites: 17.031, 17.041.

Introduction to gross anatomy, based on a study of prosected specimens. Musculoskeletal, cardiovascular, respiratory, gastrointestinal, genitourinary and nervous systems. General topographical and surface anatomy.

Physiology and Pharmacology

73.111 Physiology 1

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

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

Law

90.502 Industrial Safety and Health

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

Course Outlines

Faculty of Engineering
Enrolment Procedures

All students re-enrolling in 1988 or enrolling in graduate courses should obtain a copy of the free booklet Enrolment Procedures 1988 available from School Offices and the Admissions Office. This booklet provides detailed information on enrolment procedures and fees, enrolment timetables by Faculty and course, enrolment in miscellaneous subjects, locations and hours of Cashiers and late enrolments.

Graduate School of Engineering

The Graduate School of Engineering is concerned with the coordination and development of the graduate activities of the Faculty and provides opportunities for well-qualified graduates to engage in advanced studies and research.

The Faculty consists of the Schools of Civil Engineering, Electrical Engineering and Computer Science, Mechanical and Industrial Engineering, Surveying and the Centres for Biomedical Engineering, Manufacturing and Automation, and Safety Science. The Faculty is also closely associated with the Centres for Groundwater Management and Hydrogeology, Remote Sensing, and Waste Management which are joint enterprises of the Faculties of Engineering and Applied Science. The Faculty is also closely associated with the Joint Microelectronics Research Centre.

The School of Civil Engineering consists of five departments: Civil Engineering Materials (soil mechanics, rock mechanics, concrete technology, plastics and timber, metals and welding technology and pavement engineering); Engineering Construction and Management (civil engineering systems, engineering economy, project planning and management and civil engineering construction); Structural Engineering (structural analysis and structural design); Transport Engineering (planning, design, construction and operation of transport modelling, economic evaluations and environmental impact studies); Water Engineering (hydraulics, hydrology, water resources and public health engineering). In addition to extensive laboratory facilities on the Kensington campus, the School operates laboratories at King Street, Randwick and King Street, Manly Vale. The latter complex houses the School’s Water Research Laboratory and the associated Water Reference Library. The School also uses the Fowlers Gap Arid Zone Research Station for construction camps and data collection for arid zone hydrology.

The School of Electrical Engineering and Computer Science comprises five departments: Communications (all aspects of theory, applied electronics and engineering relating to communication systems such as telephones, broadcasting and television); Electric Power (electrical machines and generation, distribution and utilization of electric energy); Electronics (electronic circuits, devices, micro-electronics and application of electronics to such areas as solar power generation); Computer Science (design of computer devices and the handling of information in all forms, e.g. numeric alphabetic, pictorial, verbal); Systems and Control (development of theories for the control
of complex systems and the application of these theories including computer simulation). The School also houses the Joint Microelectronics Research Centre.

The School of Mechanical and Industrial Engineering consists of three departments: Applied Mechanics (agricultural engineering, automatic control, biomechanics, engineering design, engineering mechanics and mechanics of solids); Fluid Mechanics and Thermodynamics (energy utilisation and power generation, nuclear engineering, refrigeration and air conditioning, gas and liquid handling, aeronautical engineering and naval architecture); Industrial Engineering (economic analysis, production planning and control, product and process design, methods engineering and operations research). The Centre for Manufacturing and Automation is also located within the School.

The School of Surveying encompasses the following areas: Cadastral Surveying (knowledge of the laws and practices relating to property boundaries); Geodetic Surveying (the shape, size and mathematical model of the earth including small movements of the earth's crust); Satellite Surveying (the use of data from ground survey, air photography and satellite imagery to produce accurate maps); Hydrographic Surveying (the mapping of the seabed and waterways of navigation and offshore resource management); Engineering Surveying (the precise survey of large engineering constructions); Land Management and Development (environmental assessment for resource management and change of land use); Land Information Management (the use of computerised systems for accurate information of spatially related data); Photogrammetry (measurement of 3-dimensional positions from photographs and remotely sensed images).

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

The Centre for Manufacturing and Automation promotes and co-ordinates teaching and research in the areas of manufacturing science and technology, machine control and automation, as well as computer integrated manufacturing and management.

The Centre for Safety Science promotes and co-ordinates teaching and research of a multidisciplinary range of scientific disciplines concerned with occupational health and safety. The major areas of study include occupational health control, safety engineering and management for safety with an emphasis being placed on the engineering of a safe working environment.

The Centre for Groundwater Management and Hydrogeology was established early in 1987 as a research and training unit within the Faculties of Applied Science and Engineering. Its general aims are to research the groundwater problems of strategic national importance and to co-ordinate and develop postgraduate courses and continuing education programs, and to liaise with industry.

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

The Centre for Waste Management is a joint enterprise of the Faculties of Engineering and Applied Science, and co-ordinates and develops teaching and research in the multidisciplinary area of waste management. Waste management is concerned with the study of treating, controlling and disposing of industrial and domestic wastes as applied to the analysis of waste disposal technologies. Particular emphasis is placed on the safe treatment, disposal and resource recovery of solid and liquid wastes.

The Joint Microelectronics Research Centre was established in 1982 under the Commonwealth Special Research Centres Program. Its laboratories are located in the School of Electrical Engineering and Computer Science and at the Royal Melbourne Institute of Technology. The function of the Centre is to carry out research in semiconductor materials and processes, integrated circuit design, computer-aided design and computer-aided testing.

The Faculty awards seven higher degrees as follows: Research — Doctor of Philosophy, Master of Engineering and Master of Surveying; Course Work Masters — Master of Engineering Science (available in a number of areas of specialization), Master of Surveying Science, Master of Safety Science and Master of Biomedical Engineering. In addition, the degrees of Doctor of Science and Master of Science may be awarded for research conducted in, or in association with, the Faculty of Engineering.

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

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

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Research Degrees

Doctor of Philosophy
PhD

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

Admission Guidelines A candidate for registration for the degree of Doctor of Philosophy should hold an honours degree from the University of New South Wales or an honours degree of equivalent standing from another approved university. Applications for admission should be made to the Registrar on the prescribed form at least one calendar month before the commencement of the session in which registration is to begin.
Engineering

Period of Candidature

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

Master of Engineering/Master of Science/
Master of Surveying
ME/MSc/MSurv

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

Admission Guidelines

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

Period of Candidature

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

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

<table>
<thead>
<tr>
<th>Degree</th>
<th>School/Course</th>
<th>Course Code</th>
</tr>
</thead>
<tbody>
<tr>
<td>PhD</td>
<td>Civil Engineering</td>
<td>1630</td>
</tr>
<tr>
<td></td>
<td>Electrical Engineering and Computer Science</td>
<td>1641</td>
</tr>
<tr>
<td></td>
<td>Mechanical and Industrial Engineering</td>
<td>1660</td>
</tr>
<tr>
<td></td>
<td>Nuclear Engineering</td>
<td>1670</td>
</tr>
<tr>
<td></td>
<td>Surveying</td>
<td>1680</td>
</tr>
<tr>
<td></td>
<td>Biomedical Engineering</td>
<td>1710</td>
</tr>
<tr>
<td>ME</td>
<td>Civil Engineering</td>
<td>2650</td>
</tr>
<tr>
<td></td>
<td>Electrical Engineering and Computer Science</td>
<td>2661</td>
</tr>
<tr>
<td></td>
<td>Mechanical and Industrial Engineering</td>
<td>2690</td>
</tr>
<tr>
<td></td>
<td>Nuclear Engineering</td>
<td>2700</td>
</tr>
<tr>
<td>MSurv</td>
<td>Surveying</td>
<td>2720</td>
</tr>
</tbody>
</table>

Course Work Masters Degrees

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

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

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

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

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

Admission Guidelines

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

Applicants for admissions to a course of study leading to the award of a course work Masters degree should apply to the Registrar on the prescribed form at least two calendar months before the commencement of the session in which registration is to begin. It may be necessary to limit entry to some formal courses because of available resources. In such cases, an application may be provisionally accepted 'subject to a place being available'. When a firm offer is made, it is subject to acceptance within one month.

*See definition of 'credit' under Graduate Subjects later in this section.
Period of Candidature
The normal period is two academic sessions (full-time) or four academic sessions (part-time) from the date of enrolment. The maximum period of candidature is four academic sessions (full-time) and eight academic sessions (part-time). In special cases an extension of time may be granted. A candidate is not permitted to continue in a course if the credit value of the subjects failed totals more than six.

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

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

Applicants for admission to a course of study leading to the award of a course work Masters degree should apply to the Registrar on the prescribed form at least two calendar months before the commencement of the session in which registration is to begin. It may be necessary to limit entry to some formal courses because of available resources. In such cases, an application may be provisionally accepted ‘subject to a place being available’. When a firm offer is made, it is subject to acceptance within one month.

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

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

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

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

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

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

Detailed information is available from the schools offering the courses.

8500
Electrical Engineering and Computer Science

Master of Engineering Science
MEngSc

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

All candidates must register in one of the following major areas and in at least one of its programs:

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

Programs:
1. Communication Electronics
2. Digital Communication and Systems
3. Microwave and Optical Communications
4. Signal Processing

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

Programs:
1. Power Systems Engineering
2. Electrical Power Technology
3. Power Systems Engineering (for engineers from neighbouring countries)

Electronics Program Co-ordinator:
Dr R.S. Huang

Program by arrangement with co-ordinator

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

Program by arrangement with co-ordinator

Systems and Control Program Co-ordinator
Dr D.H. Mee

Programs:
1. Digital Systems and Control
2. Cybernetic Engineering and Advanced Robotics
3. Biomedical Engineering (see co-ordinator)

Programs listed would normally consist of 18 credits of course work (6 subjects) and an 18 credit project. However, other appropriate programs or subjects in the same major area or other areas may be substituted for the project allowing completion of the 36 credits by course work only.

Specialist Programs

8501 Communications

1. Communication Electronics
   - Normally 18 credits of course work and an 18 credit project.
   - One of the five elective subjects may be chosen from outside this program.

Compulsory subject
6.340G Communication Electronics 3

Elective subjects
6.060G Microprocessor Systems 3
6.169G Microwave Circuits: Theory and Techniques 3
6.170G Microwave and Optical Devices 3
6.338G Television Systems 3
6.341G Signal Processing 1 - Fundamental Methods 3
6.343G Digital and Analogue Communications 3
6.404G Real Time Computing and Control 3
6.577G Integrated Circuit Design 3
6.650G Computer Science Elective - VLSI System Design 3

2. Digital Communication and Systems
   - Normally 18 credits of coursework and an 18 credit project.
   - At least three subjects must be taken from the following list and the remaining subjects from other graduate programs within the Department and School.

Compulsory subjects
6.336G Digital Communication Networks 1 3
6.337G Digital Communication Networks 2 3
6.338G Television Systems 3
6.343G Digital and Analogue Communications 3
6.347G Digital Modulation and Coding 3

3. Microwave and Optical Communications
   - Normally 18 credits of course work and an 18 credit project.
   - One of the three elective subjects may be chosen from outside this program.

Compulsory subjects
6.150G Theory of Optical Fibres and Optical Signal Processing 3
6.167G Propagation and Transmission of Electromagnetic Waves 3
6.170G Microwave and Optical Devices 3

Elective subjects
6.164G Antenna Design and Applications 3
6.169G Microwave Circuits: Theory and Techniques 3
6.348G Optical Communications Systems 3
4. Signal Processing
- Normally 18 credits of course work and an 18 credit project.
- One of the four elective subjects may be chosen from outside the program.

Compulsory subjects
- 6.341G Signal Processing 1 - Fundamental Methods 3
- 6.342G Signal Processing 2 - Advanced Techniques 3

Elective subjects
- 6.070G Digital Image Processing Systems 3
- 6.150G Theory of Optical Fibres and Optical Signal Processing 3
- 6.340G Communications Electronics 3
- 6.343G Digital and Analogue Communications 3
- 10.061G Advanced Mathematics for Electrical Engineers 3
- 10.361G Statistics 3

8502 Electric Power

1. Power Systems Engineering
- Normally 18 credits of course work and either an 18 credit project or a program in another area offered by the School
- Three elective subjects to be chosen.

Compulsory subjects
- 6.202 Power Engineering 1 3
- 6.242G Power System Analysis 3
- 6.205G Power System Planning and Economics 3

Elective subjects
- 6.206G Power System Operation, Control and Protection 3
- 6.228G Power System Equipment 3
- 6.221G High Voltage Technology 3
- 6.215 Industrial Electrical Systems 3
- 6.229G Fields and Materials 3

2. Electrical Power Technology
- Normally 18 credits of course work and either an 18 credit project or a program in another area offered by the School
- Four elective subjects to be chosen.

Compulsory subjects
- 6.229G Fields and Materials 3
- 6.221G High Voltage Technology 3

Elective subjects
- 6.228G Power System Equipment 3
- 6.224G Partial Discharges in Electrical Insulation 3
- 6.227G Insulation Performance in Electrical Plant 3
- 6.212 Power Engineering - Utilisation 3
- 6.242G Power System Analysis 3
- 6.215 Industrial Electrical Systems 3

3. Power Systems Engineering
(for engineers from neighbouring countries)
- Normally 18 credits of course work and an 18 credit project.
- Two elective subjects to be chosen.

Compulsory subjects
- 6.202 Power Engineering 1 3
- 6.242G Power System Analysis 3
- 6.205G Power System Planning and Economics 3
- 6.228G Power System Equipment 3

Elective subjects
- 6.221G High Voltage Technology 3
- 6.212 Power Engineering - Utilisation 3
- 6.206G Power System Operation Control and Protection 3
- 6.205G Power System Planning and Economics 3
- 6.215 Industrial Electrical Systems 3
- 6.224G Partial Discharges in Electrical Insulation 3
- 6.227G Insulation Performance in Electrical Plant 3
- 6.229G Fields and Materials 3

8505 Systems and Control

1. Digital Systems and Control
- Normally 18 credits of course work and an 18 credit project

Compulsory subjects
- 6.401G Computer Control Systems 1 3
- 6.403G Computer Control Systems 2 3
- 6.404G Real Time Computing and Control 3
- 6.405G Topics in Digital Control 3

Elective subjects
- 6.060G Microprocessor Systems 3
- 6.342G Signal Processing 2 - Advanced Techniques 3
- 6.400G Systems and Control 3
- 6.468G Computer Display Systems and Interactive Instrumentation 3
- 6.470G Robotics, Automation and Productivity Technology 3

2. Cybernetic Engineering and Advanced Robotics
- Normally 9 credits of course work and an 18 credit project.
- Remaining 9 credits may be taken from the elective list or other programs and subjects.

Compulsory subjects
- 6.457G Cybernetic Engineering 3
- 6.469G Robot Vision 3
- 6.470G Robotics, Automation and Productivity Technology 3

Elective subjects
- 6.060G Microprocessor Systems 3
- 6.070G Digital Image Processing Systems 3
- 6.342G Signal Processing 2 - Advanced Techniques 3
- 6.400G Systems and Control 3
- 6.404G Real Time Computing and Control 3
- 6.468G Computer Display Systems and Interactive Instrumentation 3
Engineering

8530
Industrial Engineering

8540
Mechanical Engineering

Master of Engineering Science
MEngSc

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

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

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

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

Specialist Programs

1. Refrigeration and Air Conditioning

<table>
<thead>
<tr>
<th>Credits</th>
<th>Subject Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>3,3</td>
<td>5.151-2G Refrigeration and Air Conditioning Design 1, 2</td>
</tr>
<tr>
<td>3</td>
<td>5.715G Two Phase Flow and Heat Transfer</td>
</tr>
<tr>
<td>4</td>
<td>5.731G Analysis of Heat Transfer</td>
</tr>
<tr>
<td>3,3</td>
<td>5.755-6G Refrigeration and Air Conditioning 1, 2</td>
</tr>
<tr>
<td></td>
<td>18 credit Project Report</td>
</tr>
</tbody>
</table>

2. Industrial Automation

<table>
<thead>
<tr>
<th>Credits</th>
<th>Subject Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>3</td>
<td>5.086G Digital Logic Fundamentals for Mechanical Engineers</td>
</tr>
<tr>
<td>3</td>
<td>5.087G Microprocessor Fundamentals for Mechanical Engineers</td>
</tr>
<tr>
<td>3</td>
<td>5.088G Industrial Applications of Microprocessors</td>
</tr>
<tr>
<td>3</td>
<td>5.089G Elements of Industrial Automation</td>
</tr>
<tr>
<td>3</td>
<td>5.090G The Analysis and Use of Integrated CAD/CAM systems</td>
</tr>
<tr>
<td>3,3</td>
<td>5.328-9G Control and Modelling of Mechanical Systems 1, 2</td>
</tr>
<tr>
<td>3</td>
<td>18.260G Computer Aided Programming for Numerical Control</td>
</tr>
<tr>
<td></td>
<td>18 credit Project Report</td>
</tr>
</tbody>
</table>

3. Industrial Management

<table>
<thead>
<tr>
<th>Credits</th>
<th>Subject Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>3</td>
<td>5.075G Computational Methods in Mechanical Engineering 1</td>
</tr>
<tr>
<td>3</td>
<td>5.317G Industrial Robotics</td>
</tr>
<tr>
<td>2</td>
<td>18.772G Information Processing Systems in Organization</td>
</tr>
<tr>
<td>3</td>
<td>18.868G Industrial Applications of Mathematical Programming</td>
</tr>
</tbody>
</table>

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

2. Industrial Automation

18 credits of core subjects taken from:

<table>
<thead>
<tr>
<th>Credits</th>
<th>Subject Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>3</td>
<td>5.086G Digital Logic Fundamentals for Mechanical Engineers</td>
</tr>
<tr>
<td>3</td>
<td>5.087G Microprocessor Fundamentals for Mechanical Engineers</td>
</tr>
<tr>
<td>3</td>
<td>5.088G Industrial Applications of Microprocessors</td>
</tr>
<tr>
<td>3</td>
<td>5.089G Elements of Industrial Automation</td>
</tr>
<tr>
<td>3</td>
<td>5.090G The Analysis and Use of Integrated CAD/CAM systems</td>
</tr>
<tr>
<td>3,3</td>
<td>5.328-9G Control and Modelling of Mechanical Systems 1, 2</td>
</tr>
<tr>
<td>3</td>
<td>18.260G Computer Aided Programming for Numerical Control</td>
</tr>
</tbody>
</table>

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

3. Industrial Management

<table>
<thead>
<tr>
<th>Credits</th>
<th>Subject Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>3</td>
<td>18.074G Industrial Management</td>
</tr>
<tr>
<td>3</td>
<td>18.965G Industrial Management Seminar</td>
</tr>
</tbody>
</table>

at least 11 credits selected from:

<table>
<thead>
<tr>
<th>Credits</th>
<th>Subject Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>3</td>
<td>18.074G Industrial Management</td>
</tr>
<tr>
<td>3</td>
<td>18.081G Industrial Management Seminar</td>
</tr>
<tr>
<td>4</td>
<td>18.380G Methods Engineering</td>
</tr>
<tr>
<td>6</td>
<td>18.571G Operations Research 1</td>
</tr>
<tr>
<td>3</td>
<td>18.675G Economic Decisions in Industrial Management</td>
</tr>
<tr>
<td>2</td>
<td>18.776G Production and Inventory Control</td>
</tr>
<tr>
<td>9</td>
<td>18.909G Project Report</td>
</tr>
<tr>
<td>18</td>
<td>18.918G Project Report</td>
</tr>
</tbody>
</table>

The remaining credits may be selected from:

<table>
<thead>
<tr>
<th>Credits</th>
<th>Subject Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>3</td>
<td>15.565G Industrial Relations</td>
</tr>
<tr>
<td>3</td>
<td>18.061G Industrial Experimentation 1</td>
</tr>
<tr>
<td>3</td>
<td>18.076G Decision Support Systems</td>
</tr>
<tr>
<td>3</td>
<td>18.171G Inspection and Quality Control</td>
</tr>
<tr>
<td>3</td>
<td>18.360G Ergonomics</td>
</tr>
<tr>
<td>3</td>
<td>18.371G Factory Design and Layout</td>
</tr>
<tr>
<td>3</td>
<td>18.464G Value Analysis/Engineering</td>
</tr>
<tr>
<td>3</td>
<td>18.465G Computer-Aided Manufacturing</td>
</tr>
</tbody>
</table>
### 18.672G Decision Theory for Industrial Management

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>18.764G</td>
<td>Management of Distribution Systems</td>
<td>2</td>
</tr>
<tr>
<td>18.862G</td>
<td>Linear Programming</td>
<td>2</td>
</tr>
<tr>
<td>18.863G</td>
<td>Nonlinear Programming</td>
<td>2</td>
</tr>
<tr>
<td>18.870G</td>
<td>Large Scale Optimization in Industry</td>
<td>3</td>
</tr>
<tr>
<td>18.868G</td>
<td>Industrial Applications of Mathematical Programming</td>
<td>3</td>
</tr>
<tr>
<td>28.913G</td>
<td>Marketing Management</td>
<td>3</td>
</tr>
</tbody>
</table>

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

### 4. Operations Research

**Prerequisites:**

(i) 2 years of University level Mathematics

(ii) minimum 40 hours University level course in Probability and Statistics (or enrolment in 5.0721 Computing or equivalent as a co-requisite)

(iii) minimum 40 hours University level course in Engineering Economic Analysis (or enrolment in 18.675G Economic Decisions in Industrial Management as a co-requisite)

(iv) competence in computer programming (or enrolment in 5.0721 Computing as a co-requisite).

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>14.062G</td>
<td>Accounting for Engineers</td>
<td>3</td>
</tr>
<tr>
<td>18.571G</td>
<td>Operations Research 1</td>
<td>6</td>
</tr>
<tr>
<td>18.574G</td>
<td>Management Simulation</td>
<td>3</td>
</tr>
<tr>
<td>18.970G</td>
<td>Operations Research Seminar</td>
<td>0</td>
</tr>
<tr>
<td>18.909G</td>
<td>Project</td>
<td>9</td>
</tr>
<tr>
<td>18.918G</td>
<td>Project Report</td>
<td>18</td>
</tr>
</tbody>
</table>

The remaining credits may be selected from:

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>18.074G</td>
<td>Industrial Management</td>
<td>3</td>
</tr>
<tr>
<td>18.076G</td>
<td>Decision Support Systems</td>
<td>3</td>
</tr>
<tr>
<td>18.360G</td>
<td>Ergonomics</td>
<td>3</td>
</tr>
<tr>
<td>18.371G</td>
<td>Factory Design and Layout</td>
<td>3</td>
</tr>
<tr>
<td>18.380G</td>
<td>Methods Engineering</td>
<td>4</td>
</tr>
<tr>
<td>18.464G</td>
<td>Value Analysis/Engineering</td>
<td>3</td>
</tr>
<tr>
<td>18.671G</td>
<td>Decision Theory</td>
<td>2</td>
</tr>
<tr>
<td>18.672G</td>
<td>Decision Theory for Industrial Management</td>
<td>3</td>
</tr>
<tr>
<td>18.673G</td>
<td>Energy Modelling, Optimization and Energy Accounting</td>
<td>3</td>
</tr>
<tr>
<td>18.675G</td>
<td>Economic Decisions in Industrial Management</td>
<td>3</td>
</tr>
<tr>
<td>18.760G</td>
<td>Discrete Event Simulation Languages</td>
<td>3</td>
</tr>
<tr>
<td>18.761G</td>
<td>Simulation in Operations Research</td>
<td>3</td>
</tr>
<tr>
<td>18.764G</td>
<td>Management of Distribution Systems</td>
<td>2</td>
</tr>
<tr>
<td>18.765G</td>
<td>Optimization of Networks</td>
<td>2</td>
</tr>
<tr>
<td>18.772G</td>
<td>Information Processing Systems in Organizations</td>
<td>2</td>
</tr>
<tr>
<td>18.776G</td>
<td>Production and Inventory Control</td>
<td>2</td>
</tr>
<tr>
<td>18.862G</td>
<td>Linear Programming</td>
<td>2</td>
</tr>
<tr>
<td>18.863G</td>
<td>Nonlinear Programming</td>
<td>2</td>
</tr>
<tr>
<td>18.870G</td>
<td>Large Scale Optimization in Industry</td>
<td>3</td>
</tr>
<tr>
<td>18.874G</td>
<td>Dynamic Programming</td>
<td>2</td>
</tr>
<tr>
<td>18.879G</td>
<td>Mathematical Programming Analysis</td>
<td>3</td>
</tr>
</tbody>
</table>

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

### 5. Advanced Analysis for Design

**Prerequisites:**

(i) 5.123 Mechanical Engineering Design 3 or equivalent

(ii) 5.423 Mechanics of Solids 3 or equivalent

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>5.124G</td>
<td>Design Technology</td>
<td>2</td>
</tr>
<tr>
<td>5.1244</td>
<td>Project Management</td>
<td>2</td>
</tr>
<tr>
<td>5.1245</td>
<td>Computer Based Engineering Design (or 18.870G)</td>
<td>2</td>
</tr>
<tr>
<td>5.403G</td>
<td>Experimental Stress Analysis</td>
<td>3</td>
</tr>
<tr>
<td>6.044</td>
<td>Electrical Product Design and Reliability (or 6.576G)</td>
<td>3</td>
</tr>
<tr>
<td>6.576G</td>
<td>Reliability Engineering (or 6.044)</td>
<td>3</td>
</tr>
<tr>
<td>8.731G</td>
<td>Project Management (or 8.732G)</td>
<td>3</td>
</tr>
<tr>
<td>8.732G</td>
<td>Advanced Project Management Theory (or 8.731G)</td>
<td>3</td>
</tr>
<tr>
<td>18.464G</td>
<td>Value Analysis/Engineering</td>
<td>3</td>
</tr>
<tr>
<td>18.675G</td>
<td>Economic Decisions in Industrial Management</td>
<td>3</td>
</tr>
<tr>
<td>18.870G</td>
<td>Large Scale Optimization in Industry (or 5.124G)</td>
<td>3</td>
</tr>
</tbody>
</table>

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

Students who elect to take the 9 credit Project will be required to take one of the following specialist options:

### Industrial Automation

The following two subjects from the Industrial Automation package subject to availability:

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>5.086G</td>
<td>Digital Fundamentals for Mechanical Engineers</td>
<td>3</td>
</tr>
<tr>
<td>5.089G</td>
<td>Industrial Applications of Microprocessors</td>
<td>3</td>
</tr>
<tr>
<td>5.090G</td>
<td>The Analysis and Use of Integrated CAD/CAM Systems</td>
<td>3</td>
</tr>
</tbody>
</table>

### Robotics

The following two subjects from the Industrial Automation package subject to availability:

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>5.086G</td>
<td>Digital Fundamentals for Mechanical Engineers</td>
<td>3</td>
</tr>
<tr>
<td>5.317G</td>
<td>Industrial Robots</td>
<td>3</td>
</tr>
<tr>
<td>5.320G</td>
<td>Artificially Intelligent Machines</td>
<td>3</td>
</tr>
</tbody>
</table>
Engineering

6.404G Real Time Computing and Control 3
6.469G Robot Vision 3
6.470G Robotics Automation and Productivity Technology 3

Manufacturing Management
14.062G Accounting for Engineers 3
18.675G Economic Decisions in Industrial Management 3
18.776G Production and Inventory Control 3

Manufacturing Design
Either
18.380G Methods Engineering 3
18.171G Inspection and Quality Control 3
18.371G Factory Design and Layout 3
or
14.062G Accounting for Engineers 3
18.461G Design for Production 3
18.464G Value Analysis and Engineering 3

6. Nuclear Engineering
15 credits of core subjects:
5.230G Radioactivity 1 3
5.231G Radioactivity 2 3
5.232G Neutronics 3
5.233G Nuclear Safety 3
5.234G Nuclear Power Assessment 3
and
5.918G Research Project 18
or
5.909G Project 9

The remaining credits may be selected from:
18.673G Energy Modelling, Optimization and Energy Accounting 3
5.320G Artificially Intelligent Machines 3
5.414G Finite Element Applications 3
5.415G Stress Analysis for Mechanical Engineering Design 1 3
5.417G Mechanics of Fracture and Fatigue 3
5.601G Computational Fluid Dynamics 3
5.715G Two Phase Flow and Heat Transfer 3
5.731G Analysis of Heat Transfer 4
or other such subjects as may be approved by the Head of School.

7. Computer Integrated Manufacturing
18 credits of core subjects:
18.074G Industrial Management 3
18.465G Computer Aided Manufacturing 3
47.601G Computer Aided Design for Manufacture 3
47.602G Computer Integrated Manufacturing 3
47.603G Product Design and Technological Innovation 3
and
18 credit Project Report

Manufacturing Management
14.062G Accounting for Engineers 3
18.675G Economic Decisions in Industrial Management 3
18.776G Production and Inventory Control 3

Manufacturing Design
Either
18.380G Methods Engineering 3
18.171G Inspection and Quality Control 3
18.371G Factory Design and Layout 3
or
14.062G Accounting for Engineers 3
18.461G Design for Production 3
18.464G Value Analysis and Engineering 3

6. Nuclear Engineering
15 credits of core subjects:
5.230G Radioactivity 1 3
5.231G Radioactivity 2 3
5.232G Neutronics 3
5.233G Nuclear Safety 3
5.234G Nuclear Power Assessment 3
and
5.918G Research Project 18
or
5.909G Project 9

The remaining credits may be selected from:
18.673G Energy Modelling, Optimization and Energy Accounting 3
5.320G Artificially Intelligent Machines 3
5.414G Finite Element Applications 3
5.415G Stress Analysis for Mechanical Engineering Design 1 3
5.417G Mechanics of Fracture and Fatigue 3
5.601G Computational Fluid Dynamics 3
5.715G Two Phase Flow and Heat Transfer 3
5.731G Analysis of Heat Transfer 4
or other such subjects as may be approved by the Head of School.

7. Computer Integrated Manufacturing
18 credits of core subjects:
18.074G Industrial Management 3
18.465G Computer Aided Manufacturing 3
47.601G Computer Aided Design for Manufacture 3
47.602G Computer Integrated Manufacturing 3
47.603G Product Design and Technological Innovation 3
and
18 credit Project Report
Graduate Study: Course Outlines

8610
Waste Management

Master of Engineering Science
MEngSc

8085
Waste Management

Master of Engineering Science
MAppSc

Candidates are required to complete a course totalling at least 36 credits, made up of compulsory subjects, elective subjects
and a project. The degree may be obtained internally on a full time (normally 2 sessions of 18 credits) or part time (normally 4
sessions of 9 credits) basis. An external course program is also
offered (normally over 4 sessions) with resource material posted
to students and evaluation made on written assignments.

Candidates would be enrolled as MEngSc or MAppSc depend-
ing on their previous qualification experience and course content.

Compulsory subjects

<table>
<thead>
<tr>
<th>Subject</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>8.872G Management of Wastes</td>
<td>3</td>
</tr>
<tr>
<td>8.873G Waste and Wastewater Analysis and</td>
<td>3</td>
</tr>
<tr>
<td>Environmental Requirements</td>
<td></td>
</tr>
<tr>
<td>8.874G Waste Management Science</td>
<td>3</td>
</tr>
<tr>
<td>27.715G Sources of Waste and Landfill</td>
<td>3</td>
</tr>
<tr>
<td>Disposal</td>
<td></td>
</tr>
<tr>
<td>48.067G Treatment, Disposal and Resource</td>
<td>3</td>
</tr>
<tr>
<td>Recovery of Solid and Liquid Wastes</td>
<td></td>
</tr>
<tr>
<td>48.388G Unit Operations in Wastewater Sludge</td>
<td>3</td>
</tr>
<tr>
<td>and Solids Management</td>
<td></td>
</tr>
</tbody>
</table>

Project(MEngSc)

<table>
<thead>
<tr>
<th>Subject</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>8.909G Project</td>
<td>9</td>
</tr>
<tr>
<td>8.918G Project Report</td>
<td>18</td>
</tr>
</tbody>
</table>

Project (MAppSc)

<table>
<thead>
<tr>
<th>Subject</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>46.512G Project</td>
<td>9</td>
</tr>
<tr>
<td>46.513G Project Report</td>
<td>18</td>
</tr>
</tbody>
</table>

Elective subjects

Selection of the subjects for the formal course work must be
approved by the Director of the Centre for Waste Management.
For a graduate degree specializing in Waste Management a
candidate would normally complete 18 credits of core subjects
plus 9 credits selected from the list of elective subjects.

<table>
<thead>
<tr>
<th>Subject</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>7.152G Mining Conservation</td>
<td>3</td>
</tr>
<tr>
<td>7.535X Mine Fill Technology</td>
<td>2</td>
</tr>
<tr>
<td>48.391G Atmospheric Pollution Control (Theory)</td>
<td>3</td>
</tr>
<tr>
<td>48.391X Atmospheric Pollution Control (Theory)</td>
<td>3</td>
</tr>
<tr>
<td>48.392G Atmospheric Pollution Control (Practical</td>
<td>3</td>
</tr>
<tr>
<td>Aspects)</td>
<td></td>
</tr>
<tr>
<td>8.857G Sewage Treatment and Disposal</td>
<td>3</td>
</tr>
<tr>
<td>8.870G Hydraulics and Design of Water and</td>
<td>3</td>
</tr>
<tr>
<td>Wastewater Treatment Plants</td>
<td></td>
</tr>
</tbody>
</table>

25.702G Hydrogeology                          | 3       |
25.704G Environmental Geology                 | 3       |
25.707X Geopollution Management               | 3       |
25.707G Geopollution Management               | 3       |
46.203G Medical Aspects                      | 1       |
46.204G Legislative Aspects                   | 1       |
47.481G Introduction to Safety Engineering    | 3       |
47.120G Human Behaviour and Safety Science    | 3       |
48.063G Industrial Water and Wastewater       | 3       |
Engineering                               |

8640
Remote Sensing

Master of Engineering Science
MEngSc

Candidates are required to complete a course totalling at least 36 credits, made up of compulsory subjects, elective subjects
and a project or research project. Compulsory subjects not
offered in a particular year may be substituted by an equivalent
subject, approved by the appropriate Head of School. The
degree will normally comprise one year of full-time study (two
sessions of 18 credits) or two years of part-time study (four ses-
sions of 9 credits each).

Candidates who are not exempted from any of the compulsory
subjects and who opt for the Research Project (18 credits), will
achieve the required 36 credits without any elective subjects.

Compulsory subjects

<table>
<thead>
<tr>
<th>Subject</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>27.043G Remote Sensing Applications</td>
<td>3</td>
</tr>
<tr>
<td>29.601G Remote Sensing Principles and</td>
<td>6</td>
</tr>
<tr>
<td>Procedures</td>
<td></td>
</tr>
<tr>
<td>29.605G Ground Investigations for Remote</td>
<td>3</td>
</tr>
<tr>
<td>Sensing</td>
<td></td>
</tr>
<tr>
<td>97.580G Image Analysis in Remote Sensing</td>
<td>3</td>
</tr>
<tr>
<td>97.581G Microwave Remote Sensing</td>
<td>3</td>
</tr>
</tbody>
</table>

Project

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

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

Elective subjects

Candidates are required to include addidtional subjects selected
from the following listed elective subjects, or from other rele-
vant subjects offered within the University, as approved by the
appropriate Head of School, to complete a program totalling 36
credits.

<table>
<thead>
<tr>
<th>Subject</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>6.070G Digital Image Processing Sytems</td>
<td>3</td>
</tr>
<tr>
<td>6.468G Computer Display Systems and Interactive Instrumentation</td>
<td>3</td>
</tr>
<tr>
<td>6.611 Computing 1</td>
<td>4</td>
</tr>
<tr>
<td>6.621 Computing 2A</td>
<td>3</td>
</tr>
</tbody>
</table>
**Engineering**

25.816G  Remote Sensing (in Applied Geology)  2  
27.642G  Mathematical Methods for Spatial Analysis  2  
27.644G  Computer Mapping and Data Display  3  
27.672G  Geographic Information Systems  3  
27.911G  Soil Erosion and Conservation  6  
29.530G  Analytical Photogrammetry  3  
29.604G  Land Information Systems  3  

8650  Surveying  

**Master of Surveying Science  
MSurvSc**

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

- advanced surveying  
- geodesy  
- photogrammetry  
- land development and management  
- land and geographic information systems

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

8660  Biomedical Engineering  

**Master of Biomedical Engineering  
MBiomedE**

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

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

**Elective subjects**

27.644G  Computer Mapping and Data Display  3  
29.7120G  Computer Graphics  2  
47.580G  Image Analysis in Remote Sensing  3  
55.817G  Information Storage and Retrieval Systems  6  
55.815G  Economics of Information Systems  3  

**Project**

29.909G  Projects  9  
29.918G  Projects Report  18  

The Masters degree program in Land and Geographic Systems is offered in both the Faculty of Engineering and the Faculty of Applied Science. Entry into either Faculty depends on the background of the applicant and the orientation of the proposed program.

**Session 1 (March-June)**

**Strand A**

- 6.481G  Introductory Physiology for Engineers#  3  
- 32.025G  Radiation Physics  5  
- 32.510G  Introductory Biomechanics§  3  
- 32.561G  Mechanical Properties of Biomaterials*  3  
- 32.601G  Biomedical Applications of Microprocessors 1***  3  
- 42.211G  Principles of Biology  3  
- 42.212G  Principles of Biochemistry  3  
- 47.061G  Principles of Ergonomics  3  
- 70.011G  Introductory Anatomy HR  6  
- 73.111  Physiology 1A (full year) C  6

**Strand B**

- 6.021E  Digital Logic and Systems  4  
- 32.025G  Radiation Physics  5  
- 32.040G  Analogue Electronics for Biomedical Engineers  4  
- 32.101G  Mathematical Modelling for Biomedical Engineers C  4  
- 32.501G  Computing for Biomedical Engineers HR  4  
- 32.510G  Introductory Biomechanics§  3
Graduate Study: Course Outlines

Session 2 (July-November)

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Credits</th>
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<tbody>
<tr>
<td>32.050G</td>
<td>Microprocessors and Circuit Design for Biomedical Engineers‡</td>
<td>4</td>
</tr>
<tr>
<td>32.010G</td>
<td>Biomedical Engineering Practice</td>
<td>2</td>
</tr>
<tr>
<td>32.012G</td>
<td>Biomedical Statistics</td>
<td>4</td>
</tr>
<tr>
<td>32.311G</td>
<td>Mass Transfer in Medicine</td>
<td>4</td>
</tr>
<tr>
<td>32.321G</td>
<td>Physiological Fluid Mechanics</td>
<td>4</td>
</tr>
<tr>
<td>32.332G</td>
<td>Biocompatibility</td>
<td>3</td>
</tr>
<tr>
<td>32.541G</td>
<td>Mechanics of the Human Body*</td>
<td>3</td>
</tr>
<tr>
<td>32.602G</td>
<td>Biomedical Applications of Microprocessors †††</td>
<td>3</td>
</tr>
<tr>
<td>32.603G</td>
<td>Static and Flow Cytometry</td>
<td>3</td>
</tr>
<tr>
<td>32.611G</td>
<td>Medical Instrumentation†</td>
<td>3</td>
</tr>
<tr>
<td>47.062G</td>
<td>Applied Ergonomics</td>
<td>3</td>
</tr>
<tr>
<td>73.111</td>
<td>Physiology 1A</td>
<td>StrA 6</td>
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Session 3 (March-June)

<table>
<thead>
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<th>Credits</th>
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<tbody>
<tr>
<td>32.018G</td>
<td>Project Report†† or</td>
<td>C 18</td>
</tr>
<tr>
<td>32.030G</td>
<td>Project Report††</td>
<td>30</td>
</tr>
<tr>
<td>32.060G</td>
<td>Biomedical Systems Analysis</td>
<td>3</td>
</tr>
<tr>
<td>32.551G</td>
<td>Biomechanics of Physical Rehabilitation*</td>
<td>3</td>
</tr>
<tr>
<td>32.621G</td>
<td>Biological Signal Analysis</td>
<td>3</td>
</tr>
<tr>
<td>32.701G</td>
<td>Dynamics of the Cardiovascular System</td>
<td>3</td>
</tr>
<tr>
<td>72.402G</td>
<td>Principles of Disease Processes**</td>
<td>3</td>
</tr>
</tbody>
</table>

C Compulsory
HR Highly Recommended
StrA Strand A only
†For students with no mechanics background.
‡These three electives vary according to session offered. Only one is offered each year. Prerequisite 32.510G or equivalent.
††Prerequisite 32.040G or equivalent.
§Prerequisite 32.501G and 32.040G or equivalents.
**For non-medical graduates only. Prerequisite 73.111 or equivalent, pre- or co-requisite 70.001C
††Research project may be done concurrently with course work during the other sessions. An 18 credit Project Report is the normal requirement.
#Part-time students only who are unable to do 73.111
****Prerequisite 32.050G or equivalent.
†††Follows on from 32.601G

8670 Faculty of Engineering

Master of Safety Science
MSafetySc

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

Preliminary subjects

Statistics and Computing

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>16.901G</td>
<td>Health Services Statistics 1</td>
<td>2</td>
</tr>
<tr>
<td>32.012G</td>
<td>Biomedical Statistics</td>
<td>4</td>
</tr>
<tr>
<td>32.501G</td>
<td>Computing for Biomedical Engineers</td>
<td>4</td>
</tr>
<tr>
<td>47.030G</td>
<td>Computing for Safety Science</td>
<td>3</td>
</tr>
</tbody>
</table>

Courses of study leading to the award of a Graduate Diploma in Engineering provide graduates with opportunities to extend their professional knowledge. In most cases, candidates may choose from a range of subjects in the special area of their choice. There are also opportunities to select subjects from other professional areas in which candidates may be interested. In addition, the graduate diploma courses in Engineering Developments are intended for those who wish to take a more general program in several areas of interest.
Before enrolment, an applicant should submit an intended program for approval by the school or centre offering the majority of the credits. Candidates must complete a program totalling 30 credits. Forty per cent of these may consist of approved undergraduate subjects and the program may contain subjects from other schools of the Faculty, other faculties of the University and other universities or institutions subject to meeting any prerequisite requirements. If an applicant nominates a course of study from the list below, at least half of the credits should come from the subjects taken in that area.

Admission Guidelines

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

Period of Candidature

The normal period is two academic sessions (full-time) or four academic sessions (part-time) from the date of enrolment. The maximum period of candidacy is four academic sessions (full-time) and six academic sessions (part-time). In special cases extensions may be granted.

A candidate is not permitted to continue in a course if the credit value of the subjects failed totals more than six.

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

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

**The Graduate Diploma in Remote Sensing and Waste Management are offered in both the Faculty of Engineering and the Faculty of Applied Science. Entry into either Faculty depends upon the background of the applicant and the orientation of the proposed program.

*The Graduate Diploma in Safety Science is an interdisciplinary, structured course for candidates from a wide range of backgrounds.

Further details of the recommended programs of study may be obtained from the course authorities concerned.

Subjects available in the Faculty of Engineering are listed at the end of this section. However, not all electives are offered in any particular year. Subjects available by tape correspondence as well as all subject descriptions, appear later in this handbook.

Graduate Subjects

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

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

Many graduate subjects assume that students have prior, or preliminary, knowledge of the area of study. It is the responsibility of students to acquaint themselves with this level of assumed prior knowledge and take steps, if necessary, to obtain it. This may, for example, involve a course of preparatory reading before commencing the subject.

In some cases the assumed level of knowledge for a specific subject is indicated in this Handbook by the statement of assumed knowledge. This is intended as a guide to the assumed prior knowledge and often uses the description of other subjects in the Handbook (graduate and undergraduate) to indicate the content and level which the lecturer will assume. Students who are in doubt as to the adequacy of their preparation should contact the lecturer concerned and discuss the matter. The lecturer in charge of a subject matter has the authority to decide whether or not the student has the appropriate level of assumed knowledge.

<table>
<thead>
<tr>
<th>Safety Science</th>
</tr>
</thead>
<tbody>
<tr>
<td>Credits</td>
</tr>
<tr>
<td>47.030G Computing for Safety Science</td>
</tr>
<tr>
<td>47.051G Principles of Engineering Mechanics</td>
</tr>
<tr>
<td>47.052G Introduction to Safety Engineering</td>
</tr>
<tr>
<td>47.054G Machines and Structures Safety</td>
</tr>
<tr>
<td>47.060G Electrical Safety</td>
</tr>
<tr>
<td>47.061G Principles of Ergonomics</td>
</tr>
<tr>
<td>47.062G Applied Ergonomics</td>
</tr>
<tr>
<td>47.070G Ventilation</td>
</tr>
<tr>
<td>47.090G Introduction to Occupational Health and Safety Law</td>
</tr>
<tr>
<td>47.180G Management for Safety</td>
</tr>
<tr>
<td>47.120G Human Behaviour and Safety Science</td>
</tr>
<tr>
<td>47.230G Radiation Protection</td>
</tr>
<tr>
<td>47.330G The Accident Phenomenon</td>
</tr>
<tr>
<td>47.480G Fire and Explosion</td>
</tr>
<tr>
<td>47.481G Management of Dangerous Materials</td>
</tr>
<tr>
<td>47.903G Special Report in Safety Science</td>
</tr>
<tr>
<td>47.909G Project</td>
</tr>
<tr>
<td>47.918G Project Report</td>
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</table>
## Civil Engineering

### Department of Transport Engineering

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>8.401G</td>
<td>Human Factors in Transport</td>
<td>3</td>
</tr>
<tr>
<td>8.402G</td>
<td>Transport, Environment, Community</td>
<td>6</td>
</tr>
<tr>
<td>8.403G</td>
<td>Theory of Land Use/Transport Interaction</td>
<td>3</td>
</tr>
<tr>
<td>8.404G</td>
<td>Local Area Transport Planning</td>
<td>3</td>
</tr>
<tr>
<td>8.405G</td>
<td>Urban Transport Planning Practice</td>
<td>3</td>
</tr>
<tr>
<td>8.406G</td>
<td>Regional Transport Planning</td>
<td>3</td>
</tr>
<tr>
<td>8.407G</td>
<td>Transport System Design (Non-Urban)</td>
<td>3</td>
</tr>
<tr>
<td>8.408G</td>
<td>Transport System Design (Urban)</td>
<td>3</td>
</tr>
<tr>
<td>8.409G</td>
<td>Interchange Design</td>
<td>3</td>
</tr>
<tr>
<td>8.410G</td>
<td>Highway Engineering Practice Part 1</td>
<td>3</td>
</tr>
<tr>
<td>8.411G</td>
<td>Highway Engineering Practice Part 2</td>
<td>3</td>
</tr>
<tr>
<td>8.412G</td>
<td>Economics for Transportation Studies</td>
<td>3</td>
</tr>
<tr>
<td>8.413G</td>
<td>Transport Economics</td>
<td>3</td>
</tr>
<tr>
<td>8.414G</td>
<td>Transport Systems Part 1</td>
<td>3</td>
</tr>
<tr>
<td>8.415G</td>
<td>Transport Systems Part 2</td>
<td>3</td>
</tr>
<tr>
<td>8.416G</td>
<td>Traffic Engineering</td>
<td>6</td>
</tr>
<tr>
<td>8.417G</td>
<td>Transport and Traffic Flow Theory</td>
<td>6</td>
</tr>
<tr>
<td>8.418G</td>
<td>Economics for Transportation Studies</td>
<td>3</td>
</tr>
<tr>
<td>8.419G</td>
<td>Statistics for Transport Studies Part 1</td>
<td>3</td>
</tr>
<tr>
<td>8.420G</td>
<td>Statistics for Transport Studies Part 2</td>
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</tr>
<tr>
<td>8.421G</td>
<td>Transport Engineering Elective</td>
<td>3</td>
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</tbody>
</table>

### Department of Engineering Construction and Management

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Credits</th>
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</thead>
<tbody>
<tr>
<td>8.701G</td>
<td>Economic Decision Making in Civil Engineering</td>
<td>3</td>
</tr>
<tr>
<td>8.702G</td>
<td>Network Methods in Civil Engineering</td>
<td>3</td>
</tr>
<tr>
<td>8.703G</td>
<td>Optimization Techniques in Civil Engineering</td>
<td>3</td>
</tr>
<tr>
<td>8.704G</td>
<td>Stochastic Methods in Civil Engineering</td>
<td>3</td>
</tr>
<tr>
<td>8.705G</td>
<td>Systems Modelling</td>
<td>3</td>
</tr>
<tr>
<td>8.706G</td>
<td>Experimental Methods in Engineering Research</td>
<td>3</td>
</tr>
<tr>
<td>8.707G</td>
<td>Numerical Methods in Civil Engineering</td>
<td>3</td>
</tr>
<tr>
<td>8.710G</td>
<td>Advanced Topics in Optimization in Civil Engineering</td>
<td>3</td>
</tr>
<tr>
<td>8.714G</td>
<td>Advanced Topics in System Modelling</td>
<td>3</td>
</tr>
<tr>
<td>8.723G</td>
<td>Construction Design</td>
<td>3</td>
</tr>
<tr>
<td>8.724G</td>
<td>Construction Technology</td>
<td>3</td>
</tr>
<tr>
<td>8.725G</td>
<td>Construction Accounting and Control</td>
<td>3</td>
</tr>
<tr>
<td>8.726G</td>
<td>Construction Law and Professional Practice</td>
<td>3</td>
</tr>
<tr>
<td>8.727G</td>
<td>Construction Planning and Estimating</td>
<td>6</td>
</tr>
<tr>
<td>8.728G</td>
<td>Design of Construction Operations</td>
<td>6</td>
</tr>
<tr>
<td>8.731G</td>
<td>Project Management</td>
<td>3</td>
</tr>
<tr>
<td>8.732G</td>
<td>Advanced Project Management Theory</td>
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### Department of Water Engineering

<table>
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<th>Course Code</th>
<th>Course Title</th>
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</thead>
<tbody>
<tr>
<td>8.830G</td>
<td>Hydromechanics</td>
<td>3</td>
</tr>
<tr>
<td>8.831G</td>
<td>Closed Conduit Flow</td>
<td>3</td>
</tr>
<tr>
<td>8.832G</td>
<td>Pipe Networks and Transients</td>
<td>3</td>
</tr>
<tr>
<td>8.833G</td>
<td>Free Surface Flow</td>
<td>3</td>
</tr>
<tr>
<td>8.835G</td>
<td>Coastal Engineering 1</td>
<td>3</td>
</tr>
<tr>
<td>8.836G</td>
<td>Coastal Engineering 2</td>
<td>3</td>
</tr>
<tr>
<td>8.842G</td>
<td>Groundwater Hydrology</td>
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</tr>
<tr>
<td>8.843G</td>
<td>Groundwater Hydraulics</td>
<td>3</td>
</tr>
<tr>
<td>8.844G</td>
<td>Soil-Water Hydrology</td>
<td>3</td>
</tr>
<tr>
<td>8.847G</td>
<td>Water Resources Policy</td>
<td>3</td>
</tr>
<tr>
<td>8.848G</td>
<td>Water Resources System Design</td>
<td>3</td>
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<tr>
<td>8.849G</td>
<td>Irrigation</td>
<td>3</td>
</tr>
<tr>
<td>8.850G</td>
<td>Drainage of Agricultural Lands</td>
<td>3</td>
</tr>
<tr>
<td>8.851G</td>
<td>Unit Operations in Public Health Engineering</td>
<td>3</td>
</tr>
<tr>
<td>8.852G</td>
<td>Water Distribution and Sewage Collection</td>
<td>3</td>
</tr>
<tr>
<td>8.855G</td>
<td>Water and Wastewater Analysis and Quality Requirements</td>
<td>3</td>
</tr>
<tr>
<td>8.856G</td>
<td>Water Treatment*</td>
<td>3</td>
</tr>
<tr>
<td>8.857G</td>
<td>Sewage Treatment and Disposal*</td>
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## Engineering

<table>
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<th>Course Title</th>
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<tr>
<td>8.858G</td>
<td>Water Quality Management**</td>
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</tr>
<tr>
<td>8.860G</td>
<td>Investigation of Groundwater Resources 1</td>
<td>3</td>
</tr>
<tr>
<td>8.861G</td>
<td>Investigation of Groundwater Resources 2</td>
<td>3</td>
</tr>
<tr>
<td>8.862G</td>
<td>Fluvial Hydraulics</td>
<td>3</td>
</tr>
<tr>
<td>8.863G</td>
<td>Estuarine Hydraulics</td>
<td>3</td>
</tr>
<tr>
<td>8.864G</td>
<td>Arid Zone Hydrology</td>
<td>3</td>
</tr>
<tr>
<td>8.865G</td>
<td>Arid Zone Waters Resources Management</td>
<td>3</td>
</tr>
<tr>
<td>8.866G</td>
<td>Public Health Science</td>
<td>3</td>
</tr>
<tr>
<td>8.869G</td>
<td>Instrumentation and Control in Water Supply and Wastewater Engineering</td>
<td>3</td>
</tr>
<tr>
<td>8.870G</td>
<td>Hydraulics and Design of Water and Wastewater Treatment Plants</td>
<td>3</td>
</tr>
<tr>
<td>8.871G</td>
<td>Water Supply and Sanitation in Developing Countries</td>
<td>3</td>
</tr>
<tr>
<td>8.872G</td>
<td>Management of Wastes</td>
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<tr>
<td>8.873G</td>
<td>Waste and Wastewater Analysis and Environmental Requirements</td>
<td>3</td>
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<td>8.874G</td>
<td>Waste Management Science</td>
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<td>8.875G</td>
<td>Hydrological Processes</td>
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<td>Applied Hydrological Modelling</td>
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<td>8.877G</td>
<td>Flood Design 1</td>
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<tr>
<td>8.878G</td>
<td>Flood Design 2</td>
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<td>Flood Design 3</td>
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**Other Subjects**

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<tbody>
<tr>
<td>8.901G</td>
<td>Civil Engineering Elective 1</td>
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<tr>
<td>8.902G</td>
<td>Civil Engineering Elective 2</td>
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<tr>
<td>8.909G</td>
<td>Project</td>
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<td>8.918G</td>
<td>Project Report</td>
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<tr>
<td>8.936G</td>
<td>Thesis*</td>
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</tbody>
</table>

*A 36 credit Thesis is not normally approved in the school. The normal program includes a 9 credit Project.

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

## Electrical Engineering and Computer Science

### Department of Communications

<table>
<thead>
<tr>
<th>Course Code</th>
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<tbody>
<tr>
<td>6.050G</td>
<td>Occasional Elective</td>
<td>3</td>
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<tr>
<td>6.150G</td>
<td>Theory of Optical Fibres and Optical Signal Processing</td>
<td>3</td>
</tr>
<tr>
<td>6.164G</td>
<td>Antenna Design and Applications</td>
<td>3</td>
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<tr>
<td>6.167G</td>
<td>Propagation and Transmission of Electromagnetic Waves</td>
<td>3</td>
</tr>
<tr>
<td>6.169G</td>
<td>Microwave Circuits: Theory and Techniques</td>
<td>3</td>
</tr>
<tr>
<td>6.170G</td>
<td>Microwave and Optical Devices</td>
<td>3</td>
</tr>
<tr>
<td>6.336G</td>
<td>Digital Communication Networks 1</td>
<td>3</td>
</tr>
<tr>
<td>6.337G</td>
<td>Digital Communication Networks 2</td>
<td>3</td>
</tr>
<tr>
<td>6.338G</td>
<td>Television Systems</td>
<td>3</td>
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<tr>
<td>6.340G</td>
<td>Communication Electronics</td>
<td>3</td>
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<tr>
<td>6.341G</td>
<td>Signal Processing 1—Fundamental Methods</td>
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<tr>
<td>6.342G</td>
<td>Signal Processing 2—Advanced Techniques</td>
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<tr>
<td>6.343G</td>
<td>Digital and Analogue Communications</td>
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<td>6.347G</td>
<td>Digital Modulation and Coding</td>
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<td>Optical Communication Systems</td>
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### Department of Electric Power Engineering

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<tbody>
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<td>Power System Planning and Economics</td>
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<tr>
<td>6.206G</td>
<td>Power System Operation, Control and Protection</td>
<td>3</td>
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<tr>
<td>6.221G</td>
<td>High Voltage Technology</td>
<td>3</td>
</tr>
<tr>
<td>6.224G</td>
<td>Partial Discharges in Electrical Insulation</td>
<td>3</td>
</tr>
<tr>
<td>6.227G</td>
<td>Insulation Performance in Electrical Plant</td>
<td>3</td>
</tr>
<tr>
<td>6.228G</td>
<td>Power System Equipment</td>
<td>3</td>
</tr>
<tr>
<td>6.229G</td>
<td>Fields and Materials</td>
<td>3</td>
</tr>
<tr>
<td>6.242G</td>
<td>Power Systems Analysis</td>
<td>3</td>
</tr>
<tr>
<td>6.250G</td>
<td>Power Elective 1</td>
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</tr>
<tr>
<td>6.251G</td>
<td>Power Elective 2</td>
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### Department of Electronics

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<th>Course Title</th>
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<tbody>
<tr>
<td>6.550G</td>
<td>Solid State Electronics Elective</td>
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<tr>
<td>6.573G</td>
<td>Advanced Semiconductor Devices</td>
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<tr>
<td>6.575G</td>
<td>Integrated Circuit Technology</td>
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<td>6.577G</td>
<td>Integrated Circuit Design</td>
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<tr>
<td>6.578G</td>
<td>Solar Energy Conversion</td>
<td>3</td>
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<tr>
<td>6.579G</td>
<td>Solar Cells · Operating Principles, Technology and System Applications</td>
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### Department of Systems and Control

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<td>6.400G</td>
<td>Systems and Control</td>
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<tr>
<td>6.401G</td>
<td>Computer Control Systems 1</td>
<td>3</td>
</tr>
<tr>
<td>6.403G</td>
<td>Computer Control Systems 2</td>
<td>3</td>
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<td>6.404G</td>
<td>Real Time Computing and Control</td>
<td>3</td>
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<td>6.405G</td>
<td>Topics in Digital Control</td>
<td>3</td>
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<tr>
<td>6.433G</td>
<td>Design of Advanced Microprocessor Systems</td>
<td>3</td>
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<tr>
<td>6.457G</td>
<td>Cybernetic Engineering</td>
<td>3</td>
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<tr>
<td>6.468G</td>
<td>Computer Display Systems and Interactive Instrumentation</td>
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<tr>
<td>6.469G</td>
<td>Robot Vision</td>
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<tr>
<td>6.470G</td>
<td>Robotics, Automation and Productivity Technology</td>
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<tr>
<td>6.484G</td>
<td>Biological Signal Analysis</td>
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### Department of Computer Science

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<tbody>
<tr>
<td>6.650G</td>
<td>Computer Science Elective — VLSI System Architecture and Design</td>
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<td>6.651G</td>
<td>Digital Electronics</td>
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<td>6.654G</td>
<td>Digital Systems</td>
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<td>6.655G</td>
<td>Computer Organization and Architecture</td>
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<td>Software Systems B</td>
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**Other subjects**

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<tbody>
<tr>
<td>10.061G</td>
<td>Advanced Mathematics 1 for Electrical Engineers</td>
<td>3</td>
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<td>10.361G</td>
<td>Statistics</td>
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*Engineering*
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<tbody>
<tr>
<td>6.918G</td>
<td>Project Report (not normally approved for part-time students)</td>
<td>18</td>
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<tr>
<td>6.936G</td>
<td>Thesis (not normally approved for part-time students)</td>
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**Mechanical and Industrial Engineering**

<table>
<thead>
<tr>
<th>Course Code</th>
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<tbody>
<tr>
<td>5.045-6-7G</td>
<td>Advanced Topics in Mechanical Engineering</td>
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<tr>
<td>5.048G</td>
<td>Advanced Topic in Mechanical Engineering</td>
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<tr>
<td>5.049G</td>
<td>Advanced Topic in Mechanical Engineering</td>
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<tr>
<td>5.073G</td>
<td>Ordinary Differential Equations in Mechanical Engineering</td>
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<tr>
<td>5.086G</td>
<td>Digital Logic Fundamentals for Mechanical Engineers</td>
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<tr>
<td>5.087G</td>
<td>Microprocessor Fundamentals for Mechanical Engineers‡</td>
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<td>5.088G</td>
<td>Industrial Applications of Microprocessors</td>
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<tr>
<td>5.089G</td>
<td>Elements of Industrial Automation‡</td>
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<tr>
<td>5.090G</td>
<td>The Analysis and Use of Integrated CAD/CAM Systems</td>
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<td>5.151-2G</td>
<td>Refrigeration and Air Conditioning Design 1, 2*</td>
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<tr>
<td>5.230-1G</td>
<td>Radioactivity 1, 2</td>
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<td>5.232G</td>
<td>Neutronics</td>
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<td>5.233G</td>
<td>Nuclear Safety</td>
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<td>5.234G</td>
<td>Nuclear Power Assessment</td>
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<td>5.307-8G</td>
<td>Dynamics 1, 2</td>
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<td>Industrial Robotics</td>
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<td>5.318-9G</td>
<td>Advanced Mechanism Analysis and Synthesis 1, 2*</td>
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<td>5.320G</td>
<td>Artificially Intelligent Machines</td>
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<td>5.328-9G</td>
<td>Control and Modelling of Mechanical Systems 1, 2†</td>
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<td>5.336G</td>
<td>Random Vibrations</td>
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<td>Mechanical Vibration Analysis</td>
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<td>5.403G</td>
<td>Experimental Stress Analysis</td>
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<td>5.414G</td>
<td>Finite Element Applications</td>
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<td>Stress Analysis for Mechanical Engineering Design 1, 2</td>
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<td>5.417G</td>
<td>Mechanics of Fracture and Fatigue</td>
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<td>5.601G</td>
<td>Computational Fluid Dynamics</td>
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<td>5.602G</td>
<td>Numerical Fluid Dynamics and Heat Transfer</td>
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<td>5.616-7G</td>
<td>Internal Combustion Engines 1, 2</td>
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<td>5.621-2G</td>
<td>Gasdynamics 1, 2</td>
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<td>5.631-2G</td>
<td>Lubrication Theory and Design 1, 2</td>
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<td>5.653-4G</td>
<td>Acoustic Noise 1, 2</td>
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<td>5.655G</td>
<td>Energy Conservation and System Design</td>
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<td>5.715G</td>
<td>Two Phase Flow and Heat Transfer*</td>
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<td>5.722G</td>
<td>Solar Thermal Energy Design</td>
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<td>5.731G</td>
<td>Analysis of Heat Transfer*</td>
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<td>5.732G</td>
<td>Power Plant Engineering</td>
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**Graduate Study: Course Outlines**

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<td>Ambient Energy Air Conditioning</td>
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<tr>
<td>5.755-6G</td>
<td>Refrigeration and Air Conditioning 1, 2*</td>
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<tr>
<td>5.757G</td>
<td>Refrigeration and Air Conditioning Applications</td>
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<td>5.759G</td>
<td>Refrigeration and Air Conditioning Experiment</td>
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<td>Project</td>
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<td>5.912-3G</td>
<td>Naval Hydrodynamics 1, 2</td>
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<td>Project Report</td>
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<tr>
<td>5.936G</td>
<td>Thesis§</td>
<td>36</td>
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</table>

*Candidates wishing to specialize in Refrigeration and Air Conditioning should select this subject.
+Candidates wishing to specialize in Industrial Automation should select this subject.
§A 36 credit thesis is not normally approved in the School of Mechanical and Industrial Engineering.

**Department of Industrial Engineering**

<table>
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<tr>
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<td>18.062G</td>
<td>Industrial Experimentation 2</td>
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<td>18.074G</td>
<td>Industrial Management</td>
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<tr>
<td>18.076G</td>
<td>Decision Support Systems</td>
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<td>18.171G</td>
<td>Inspection and Quality Control</td>
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<td>18.261G</td>
<td>Computer Automation</td>
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<td>18.360G</td>
<td>Ergonomics</td>
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<td>18.371G</td>
<td>Factory Design and Layout</td>
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<td>18.380G</td>
<td>Methods Engineering</td>
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<td>18.461G</td>
<td>Design for Production</td>
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<td>18.464G</td>
<td>Value Analysis/Engineering</td>
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<td>18.465G</td>
<td>Computer Aided Manufacturing</td>
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<td>18.571G</td>
<td>Operations Research 1</td>
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<td>18.574G</td>
<td>Management Simulation</td>
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<td>Case Studies in Operations Research</td>
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<td>Energy Modelling, Optimization and Energy Accounting</td>
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<td>18.675G</td>
<td>Economic Decisions in Industrial Management</td>
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<td>18.760G</td>
<td>Discrete Event Simulation Languages</td>
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<td>18.761G</td>
<td>Simulation in Operations Research</td>
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<td>18.763G</td>
<td>Variational Methods in Operations Research</td>
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<tr>
<td>18.764G</td>
<td>Management of Distribution Systems</td>
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</tr>
<tr>
<td>18.765G</td>
<td>Optimization of Networks</td>
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<td>18.770G</td>
<td>Stochastic Control</td>
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<td>18.772G</td>
<td>Information Processing Systems in Organizations</td>
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<td>18.774G</td>
<td>Applied Stochastic Processes</td>
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<td>Networks and Graphs</td>
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<tr>
<td>18.776G</td>
<td>Production and Inventory Control</td>
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<td>18.777G</td>
<td>Time Series and Forecasting</td>
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<td>18.778G</td>
<td>Scheduling and Sequencing</td>
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<td>18.779G</td>
<td>Game Theory</td>
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<td>18.862G</td>
<td>Linear Programming</td>
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<td>18.863G</td>
<td>Non-Linear Programming</td>
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<td>18.868G</td>
<td>Industrial Applications of Mathematical Programming</td>
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<td>18.870G</td>
<td>Large Scale Optimization in Industry</td>
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<td>18.871G</td>
<td>Mathematics for Operations Research</td>
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<tr>
<td>18.874G</td>
<td>Dynamic Programming</td>
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Engineering

18.875G Geometric Programming  
18.876G Advanced Mathematics for Operations Research  
18.879G Mathematical Programming Analysis  
18.967G Advanced Topic in Production Engineering  
18.968G Advanced Topic in Production Engineering  
18.969G Advanced Topic in Production Engineering  
18.970G Operations Research Seminar  
18.971G Advanced Topic in Industrial Engineering  
18.977G Advanced Topic in Operations Research  
18.978G Advanced Topic in Operations Research  
18.979G Advanced Topic in Operations Research  
18.980G Project  
18.981G Project Report  
18.982G Thesis†  
18.983G Project  
18.984G Biomedical Engineering Practice  
18.986G Biomedical Statistics  
18.991G Project Report  
18.992G Radiation Physics  
18.993G Analogue Electronics for Biomedical Engineers  
18.994G Microprocessors and Circuit Design for Biomedical Engineers†  
18.995G Biomedical Systems Analysis  
18.996G Mathematical Modelling for Biomedical Engineers  
29.601G Remote Sensing Principles and Procedures  
29.603G Statutory Control of Land Development  
29.604G Land Information Systems  
29.605G Ground Investigations for Remote Sensing  
29.608G Cadastral Systems  
29.609G Project  
29.618G Project Report  
29.636G Thesis  
29.637G Project  
29.638G Biomedical Engineering Practice  
29.639G Biomedical Statistics  
29.640G Project Report  
29.641G Radiation Physics  
29.642G Analogue Electronics for Biomedical Engineers  
29.643G Microprocessors and Circuit Design for Biomedical Engineers†  
29.644G Biomedical Systems Analysis  
29.645G Mathematical Modelling for Biomedical Engineers  
29.646G Principles of Disease Processes††  

Centre for Manufacturing and Automation  
97.601G Computer Aided Design for Manufacture  
97.602G Computer Integrated Manufacturing  
97.603G Product Design and Technological Innovation  

Note 1: Candidates taking their Projects in Industrial Management are generally required to take 18.074G and 18.965G plus at least 11 credits from 18.380G, 18.571G, 18.675G, 18.776G and 14.062G Accounting for Engineers. Before enrolling in the Projects they must have had one year's relevant industrial experience and have access to industry for their project topics.

Note 2: Candidates taking their projects in Operations Research are generally required to take the 18.571G, 18.574G, 18.970G and 14.062G Accounting for Engineers.

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

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

Surveying  
29.101G Aspects of Electromagnetic Distance Measurement  
29.102G Characteristics of Optical Surveying Instrumentation  
29.103G Precise Engineering Surveys  
29.106G Special Topic in Surveying A  
29.107G Special Topic in Surveying B  
29.110G Adjustment of Control Surveys  
29.112G Satellite Surveying  
29.113G Doppler Positioning  
29.117G Gravimetric Geoid Evaluations  
29.130G Analytical Photogrammetry  
29.131G Photogrammetric Block Adjustment  
29.132G Computer Assisted Mapping  
29.151G Project  
29.152G Project Report  
29.153G Thesis  
29.154G Project  
29.155G Biomedical Engineering Practice  
29.156G Biomedical Statistics  
29.157G Project Report  
29.158G Radiation Physics  
29.160G Analogue Electronics for Biomedical Engineers  
29.161G Microprocessors and Circuit Design for Biomedical Engineers†  
29.162G Biomedical Systems Analysis  
29.163G Mathematical Modelling for Biomedical Engineers  
29.164G Principles of Disease Processes††  

Note 1: Candidates taking their Projects in Industrial Management are generally required to take 18.074G and 18.965G plus at least 11 credits from 18.380G, 18.571G, 18.675G, 18.776G and 14.062G Accounting for Engineers. Before enrolling in the Projects they must have had one year's relevant industrial experience and have access to industry for their project topics.

Note 2: Candidates taking their projects in Operations Research are generally required to take the 18.571G, 18.574G, 18.970G and 14.062G Accounting for Engineers.

Notes on the Project Courses  
• These 3 electives vary according to session offered. Prerequisite 32.510G or equivalent.
• Prerequisite 32.040G or equivalent.
•• Prerequisite 32.050G or equivalent.
†† For non-medical graduates only. Prerequisite 73.111 or equivalent, pre- or co-requisite 70.011C.

†Prerequisite 32.501G and 32.040G or equivalents.
‡These 3 electives vary according to session offered. Prerequisite 32.510G or equivalent.
*Prerequisite 32.040G or equivalent.
**Prerequisite 32.050G or equivalent.
††Follows on from 32.601G.
Graduate Diploma Subjects

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

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

School of Electrical Engineering and Computer Science

- 6.060G Microprocessor Systems 3
- 6.481G Introductory Physiology for Engineers 3
- 6.659G Data Bases and Networks 3
- 6.660G Design and Analysis of Algorithms 3
- 6.661G Business Information Systems 3

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

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

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- 6.060G Microprocessor Systems 3
- 6.481G Introductory Physiology for Engineers 3
- 6.659G Data Bases and Networks 3
- 6.660G Design and Analysis of Algorithms 3
- 6.661G Business Information Systems 3

School of Mechanical and Industrial Engineering

- 5.086G Digital Logic Fundamentals for Mechanical Engineers 3
- 18.380G Methods Engineering 4
- 18.580G Operations Research 6
- 18.681G Engineering Economic Analysis 3
- 18.780G Production Control 2
- 14.001 Introduction to Accounting A 3
- 14.002 Introduction to Accounting B 3
- 14.042G Industrial Law 2
- 14.062G Accounting for Engineers 3

Project Reports and Theses

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

Civil Engineering

Engineering Construction and Management

Construction techniques. Equipment selection. Field studies of spatial layout, material flow, and construction operations.

Micro, macro, and system structure of construction operations. Civil engineering management. Critical path methods, and operations research methods in engineering construction. Information flow requirements and decision processes of office and field agents.

Geotechnical Engineering


Numerical Methods in Geomechanics

Finite element techniques and their applications in geotechnical engineering including static and dynamic loading. Theoretical and numerical studies of rock blasting. Numerical techniques in static and dynamic fracture mechanics. Application of artificial intelligence and fuzzi-sets in geotechnical engineering.

Pavement Engineering


Civil Engineering Materials


Groundwater


Hydrology

Engineering

Stochastic hydrology.
Hydrological processes.
Hydrometeorology.
Urban drainage.
Arid Lands Hydrology.

Hydraulics.
Two-fluid systems with small density differences.
Sediment motion.
Air entrainment in water in open channels and close conduits.
Wave action and coastal engineering.
Flow through porous media.
Hydraulic transportation of solids.
Coastal engineering and breakwater stability.
Closed conduit flow.

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

Communications
Optical communications.
Optical fibres and integrated optics.
Electro-optic devices such as sensors.
Digital communications.
Digital radio and modulation methods.
Computer communications and local area networks.
New architectures for local area networks.
Switching and stored program control systems.
UHF and microwave circuits and devices.
Microwave measurements.
Antennas and phased arrays.
Radar and navigational aids.
Signal processing and analysis.
Active and adaptive filtering.
Digital filters.
Digital signal processor chip applications.
Acoustic and seismic signal processing.
Speech recognition and synthesis.
Real-time speech to text conversion.
Communications aids for the handicapped.
Digital image processing.
Electronic music.
Man-machine interaction.

Computer Science
Computer organization.
Computer graphics.
Artificial intelligence.
Expert systems
Operating systems.
Languages.
Scheduling.
Network projects.
Data base machine projects.
Computer aided design.
Computer aided instruction projects (CAI)
Fault tolerant computer systems.
Graduate Study: Course Outlines

Office automation and electronic publishing.
Computer aids for dyslexic children.
Digital systems description languages.
Integrated circuit and logic testing.
VLSI systems.

**Digital control.**
**Multivariable control.**
**Control applications of expert systems.**
**Identification and systems modelling.**

**Electric Power**

Power systems analysis and planning.
The I.C stability, dynamics and control of electric power systems.
Power system protection.
Static VAR compensation.
Design and optimal operation of distribution systems.
Transformer design.
Electrical measurements and data acquisition.
Application of insulating material.
High voltage and high current phenomena.
Arcing fault characteristics.
Electrical machines and drives.
Electrical equipment for hazardous atmospheres.
Gaseous discharges and insulation.
Partial discharge detection and location.
Superconductivity.
Electromagnetic transient analysis.
Harmonic analysis.
Wind power generation and integration.
Load management and control.
Production costing and pricing in power systems.
Computer aided teaching systems.
Power electronics.
Remote area supply.

**Applied Mechanics**

Biomechanics.
Impact mechanics.
Adaptive control systems.
Process simulation and control.
Spatial and planar mechanisms.
Dynamics of machines.
Rotor bearing dynamics.
Multi-mode vibrations.
Lubrication and wear.
Hydrodynamic dampers.
Computer aided design.
Industrial automation.
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.

**Electronics**

Semiconductor device physics.
Integrated circuit design.
Integrated circuit technology.
Surface elastic wave devices.
Microelectronic sensors.
Photovoltaic solar energy conversion.
Computer-aided IC design.
Dry etching.
Remote sensing.
Integrated circuits for advanced signal processing.

**Fluid Mechanics/Thermodynamics — Including Aeronautical Engineering, Naval Architecture and Nuclear Engineering**

Two-phase flow with and without heat transfer. Slurries.
Conveying of solid dusts by gases.
Hydraulic transients.
Hydrodynamics, water hammer. Fluidics.
Conduction, convection, and radiation. Natural convection.
Computational fluid dynamics and heat transfer.
Refrigeration and air conditioning.
Energy conversion and conservation.
Solar energy and systems.
Engine performance and emissions.
Gas dynamics. Transonic flow. Shock waves.
Large scale structures.
Light aircraft design and performance.
Development of a ship structure optimization system.
Analysis and design of plated grillages.
Vortex shedding in aeronautical and maritime engineering.
Economic studies relative to ship industry.
Hydrodynamics of planing surfaces.
Problems in wave resistance.
Finite element methods.
Neutron transport and diffusion theory.
Thermal and thermo-mechanical analysis of reactor components.
Nuclear reactor noise theory and analysis.
Nuclear fuel cycles
Reactor channel hydrodynamics.
Numerical methods for reactor analysis and simulation.
Nuclear power planning and reactor strategy.
Risk assessment.
Radiation processing.

Industrial Engineering — comprising Operations Research and Production Engineering

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

Geodynamics: crustal motion studies using satellite laser ranging and very long baseline interferometry data and GPS. Adjustment of continental control networks. Ionospheric and tropospheric effects in GPS measurements.

Photogrammetry.
Design of analytical plotter software.
Aerotriangulation, computer applications, block adjustment, independent model triangulation.
Digital terrain models.
Photogrammetry with digital images.
Location of features on digital images.
Geometry of image sensors, remote-sensing imaging devices.
Mapping applications of remotely sensed data.
Non-topographic applications.

Land Information Systems (LIS)

LIS pertaining to Local Government needs.
Role of Local Government in a state-wide LIS.
Incorporation of remote sensing into LIS.
Data acquisition and upgrading in LIS.
LIS networks.
LIS in developing countries.
Land tenure, land registration and cadastral surveying systems.

Surveying

Precise navigation with GPS.
GPS surveying.
Testing and calibration of GPS instruments.
Application of GPS to engineering projects.
Analysis of deformation measurements.
High precision electronic distance measurement.
Applications of inertial technology.
Precision surveys in industry.
Monitoring of structures and terrains.
Metrology.
Design of networks in engineering.

Biomedical Engineering

Modelling of respiratory function, cardiovascular function, nervous system, artificial kidney therapy, extracorporeal heart-lung support, endocrine system and other body systems.
Development of biomaterials.
Investigation of physiological fluid mechanics.
Microprocessor control of medical equipment.
Limb and joint dynamics studies.
Development of implantable electrodes.
Development of rehabilitation devices.
Development and evaluation of new hospital equipment and treatment procedures.
Signal analysis of wave forms from medical diagnostic equipment.
Implants for fracture support and joint replacement.
Improved drug administration.
Arterial haemodynamics and ventricular-vascular interaction.
Mechanisms of age-related arterial degeneration and hypertension.
Isolated heart studies of the coronary circulation and electrophysiology.

Remote Sensing

Incorporation of auxiliary data into classification procedures.
Application of satellite data to Urban Area studies.
Monitoring land use change using remotely sensed data.
Determining the characteristics of surface reflectance.
Analysis of image quality.
Application of satellite imagery to small scale mapping.
Multispectral linear transformations.
Application of spaceborne synthetic aperture radar data.
Application of aircraft and satellite data to arid land studies.
Application of satellite data to geological studies.
Synergism of radar, visible and infrared remotely sensed data.
Analysis of high resolution SPOT and Landsat IM data.

Waste Management

Landfill site selection.
Leachate testing.
Chemical fixation.
Domestic solid waste collection routing.
Hydrogeological sampling.
Acid waste treatment.
Metals removal.
Toxicity testing.
Legal aspects of hazardous waste.
Subject Descriptions

Identification of Subjects by Number

A subject is defined by the Professorial Board as 'a unit of instruction approved by the University as being a discrete part of the requirements for a course offered by the University'.

Each approved subject of the University is identifiable both by number and by name as this is a check against nomination of subject other than the one intended.

Subject numbers are allocated by the Registrar and the system of allocation is based on the following guidelines:

1. The authority offering the subject, normally a School of the University, is indicated by the number before the decimal point.

2. Each subject number is unique and is not used for more than one subject title.

3. Subject numbers which have previously been used are not used for new subject titles.

4. Graduate subjects are indicated by a suffix 'G' to a number with three digits after the decimal point. In other subjects three or four digits are used after the decimal point.

Subjects taught are listed in full in the handbook of the faculty or board of studies responsible for the particular course within which the subjects are taken. Subject descriptions are contained in the appropriate section in the handbooks.

The identifying numerical prefixes for each subject authority are set out on the following page.

Servicing Subjects are those taught by a school or department outside its own faculty. Their subject descriptions are published in the handbook of the faculty which originates the subject and are also published in the handbook of the Faculty in which the subject is taught.

The following pages contain descriptions for most of the subjects offered for the courses described in this book, the exception being the General Studies subjects. For General Studies subjects see the General Studies Handbook which is available free of charge.

HSC Exam Prerequisites

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

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

Information Key

The following is the key to the information which may be supplied about each subject:

S1 Session 1, S2 Session 2
F Session 1 plus Session 2, ie full year
S1 or S2 Session 1 or Session 2, ie choice of either session
SS single session, but which session taught is not known at time of publication
CCH class contact hours
L Lecture, followed by hours per week
T Laboratory/Tutorial, followed by hours per week
hpw hours per week
C Credit or Credit Units
CR Credit Level
DN Distinction
W weeks of session
<table>
<thead>
<tr>
<th>School, Department etc</th>
<th>Faculty</th>
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<tbody>
<tr>
<td>School of Physics</td>
<td>Science</td>
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<tr>
<td>School of Chemistry*</td>
<td>Science</td>
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<tr>
<td>School of Chemical and Industrial Engineering (New Course)</td>
<td>Applied Science</td>
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<tr>
<td>School of Materials Science and Engineering</td>
<td>Applied Science</td>
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<tr>
<td>School of Mechanical and Industrial Engineering</td>
<td>Engineering</td>
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<td>School of Electrical Engineering and Computer Science</td>
<td>Engineering</td>
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<tr>
<td>School of Mines* (Mineral Processing and Extractive Metallurgy and Mining Engineering)</td>
<td>Applied Science</td>
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<tr>
<td>School of Civil Engineering</td>
<td>Engineering</td>
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<tr>
<td>School of Fibre Science and Technology (Wool Science)</td>
<td>Science</td>
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<tr>
<td>School of Mathematics*</td>
<td>Architecture</td>
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<tr>
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<td>Biological and Behavioural Sciences</td>
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<tr>
<td>School of Psychology</td>
<td>Applied Science</td>
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<tr>
<td>School of Fibre Science and Technology (Textile Technology)</td>
<td>Architecture</td>
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<tr>
<td>School of Accountancy*</td>
<td>Commerce</td>
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<tr>
<td>School of Economics*</td>
<td>Commerce</td>
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<tr>
<td>School of Health Administration*</td>
<td>Professional Studies</td>
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<td>Faculty of Biological and Behavioural Sciences</td>
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<tr>
<td>School of Mechanical and Industrial Engineering (Industrial Engineering)</td>
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<tr>
<td>Department of Industrial Arts</td>
<td>Applied Science</td>
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<td>School of Mines* (Applied Geology)</td>
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<td>Department of General Studies</td>
<td>Board of Studies in General Education</td>
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<td>School of Geography*</td>
<td>Applied Science</td>
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<tr>
<td>School of Marketing*</td>
<td>Commerce</td>
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<tr>
<td>School of Surveying</td>
<td>Engineering</td>
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<tr>
<td>Organizational Behaviour Unit*</td>
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<td>School of Optometry</td>
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<td>Centre for Biomedical Engineering</td>
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<td>Faculty of Arts</td>
<td>Arts</td>
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<tr>
<td>School of Building*</td>
<td>Architecture</td>
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<tr>
<td>School of Town Planning</td>
<td>Architecture</td>
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<tr>
<td>School of Landscape Architecture</td>
<td>Applied Science</td>
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<tr>
<td>School of Biological Technologies (Food Science)</td>
<td>Architecture</td>
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<tr>
<td>Graduate School of the Built Environment*</td>
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<td>Professional Board</td>
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<td>School of Biochemistry</td>
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<td>Faculty of Applied Science</td>
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<td>Centre for Safety Science</td>
<td>Engineering</td>
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<td>School of Chemical Engineering and Industrial Chemistry* (Old Course)</td>
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<td>School of Biological Technologies</td>
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<td>School of English</td>
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<td>School of Education</td>
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<td>Department of Russian Studies</td>
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<td>Subjects Available from Other Universities</td>
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<td>School of Community Medicine</td>
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<td>Faculty of Medicine*</td>
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<td>Medicine/Science/Biological Sciences</td>
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<td>Australian Graduate School of Management</td>
<td>AGSM</td>
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<td>Faculty of Law</td>
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Engineering

Chemistry

Graduate Study

2.251G Toxicology, Occupational and Public Health F L1T3

Important classes of toxic materials found in the environment; treatment of pesticide residues, industrial chemicals of various types, toxic gases, mould metabolites and bacterial toxins occurring in food, carcinogenic substances, toxic metals, etc. Effects of these substances on living organisms, particularly man. Practical work: pesticide residue analysis, blood and urine analysis, gas sampling and analysis, trace metal determination and experiments on the animal metabolism of toxic substances.

Mechanical and Industrial Engineering

5.045G Advanced Topic in Mechanical Engineering C2

5.046G Advanced Topic in Mechanical Engineering C2

5.047G Advanced Topic in Mechanical Engineering C2

5.048G Advanced Topic in Mechanical Engineering C3

5.049G Advanced Topic in Mechanical Engineering C3

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.

5.086G Digital Logic Fundamentals for Mechanical Engineers C3

Excluded: 6.021E, 6.631 and equivalent.

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

5.087G Microprocessor Fundamentals for Mechanical Engineers C3


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

5.088G Industrial Applications of Microprocessors C3

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


5.089G Elements of Industrial Automation C3

Co-requisite: 5.086G or equivalent.

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

5.090G The Analysis and Use of Integrated CAD/CAM Systems C3

Prerequisite: 5.089G.


5.151G Refrigeration and Air Conditioning Design 1 C3


5.152G Refrigeration and Air Conditioning Design 2 C3

Prerequisite: 5.151G or equivalent.

5.230G Radioactivity 1


5.231G Radioactivity 2

Biological effects of radiation and radiological protection, the ICRP and the ALARA concept. Gamma shielding, from point, line, cylindrical and distributed sources. Radiation dose estimation from external and internal sources. Atmosphere dispersion, and modes of transport of radionuclides in the biosphere and geosphere. Compartment model formulations and applications in radioecology and radiation dosimetry.

5.232G Neutronics


5.233G Nuclear Safety


5.234G Nuclear Power Assessment


5.307G Dynamics 1

Excluded: 5.304G and equivalent.
As for 5.308G.

5.308G Dynamics 2

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

5.317G Industrial Robotics

Prerequisite: 5.086G or equivalent.

5.318G Advanced Mechanism Analysis and Synthesis 1

Assumed knowledge: 5.301 or 5.302 or 5.333 or equivalent. Excluded: 5.3040, 5.315G.
Algebraic displacement, velocity and acceleration analyses of simple and complex planar mechanisms. Instantaneous kinematics: centroids; inflection and Bresse circles; Euler-Savary equation; cubic of stationary curvature; centring point curve. Coupler curves and their properties; curve cognates. Constraint and freedom; mobility; velocity closure of a loop. Special configurations; singularities. Various methods of synthesis.

5.319G Advanced Mechanism Analysis and Synthesis 2

Excluded: 5.316G and equivalent.
A selection of topics from Planar mechanisms: kinematic analysis of complex mechanisms; kinetic analysis; kinematic geometry; precision position synthesis. Cams: basic and common curves; equations of motion; development of profile; determination of system geometry and mechanical properties; noise, wear, backlash and manufacture. Spatial linkages: structural analysis; closure equations; screw system algebra; special configurations.

5.320G Artificially Intelligent Machines

The principles of operation of machines into which limited powers of decision making have been delegated. The grouping of intelligent machines. Cognition; sensor technology; parsing; information representation; convolutions; software and hardware environments.

5.328G Control and Modelling of Mechanical Systems 1

As for 5.329G.

5.329G Control and Modelling of Mechanical Systems 2

Prerequisite: 5.328G or equivalent.
Development of modelling techniques using both digital and analogue computation, with special emphasis on the representation of non-linearities. Typical examples of mechanical systems.
5.336G Random Vibrations  
Assumed knowledge: 5.331 or 5.333 or equivalent.  
Probability, vibration theory review, linear mechanical system response to random vibrations. Statistical characteristics: autocorrelation, spectral density, convolution, narrow band processing, consistency, applications.

5.338G Mechanical Vibration Analysis  
Assumed knowledge: 5.303 and 5.423 or equivalent. Excluded: 5.334, 5.348, 5.335G and equivalent.  
Means of controlling inertia-induced vibration in machinery. Frequency response functions of damped and undamped systems; laboratory classes. Eigenvalues and eigenvectors for multi-degree of freedom systems, including geared shaft systems. Beam and plate vibration via finite element analysis, with laboratory experiments to verify finite element results.

5.403G Experimental Stress Analysis  
Excluded: 5.401G.  

5.414G Finite Element Applications  

5.415G Stress Analysis for Mechanical Engineering Design 1  
Prerequisite: 5.423 or equivalent. Excluded: 5.434 and equivalent.  
Plates, shells: primary, secondary and peak stresses, relations to strength. Pressure vessels. Current design philosophies.

5.416G Stress Analysis for Mechanical Engineering Design 2  
Assumed knowledge: 5.423 or equivalent.  

5.417G Mechanics of Fracture and Fatigue  
Excluded: 5.428G and 5.429G or equivalent, 5.424.  

5.601G Computational Fluid Dynamics  

5.602G Numerical Fluid Dynamics and Heat Transfer  
Assumed knowledge: 5.623, Excluded: 5.717G, 5.635  

5.616G Internal Combustion Engines 1  

5.617G Internal Combustion Engines 2  
Prerequisite: 5.615G or 5.616G or equivalent.  

5.621G Gasdynamics 1  
Excluded: 5.653, 5.811.  
One dimensional steady flow: isentropic channel flow, normal shock waves, supersonic wind tunnels and diffusers. Two dimensional steady flow: oblique shock waves, Prandtl-Meyer expansions, nozzles, airfoils. One dimensional unsteady flow: moving waves, reflections, explosions in ducts, shock tubes; method of characteristics, internal flows, piston and valve effects.

5.622G Gasdynamics 2  
Prerequisite: 5.621G or equivalent.  
5.631G Lubrication Theory and Design 1  
Excluded: 5.6342.

History of lubrication, types of bearing and bearing operation, nature of surfaces and their contact, modes of lubrication, properties of lubricants, viscous flow in pipes and channels, measurement of viscosity, infinitely long and short bearing approximations, one dimensional analysis of short bearing, other slider bearing geometries, the effect of end leakage, hydrostatic or externally pressurised bearings, squeeze films.

5.632G Lubrication Theory and Design 2  
Prerequisite: 5.631G or equivalent.


5.653G Acoustic Noise 1  
Excluded: 5.3541.

Acoustic plane wave equation, standing waves, energy density, intensity, decibel scales. Human response, annoyance and damage criteria. Transmission between media, absorbing materials. Mufflers, Three dimensional wave equation. Transmission in ducts. Room acoustics.

5.654G Acoustic Noise 2  
Prerequisite: 5.653G or equivalent. Excluded: 5.3542.


5.655G Energy Conservation and System Design  
Assumed knowledge: 5.636 or equivalent. Excluded: 5.716G, 5.717G.

Examination of some existing systems, assessment of their energy losses and their improvement by tuning. Alternative energy sources and their availability, energy utilization and efficiency in various systems. Environmental aspects, assessment of emissions, means of improvement. Economically viable energy technology under present conditions. Expected trends in energy technology in the short and long term. A number of case studies.

5.715G Two Phase Flow and Heat Transfer  
Assumed knowledge: 5.636 or equivalent. Excluded: 5.664.


5.722G Solar Thermal Energy Design  
Excluded: 5.644, 5.720G and equivalent.


5.731G Analysis of Heat Transfer  
Assumed knowledge: 5.636 or equivalent. Excluded: 5.716G, 5.717G.


5.732G Power Plant Engineering  
Assumed knowledge: 5.620, 5.626 or equivalent.


5.753G Ambient Energy Air Conditioning  
Assumed knowledge: 5.636 or equivalent.


5.755G Refrigeration and Air Conditioning  
Engineering

5.756G Refrigeration and Air Conditioning 2
Assumed knowledge: 5.755G or equivalent

5.757G Refrigeration and Air Conditioning Applications
Industrial, commercial and domestic applications of refrigeration and air conditioning. Refrigeration technology. The science and technology of foods. Building design and construction.

5.759G Refrigeration and Air Conditioning Experimentation
Prerequisites: 5.755G, 5.756G. Co-requisites: 5.151G, 5.152G.
Performance testing and system evaluation of multistage R22/brine system, R12 forced draft cooler system and dual duct air conditioning plant. Instrumentation, data acquisition and control of refrigeration plant. Use of calorimeter rooms for testing and rating of equipment. Transient performance characteristics of direct expansion coil and system, under different ambient conditions. Group project involving the designing, building, commissioning, instrumenting and testing of refrigeration and air conditioning equipment.

5.909G Project

5.912G Naval Hydrodynamics 1
Assumed knowledge: 5.663 or 10.411 A or equivalent.
As for 5.913G

5.913G Naval Hydrodynamics 2
Prerequisite: 5.912G or equivalent.
Advanced treatment of topics selected from: ship waves and ship resistance; ship manoeuvrability; ship motion and seakeeping; hydrofoil and propeller theory; aero and hydrodynamics of surface effect machines.

5.918G Project Report
5.936G Thesis

Electrical Engineering and Computer Science

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.

6.060G Microprocessor Systems
Basic computer architecture: fetching and executing instructions; Motorola 6809 registers and instructions; assemblers, addressing modes; bus waveforms; interfacing to a bus; parallel interfacing; the PIA; handshaking; interrupts; critical regions; buffered I/O; stack data frames; recursion; serial interfacing; the ACIA; direct memory access (DMA); dynamic memory; Microprocessor examples.

6.070G Digital Image Processing Systems
Excluded: 6.476G.
The fundamentals of digital image processing with topics selected from the following: Visual perception and the image model, transforms, enhancement, sharpening and smoothing, restoration, encoding, segmentation, reconstruction of images from projections and tomography, satellite imaging and imaging in remote sensing; image processing hardware and systems; picture processing; measurement and inspection.

6.150G Theory of Optical Fibres and Optical Signal Processing

6.164G Antenna Design and Applications
Pre-requisite: 6.167G.
Principles of phased arrays and reflector antennas with some emphasis on space-borne and ground-terminal antennas for satellite communications. Analysis and synthesis of phased array, null steering theory. Single and dual reflector antennas, offset-reflector systems, optimization techniques. Effects of satellite orbital saturation on design of ground terminal antennas. Monopulse tracking antennas. Antenna tolerance theory.

6.167G Propagation and Transmission of Electromagnetic Waves
6.169G Microwave Circuits: Theory and Techniques C3

6.170G Microwave and Optical Devices C3
Principles and applications of microwave amplifying and control devices. Includes microwave transistors, Gunn and impatt diodes and recent developments in ultra high speed transistors. Principles and applications of optical sources and detectors. Includes lasers, LEDs, electro-optic and acoustic-optic modulators and switches, optical detectors.

6.205G Power System Planning and Economics C3
Review of conventional planning techniques and their limitations. Introduction of a novel approach based on welfare maximisation. Examples of its application to coordinated supply and demand side planning in problems - such as demand forecasting, supply reliability, maintenance scheduling, transmission planning and demand management.

6.206G Power System Operation, Control and Protection C3
Control of system frequency: system frequency dynamics, load frequency control of interconnected systems, automatic generation control. Unit commitment and economic dispatch. Control of system voltage and reactive power. Problems of power system operation: security of supply, load forecast, power flow control, fault level containment, stability. Protection of power system and transmission lines: main protection, back up protection, system protection under emergency. Protection in distribution systems.

6.221G High Voltage Technology C3
Introduction to the technology involved in the design and testing of high voltage power system equipment. Study of the practical applications of relevant materials, with emphasis on properties of insulation systems (gases, liquids and solids) and the interaction of the materials in non-uniform fields. Methods of testing under steady state, AC and DC, and surge conditions are incorporated in the laboratory work. Design examples are taken from insulator, bushing, cable, power capacitor, transformer, rotating machine and switchgear technologies.

6.224G Partial Discharges in Electrical Insulation C3
Assumed knowledge: 6.202 or 6.222 or equivalent.
Many aspects of partial discharge phenomena and their effect on electrical insulation. The physical processes involved in partial discharges plus the interpretation of results from measurements on simple and complex apparatus, such as power cables, power capacitors, rotating machines and transformers. Techniques studied include digital based systems with particular emphasis being given to practical applications, in order to relate theoretical concepts to measurements which are subject to laboratory or on-site limitations.

6.227G Insulation Performance in Electrical Plant C3
Assumed knowledge: 6.202 or 6.222 or equivalent.
Selection from: design test requirements. Forms of high voltage works test: alternating, impulse, switching surge and direct. Non destructive tests: dielectric loss angle, dispersion, partial discharge and insulation resistance. Methods of determining material condition: moisture content, gas in oil, impurities, electron microscopy including determination of aging and long life. Commissioning and site tests.
Demonstrations and projects to support the lecture material.

6.228G Power System Equipment C3
Assumed knowledge: 6.202 or equivalent.
Operating characteristics and design features of the major equipment components of a power system. Includes a general treatment of equipment rating, thermal design, electromagnetic forces, equipment protection and data acquisition. Specific items of equipment include power transformers, instrument transformers, switchgear, overhead lines and underground cables, surge arresters, gas insulated systems, power factor correction equipment and alternators.

6.229G Fields and Materials C3
General description of the inter-relationship between the different types of fields (electric, magnetic and thermal) and materials when used in various areas of electric power engineering. Topics include: a general coverage of dielectric, conducting, magnetic and thermal materials; solution of Poisson's Laplace's and Fourier's equations for simple geometries and calculation of electric, magnetic and thermal fields, including boundary effects; a selection of typical applications from thermal rating, electric heating, contact effects, laser action, surface electron emission, etc; a brief outline of some measurement techniques applicable to the above.

6.242G Power System Analysis S2 C3

6.250G Power Elective 1 C3
As for 6.550G Solid State Electronics Elective.
6.251G Power Elective 2
As for 6.550G Solid State Electronics Elective.

6.336G Digital Communication Networks 1
Excluded: 6.652.

6.337G Digital Communication Networks 2
Prerequisites: 6.652 or 6.336G.

6.338G Television Systems
Prerequisites: 6.167G, 6.341G.

6.340G Communication Electronics
Assumed knowledge: 6.0316 or similar.
Electronic aspects of modern analogue and digital communication systems. Topics selected from: electronic systems design; electromagnetic compatibility and interference; electronic system noise; analogue modulators, demodulators, frequency conversion circuits, AM and FM transmitters and receivers; television electronics; phase locked loops; switched capacitor and other practical filter technologies; surface acoustic wave devices.

6.341G Signal Processing 1—Fundamental Methods
Excluded: 6.042.
Fundamental principles of the analysis and processing of analogue and digital signals with emphasis on digital methods. Generalized Fourier analysis; convolution, correlation, energy and power density spectra for signals and linear systems. Sampling, the discrete Fourier transform (DFT) and fast Fourier transform (FFT) algorithms. Fundamentals of filter design and realization of analogue and digital filters, including active filters and special purpose programmable digital signal processors. Digital processing of analogue signals, filter stability, sensitivity and finite word length effects in the realization of digital filters.

6.342G Signal Processing 2—Advanced Techniques
Prerequisite: 6.341G or similar.
Advanced techniques of digital signal processing with applications in communications and control, radar and sonar and the processing of speech, seismic signals and images. Topics selected from: digital methods for sampling rate changes, advanced FFT algorithms and the chirp z-transform algorithm. Analysis of random signals and noise in linear systems and nonlinear devices. Estimation and measurement of power density spectra. Linear prediction and parameter estimation for speech analysis and spectrum estimation. Mean-square estimation and adaptive filtering for the detection and estimation of signals in noise, equalization, echo and noise cancelling and deconvolution. Nonlinear techniques; homomorphic signal processing and cepstral analysis, median filtering, etc. Short-time spectral analysis and time-frequency distributions. Two-dimensional signal processing.

6.343G Digital and Analogue Communications
Co-requisite: 6.042 or 6.341G or similar. Excluded: 6.323 or similar.
Prerequisite or co-requisite for 6.347G Digital Communications and 6.348G Optical Communications.
Fundamentals of modern telecommunications systems, including theoretical and practical aspects of linear and non-linear analogue modulation (AM, SSB, FM, etc), digital signal transmission, pulse code modulation, computer communication, effects of noise in analogue and digital systems, error control, multichannel systems (FDM, TDM, etc), synchronization, relay systems, optimum transmitters and receivers.

6.347G Digital Modulation
Prerequisite: 6.343G or similar.
Advanced and unified treatment of digital transmission systems. Baseband ASK digital communication systems including intersymbol interference, eye patterns, power spectral density, probability of error estimates and bounds, Nyquist criterion partial response signals (eg simple and modified duobinary). Digital modulation including various types of shift keying modulation such as amplitude, amplitude and phase, phase, frequency and minimum shift keying (ASK, APSK, OAPSK, PSK, FSK and MSK), power spectral density, probability of error, signal constellations and system comparison. Equalization including linear, non-linear, adaptive and automatic equalization and Viterbi decoders.

6.348G Optical Communications Systems
Prerequisites: 6.150G, 6.170G.
Calculation of bandwidth of single mode and multimode fibres. Review of transmitter and receiver circuits. Connection and launching efficiency between fibre and optical source. Fibre to

6.400G Systems and Control

This subject is intended for students who do not have a suitable background in Control (ie 6.0314, 6.412 equivalent). Topics include: dynamic system modelling, time and frequency domain relationships, block diagrams, feedback theory, stability, Nyquist, Routh Test, root locus, design of continuous time controllers for SISO and MIMO systems, steady-state and transient response and specifications in both frequency and time, process control, P.I.D. controllers.

6.401G Computer Control Systems 1

Assumed knowledge: 6.412 or similar.
Introduction to computer control, overview of design, translation of analog design, including: description of sampling, the sampling theorem, data reconstruction, input/output models, the z-transform, poles and zeros, selection of sampling rate, stability, approximation methods, digital PID, digital design by transform methods, pole placement design using output feedback and polynomial design. Implementation of digital controllers.

6.403G Computer Control Systems 2

Systems identification, recursive methods, disturbance models, stochastic models, ARMA processes, input/output models, design via input/output models, including: optimal prediction and control, minimum variance control, LQG control, state-space analysis, controllability, observability, reachability, state-space design methods, optimal design via state-space, linear quadratic control, Kalman filters, adaptive control.

6.404G Real Time Computing and Control

Examines the implementation of modern control techniques and associated instrumentation using distributed computers. Practical hardware aspects, including measurement and actuation, data conditioning, acquisition and transmission, microprocessor devices, and other distributed computing components. Commercial realisations ranging from PLCs to full process control computing systems. Software: executive operating systems, concurrency, control algorithms, numerical problems, languages and development tools in the real-time context. Design of the man-machine interface using interactive computer display systems. The role of simulation and other CAD tools. Steps of engineering development from concept to commissioning. The viewpoint of industrial design is maintained throughout.

6.405G Topics in Digital Control

Prerequisites: 6.413, or both 6.401G and 6.403G.
A detailed coverage of some of the more important topics in control including: multivariable control, system identification, estimation and adaptive control, optimization techniques.

6.433G Design of Advanced Microprocessor Systems

Prerequisite: 6.060G.
Aims to familiarize the systems designer with the architecture and applications of the rapidly expanding family of microprocessor hardware support devices for dedicated control functions. Topics include: review and comparison of bus protocols of common systems; architecture, programming and applications of specialized system support devices and peripheral control chips; single chip microprocessors, architecture and applications to dedicated control tasks. Laboratory work includes individual design projects involving typical systems application of these devices.

6.457G Cybernetic Engineering

The genesis of cybernetics; fundamentals of cybernetic engineering; machines modelled on life and their evolution to robots. Topics include biological information transmission, memory and efficiency with aspects of biochemical coding and control, genetic and neural; basics of brain models and the development of pattern recognition techniques, learning machines and syntactic structures; includes the Perception view and brain modelling; the Albus approach to robotics, anthropomorphic robots; the social consequences of the dual evolution of robots.

6.468G Computer Display Systems and Interactive Instrumentation

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

6.469G Robot Vision

Prerequisite: 6.070G or equivalent.
Material oriented towards image understanding, scene analysis and world models for robots incorporating vision; including imaging techniques and geometries for vision, modelling the imaging process and image understanding, edges, range information, surface orientation, boundaries and regions, motion and optic, flow, texture, structural description, matching and inference, vision robotics.

6.470G Robotics, Automation and Productivity Technology

Principles of Robotics relevant to future trends in automating the
manufacturing process. Such aspects as arm configurations, dynamics and control with relevant sensing methods; image understanding for inspection, assembly and control together with trends in artificial intelligence for Robotics are discussed.

6.481G Introductory Physiology for Engineers S1 L2T2 C3
Excluded: 6.402.

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

6.484G Biological Signal Analysis C3
Excluded: 6.341G.

Digital computer methods of extracting information from biological signals using filtering and averaging, expectation density functions, correlation functions, spectral analysis and other techniques. Methods of constructing models of biological systems.

6.550G Solid State Electronics Elective C3

This syllabus changes from one occasion to the next, allowing presentation of a modern topic at graduate level, particularly by visiting academics of eminence.

6.573G Advanced Semiconductor Devices C3
Excluded: 6.512.

Theory and operating characteristics of a range of semiconductor devices including bipolar diodes and transistors, MOS devices and circuit connections, charge coupled devices, solar cells, light emitting diodes and semiconductor lasers.

6.575G Integrated Circuit Technology C3


6.577G Integrated Circuit Design C3

Assumed knowledge: 6.0316 or 6.322.

An advanced treatment of the design of integrated circuits with emphasis on the relationships between technology, device characteristics and circuit design. Includes properties and modelling of bipolar and MOS circuit components, circuit analysis and simulation, layout rules, analog functions such as operational and power amplifiers; multipliers, D/A and A/D converters. Analog MOS circuits. Digital circuits include gates, compound functions, RAM, ROM, speed and power analysis. Economics and yield analysis for MSI, LSI and VLSI devices.

6.578G Solar Energy Conversion C3


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

6.650G Computer Science Elective — VLSI Systems Architecture and Design C3

Assumed Knowledge: 6.532, 6.613 or 6.0318.

It is recommended that 6.577G, and 6.612 or 6.654G, and 6.655G be undertaken as co-requisites or prerequisites.


Project: a group project will be undertaken which should result in the design of a fabricatable CMOS IC. The project is an integral part of this course.

6.651G Digital Electronics C3


Digital circuits and principles, sub-system organization, microprocessors, memory technology, interface design, integrated circuit technologies and characteristics.
6.654G Digital Systems


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

6.655G Computer Organization and Architecture

Assumed knowledge: 6.0318 or 6.613.

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

6.657G Software Systems B


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

6.659G Data Bases and Networks


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

6.660G Design and Analysis of Algorithms


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

6.661G Business Information Systems


6.918G Project Report

6.936G Thesis

CIS

6.657G Software Systems B


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

6.659G Data Bases and Networks


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

Mines

7.152G Mining Conservation

The reclamation of excavated land; integration with operational stages of mining. Mining cycles of alluvial, strip, and open cuts, land clearing, stabilizing the mined area, socio-economic aspects of mining, rehabilitation costs, government regulations. Examination and evaluation of a current operation.

7.535G

7.916G Atmospheric Pollution and Control (Theory)

S1 or S2 L3

Causes, properties, dispersion, measurement and monitoring, control and legislation of air pollution in ambient and industrial environments.

7.917G Fire and Explosion

S1 or S2 L2

Chemistry and physics of combustion reactions; types of flames; deflagration and detonation; ignition; fire point; flammable limits. Industrial fuel-fired appliances; fire risks in buildings; fire fighting equipment; flame proofing; fire and explosive risks in chemical process industries; case studies. Use of appropriate standards and legislation. Fire research; insurance.

Civil Engineering

8.401G Human Factors in Transport

SS C3

Human capabilities, ergonomic principles, attitudes to new concepts, planning, the law; application to transport planning, design and implementation. The human as a processor of information,
### 8.402G Transport, Environment, Community F C6


### 8.403G Theory of Land Use/Transport Interaction S1 C3

Theoretical aspects of land use transport planning. Basic concepts, data collection methods, systems models and equation of state (function behavioural, optimizing). Introduction to land use-transport modelling (land use, generation, distribution, modal assignment, network assignment, evaluation). Planning methodologies (short-, medium-, long-term; action planning, strategic planning; local, urban, regional national).

### 8.404G Local Area Transport Planning S1 C3

Application of theoretical methods to local area planning. Local government planning and engineering: pedestrian planning, frontage land use problems, analysis of residential areas, industrial estates, shopping centres and recreational facilities, accessibility studies, environmental studies, parking studies.

### 8.405G Urban Transport Planning Practice SS C3


### 8.406G Regional Transport Planning S2 C3

The role of transport in economic and social development in regions including Third World countries; historical and contemporary analysis. Analytical techniques for regional planning. Planning practice, feasibility studies, evaluation methods. Case studies.

### 8.407G Transport Systems Design (Non-Urban) S1 C3

Process of location of road, railway and airport facilities. Data collection alternative routes, public discussion, methods, techniques, aids, plans and diagrams produced. Geometric form; differences between road, railway and airport carriageway layout. Optical guidance, design models, landscape, provision for surface-water signposting, fencing and posts.

### 8.408G Transport System Design (Urban) S2 C3

Types of urban transport facilities. Distributors, streets, bicycle routes, walk-oriented areas, bus lanes and rapid transit lanes, stops and change terminals, noise control. Minimum geometric form; speed range controls, provision for surface water on urban roads, landscape. Design of intersection and parking areas.

### 8.409G Interchange Design SS C3

Central projection theory and application to alignment design; perspective drawing methods, introduction to aerial and terrestrial photogrammetry, photomaps and photomontage as applied to transport facilities. Speed change lanes, exit and entrance terminals, ramp types, ramp speeds and design. Interchange location and layout, provision for surface water, signposting. Computer use. Safety measures during maintenance.

### 8.410G Highway Engineering Practice Part 1 S1 C3


### 8.411G Highway Engineering Practice Part 2 S2 C3


### 8.412G Economics for Transportation Studies S1 C3

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.

### 8.413G Transport Economics S2 C3

Cost and price analysis for each of the transport modes (road, rail, air and sea). Welfare analysis and taxation theory with respect to transport. Economics of location, economics of land use models; regional trade model.

### 8.414G Transport Systems Part 1 S1 C3

8.415G Transport Systems Part 2  
Historical introduction to transport systems and development of various transport modes, road (vehicles, pedestrians, cycles), conveyor, rail, sea and air. Analysis of the operational characteristics of vehicles in the transport modes of road, rail and air. Analysis of the requirements of the rights of way for each transport mode. Development of optimum criteria for the distribution of cargo and passenger traffic. Terminals and mode transfer facilities. Development of system operational models. Energy consideration, new systems.

8.416G Traffic Engineering  

8.417G Transport and Traffic Flow Theory  
Analysis of deterministic and stochastic models of the traffic stream. Topics covered include the following: Definition and measurement of traffic stream parameters. Space and time distribution of speed. Overtaking models and the moving-observer method. Fundamental diagram of traffic. Car-following theory. Headway and counting distributions. Introduction to queueing theory. Simulation techniques. Signalized and unsignalized intersections.

8.418G Statistics for Transport Studies Part 1  

8.419G Statistics for Transport Studies Part 2  
Assumed knowledge: 8.418G


8.420G Transport Engineering Elective  
An occasional offering in a specialized Transport and Highways topic selected according to current demand and/or availability of a local or visiting specialist.

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

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

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

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

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

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

8.707G Numerical Methods in Civil Engineering  

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

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

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

8.724G Construction Technology SS C3
A selection of topics from: drilling, blasting techniques, tunnelling, rock-bolting and other ground support, earth/rock transport, harbours, railways, dams, bridges, structural steelwork techniques, pipeline construction, foundation grouting, compressed air work.

8.725G Construction Accounting and Control SS C3

8.726G Construction Law and Professional Practice SS C3

8.727G Construction Planning and Estimating F C6
Project initiation and development, feasibility studies, planning and estimating procedures, contract administration; estimating cost of labour plant and materials, indirect cost and overheads, profit; construction administration. Preparation of cost estimate for a major civil engineering project.

8.728G Design of Construction Operations F C6
Heavy equipment, labour intensive, and composite operations; spatial layout and material flow concepts; the modelling of operations at the micro, macro, and systems level; engineered estimates and productivity prediction models; analysis of construction operations by timelapse methods; field methods at foreman, superintendent, engineer, and project manager levels; field studies of specific construction operations.

8.731G Project Management SS C3
A problem-oriented approach to Project and Mission Management; the nature of engineering and construction projects; the project team; behavioural aspects of project management; the organization and management of project resources; short term field planning and management strategies.

8.732G Advanced Project Management Theory SS C3
A theoretical and formative approach to Project and Mission Management; management strategies and project success evaluation techniques; organizational and behavioural aspects of the project team structure; behaviour norms and their impact on project team motivation; project management decision processes; case studies in project management.

8.753G Soil Engineering SS C3
Design and construction aspects of soil improvement techniques including lime and cement stabilization, chemical grouting, vertical drains, dynamic consolidation, vibroflotation, sand and gravel piles, lime piles, freezing, electro-osmotic dewatering. Design and construction of diaphragm walls, ground and rock anchors.

8.758G Soil Mechanics SS C3
Real soil behaviour and theories for the selection of parameters for use in engineering design. New developments and advances in all aspects of soil mechanics comprising soil mineralogy, soil structure and fabric, actual stress-strain and shear strength behaviour of soils under static and dynamic loading, soil plasticity, modern soil mechanics testing techniques and statistical (probabilistic) analysis.

8.776G Rock Mechanics SS C3

8.777G Numerical Methods in Geomechanics SS C3
Fundamentals of finite element and boundary element methods; application to practical geotechnical design and case studies; deformation and flow problems; linear and non-linear analysis; application to underground opening, stability of slopes, foundations, mining excavation; seepage and consolidation soil-structure interaction problems; earth pressures, retaining walls and buried pipes, thermal stress analysis.

8.781G Advanced Concrete Technology 1 SS C3

8.782G Advanced Concrete Technology 2 SS C3
Concrete as structural material. Elastic properties. Volume changes, shrinkage and thermal stresses; creep; predicated and design values. Cracking of plain and reinforced concrete, extensibility, cracking problems caused by volume changes and creep.

8.783G Pavement Materials SS C3

8.784G Pavement Design SS C3

8.785G Pavement Evaluation and Maintenance SS C3

8.786G Industrial and Heavy Duty Pavements SS C3

8.787G Soil Dynamics and Earthquake Engineering SS C3
Fundamentals of vibration; wave propagation in elastic medium; vertical sliding, torsional and rocking motion of footings; behaviour of dynamically loaded soils; basic principles of earthquake response spectra; liquefaction; earthquake effects on structures; earthquake resistant design.

8.788G Site Investigations SS C3
Airphoto interpretation, terrain classification, remote sensing; geophysical methods (surface and downhole). Drilling and sampling of soil and rock. In-situ testing of soil and soft rock, including penetrometers, vane, pressuremeters and new techniques. Laboratory testing of soil and soft rock. Assessment of design parameters. Instrumentation to measure pore pressure, earth pressure, settlement.

8.789G Geotechnical Engineering of Hydraulic Structures SS C3
Embankment dam engineering with emphasis on dams less than 30m high, flood mitigation and retention basin dams, levee banks—Planning of site investigations, types of embankments, dam zoning, filter design, stability analysis, foundation treatment and grouting, slope protection. Dams in alluvial foundations, treatment of erodible and dispersive soils. Canals and ponds: estimation and control of seepage, design of liners, slope stability. Investigation of permeability, design of dewatering system. Materials specifications and testing, common problems in construction.

8.790G Stability of Slopes SS C3

8.791G Foundation Engineering 1 SS C3
Stress distribution beneath foundations, settlement analysis, design of shallow footings, design of pile foundations, cast in-situ piles, foundation on shrink-swell soils, lateral earth pressures, foundations on rock, site investigations.

8.792G Foundation Engineering 2 SS C3
Advanced consolidation theory, non-linear behaviour, soil structure interaction, design of rafts and piled rafts, analysis and construction of piled foundations, steel piles, braced cuts, temporary support of excavations, design of foundations for dynamic loading, machine foundations.

8.802G Elastic Stability 1 SS C3
Euler strut; uniform and non-uniform cross sections. Eccentric loading; stressing beyond the elastic limit. Struts continuous over several supports. Stability of frames.
8.803G Elastic Stability 2
Energy methods of formation of stability problems. Approximate methods. Thin-walled open section struts; lateral buckling of beams; bending and buckling of thin plates.

8.804G Vibration of Structures 1
Review of basic aspects. Analysis of lumped mass systems with various degrees of freedom. Vibration in beams and other continuous structures.

8.805G Vibration of Structures 2

8.806G Prestressed Concrete 1
Historical development. Methods of prestressing. Elastic analysis and design. Flexural capacity and shear capacity of prestressed elements.

8.807G Prestressed Concrete 2

8.808G Prestressed Concrete 3
Partially prestressed concrete; cracked section analysis; crack control and deflection calculations; determination of appropriate level of prestress; strength calculations. Rational design procedures for prestressed members. Continuous beams; secondary moments; practical design procedures. Prestressed slabs; two-way slabs; flat slabs; load balancing approach to design, effect of tendon distribution; design procedures, flexural and shear strength; deflections.

8.809G Reinforced Concrete 1
Historical development. Methods of analysis and design, including limit state concepts. Analysis and design for bending, compression and combined bending and compression. Slenderness effects in columns. Shear and torsion. Serviceability requirements.

8.810G Reinforced Concrete 2

8.811G Reinforced Concrete 3

8.812G Plastic Analysis and Design of Steel Structures 1
The perfectly plastic material, the plastic hinge; plastic collapse of beams and frames; upper and lower bound theorems; introduction to design principles and methods.

8.813G Plastic Analysis and Design of Steel Structures 2
Estimation of deflections; factors affecting plastic moment; shake-down; three-dimensional plastic behavior; minimum weight design.

8.814G Analysis of Plates and Shells

8.817G Experimental Structural Analysis 1
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 1

8.819G Bridge Design 2

8.820G Structural Analysis and Finite Elements 1

8.821G Structural Analysis and Finite Elements 2

8.822G Structural Analysis and Finite Elements 3
Application of the finite method to analysis of struc-
8.830G Hydromechanics SS C3
General equation of fluid motion, potential flow, conformal mapping, laminar flow, Navier-Stokes equations; turbulence, shear flows, jets and wakes, boundary layers, turbulent mixing, diffusion, air entrainment, cavitation, stratification.

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

8.832G Pipe Network and Transients SS C3

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

8.835G Coastal Engineering 1 SS C3
Theory of periodic waves as applied to tides and wind generated waves in water of varying depths. Wave and tide prediction.

8.836G Coastal Engineering 2 SS C3
Wave forces on structures, shore processes and beach erosion. Estuarine hydraulics, wave and tide models.

8.842G Groundwater Hydrology SS C3
Confined and unconfined aquifers, analogue and digital models of aquifer systems, water movement in the unsaturated zone, recharge, groundwater quality, sea water intrusion.

8.843G Groundwater Hydraulics SS C3
Mechanics of flow in saturated porous materials, steady and unsteady flow to wells, leaky aquifers, partial penetration, multiple aquifer boundaries, delayed yield from storage, regional studies.

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

8.847G Water Resources Policy SS 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 SS C3
Principles of the optimal design and operation of multiple purpose, multiple component, water resource system; evaluation of cost and benefits in complex and simple systems.

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

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

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

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

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

8.856G Water Treatment SS 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 SS 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 SS C3
Fundamental concepts; systems approach to quality aspects of water resource systems; quality interchange systems; quality changes in estuarine, surface, and ground water. Quality
management by engineered systems. Economic criteria relating to water use and re-use systems.

8.869G Instrumentation and Control in Water Supply and Wastewater Engineering  S2 C1
Principles of primary elements, instrument response and reliability, control methods and the response of plants to control conditions in water and wastewater treatment and supply systems.

8.870G Hydraulics and Design of Water and Wastewater Treatment Plants  S2 C3
Co-requisites: 8.856G, 8.857G.
Application of hydraulic principles to flows within treatment plants. Selection and integration of unit processes required for water and wastewater treatment, plant layout, plant design including hydraulic profiles, the influence of flow and load variability, instrumentation and control strategies.

8.871G Water Supply and Sanitation in Developing Countries  S2 C3
Prerequisites: 8.851G, 8.855G, 8.868G.
Selection of appropriate technology for water supply and wastewater treatment and disposal to account for hot climates and low per capita incomes. Design basis for systems and the operating requirements.

8.864G Arid Zone Hydrology  S1 L1½T1½ C3
Co-requisite: 8.837G, 8.838G.
Arid zone rainfall characteristics, data collection and instrumentation, runoff processes, infiltration, transmission loss, recharge processes, flood characteristics and design; water yield, storage of water; evaporation and evaporation suppression; sediment transport and measurements.

8.872G Management of Wastes  S2 L2T1 C3
8.872X Management of Wastes (external)  S1 C3
Management and control strategies in waste management, legal requirements, local and overseas legislation, case studies of waste management.

8.873G Waste and Wastewater Analysis and Environmental Requirements  S1 L1½T1½C3
8.873X Waste and Wastewater Analysis and Environmental Requirements (external)  S1 C3
Principles of analytical methods used in chemical analysis of wastes and wastewaters, sampling schemes, statistical evaluation of data, environmental requirements to prevent pollution.

8.874G Waste Management Science  S1 L2T1C3
8.874X Waste Management Science (external)  S1 C3
Aspects of chemistry, biology and geology relevant to waste management, equilibrium and kinetic approaches, cell structure and metabolisms, formation and classification of rocks and soils.

8.875G Hydrological Processes  SS C3
Hydrological cycle, water and energy balances and circulation,
precipitation process, interception, infiltration, storm runoff process, evaporation and transpiration, surface groundwater interactions, land use effects.

**8.876G Applied Hydrological Modelling**  
SS C3
Introduction to hydrological models, deterministic catchment models, model calibration and verification, stochastic models, storage yield analysis for reservoir design, extension of records, stochastic reservoir analysis or identification of groundwater systems, conjunctive use systems.

**8.877G Flood Design 1**  
SS C3
Introduction to flood estimation, frequency analysis of hydrological data, design rainfall data, hydrograph analysis, storm rainfall-runoff relations, design flood estimation for small to medium sized catchments including the rational method, introduction to urban drainage design.

**8.878G Flood Design 2**  
SS C3
Introductory flood routing, loss rates, linear and nonlinear response, unit hydrographs, runoff routing, choice of method of flood estimation, urban drainage design.

**8.879G Flood Design 3**  
SS C3
Flood frequency analysis, river flood routing, catchment characteristics, estimation of extreme floods, synthetic unit hydrographs, design hydrograph methods, application of runoff routing models.

**8.901G Civil Engineering Elective 1**  
SS 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 2**  
SS 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

**8.909X Project (external)**  
A minor research investigation involving analysis and interpretation of data, or a critical review and interpretation of literature on a selected topic, or a design project.

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**Mathematics**

**10.061G Advanced Mathematics for Electrical Engineers**  
C3
Boundary value problems in partial differential equations. Selected topics from complex variable analysis, integral transforms, and orthogonal functions and polynomials.

**10.361G Statistics**  
C3
Probability theory, a survey of random processes with engineering applications — processes in discrete and continuous time. Markov processes, ergodicity, stationarity, auto-correlation, power spectra, estimation of auto-correlation and power spectra.

**32.012G Biomedical Statistics**  
SS L2½T1½ C4
Statistical assessment of normal and diseased states. Statistical relationships between multiple variables used to assess disease; analysis of variance, regression, factor analysis, discriminant analysis. Progression of diseases over time. Diagnosis and assessment of treatments. Experimental design and sampling. Computation methods.

**32.101G Mathematical Modelling for Biomedical Engineers**  
S1 L3T1 C4
Model formulation and validation of ordinary and partial differential equations by analytical and numerical techniques.

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**Accountancy**

**14.042G**

**14.062G Accounting for Engineers**  
F L1½
Problems related to industrial situations, and their relevance in
decision-making. Manufacturing and cost accounts, budgeting and budgetary control, cost analysis and control and profit planning.

**Economics**

**Industrial Relations**

15.565G Industrial Relations A  
**Prerequisite:** Nil.

Concepts and issues in Australian industrial relations at the macro or systems level, with overseas comparisons where appropriate. Labour movements and the evolution of employee-employer relations in the context of industrialization and change; origins and operations of industrial tribunals at the national and state levels; structure, operation and objectives of Australian trade unions and employer bodies; role of governments and their instrumentality; nature of industrial conflict and procedures for conflict resolution such as arbitration and bargaining; and national wage policy.

**Health Administration**

16.901G Health Service Statistics 1  
**Prerequisite:** Nil.

Statistical methods and theory; frequency distributions and their descriptions; an introduction to probability; principles of sampling; estimation and hypothesis testing; statistical decision theory; normal, Poisson and binomial distributions; linear regression; index numbers; time series analysis. Data drawn from the health planning field used to illustrate these methods.

**Faculty of Applied Science**

46.203G Medical Aspects  
**Prerequisite:** 46.201G.

Aspects of medicine bearing upon physiological consequences of pollutants. Synergism and antagonisms, photosynthesis and phytotoxicity, metabolic mechanisms; morbidity and mortality surveys; exposure indices. Particular pollutants aldehydes, nitrates, carbon monoxide, sulphur dioxide, oxides of nitrogen, hydrocarbons, ozone and oxidants, particulates, carcinogens.

**46.204G Legislative Aspects**  
**C2**


**Chemical Engineering and Industrial Chemistry**

48.063G Industrial Water and Wastewater Engineering  
**S1 or S2 L3**

Environmental consequences of water pollution. Water quality criteria and regulations related to industrial use and disposal. Water sources and requirements of industry. Theoretical and practical aspects of treatment methods, including screening, sedimentation, oil separation, coagulation and flocculation, filtration, biological treatment, adsorption, ion exchange, membrane processes. Strategies for industry including waste surveys, prevention at source, correction before discharge or water reuse. Economic aspects. Seminars. Factory visits/laboratory.

48.391G Atmospheric Pollution and Control (Theory)  
**S1 or S2 L3**

Causes, properties, dispersion, measurement and monitoring control and legislation of air pollution in ambient and industrial environments.

48.391X Atmospheric Pollution and Control (Theory)  
**S1 or S2 L3**

Causes, properties, dispersion, measurement and monitoring, control and legislation of air pollution in ambient and industrial environments.

48.392G Practical Aspects of Air Pollution Measurement and Control  
**S1 or S2 T3**

**Prerequisite:** 46.201G.

Laboratory and tutorial programs in the measurement and analysis of ambient and industrial air pollutants. Computation tutorials in advanced dispersion models, aerosol dynamics and control equipment design parameters.
Industrial Engineering

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

18.061G Industrial Experimentation 1 C3
Design of experiments with reference to industrial problems; planning experiments: significance testing; simple comparative experiments, accelerated experiments; fatigue testing, tool life testing; economic aspects of experimental design; analysis of variance or randomized block, latin square and factorial experiment designs.

18.062G Industrial Experimentation 2 C3
Regression analysis; use of orthogonal polynomials in regression analysis and analysis of variance; confounding in factorial design; response surfaces and determination of optimum conditions.

18.074G Industrial Management C3
Definitions of management; evolution of management thought, classical, quantitative and behavioural schools; interactions between organizations and their environment. The planning process; strategic and tactical planning, developing planning premises, nature of managerial decision making, quantitative aids, management by objectives. Organizational structures; coordination and spans of control, the informal organization, authority delegation and decentralization, groups and committees, managing organizational change and conflict. Motivation, performance and satisfaction; leadership, interpersonal and organizational communication, staffing and the personnel function. The control process; budgetary and non-budgetary methods of control, use of management information systems.

18.076G Decision Support Systems C3
Perspectives on organizational and individual decision making; basic philosophy of Decision Support Systems; knowledge representation techniques; DSS models and operators; Data Base Management systems in DSS; iterative design techniques; the DSS/user interface; practical design and implementation of a Decision Support System.

18.171G Inspection and Quality Control C3
Economics of measurement; advanced measuring and inspection methods; non-destructive testing; quality control systems; sampling by attributes and variables; standardization; case studies, process capability and variability; machine tools acceptance testing; alignment procedures.

Assumed knowledge: 5.0721 or equivalent. Excluded: 18.224.

18.261G Computer Automation C3
Computer architecture including central processor, random-access memory, read only memory, input/output ports, peripherals, and the relationships between each. A systematic study of the requirements for interfacing computers to the real world. Machine code, assembly language, and high level languages such as BASIC or FORTRAN with a comparison of each for particular applications. Development of small computer system for machine tool control, automated inspection, supervision, stock control, etc.

18.360G Ergonomics C3
Applied anatomy and kinesiology, anthropometry; application to work place arrangement, seating and bench design, tool and equipment design, lifting techniques, consumer product and architectural design. Physiological and psychological aspects of work and fatigue; measurement of energy consumption, limits to energy expenditure at work, static muscular fatigue, boredom. Environment effects; natural and artificial lighting arrangements, problems of perception, colour; noise and vibration, preventive measures; heat and ventilation, thermal regulation in humans, criteria for comfort, effects of pollutants. Man-machine interface. Displays, machine controls, reaction times, vigilance. Applications of ergonomics to occupational safety and health. Ergonomic research methodology.

Note: A project forms a substantial proportion of the assessment for this subject.

18.371G Factory Design and Layout C3
Assumed knowledge: 18.303 or 18.380G or equivalent.
Production requirements: processes, machines and storage; optimum factory size, multiple factories. Plant location: single and multiple factories and warehouses; location models and economic analysis. 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. Group technology. Practical aspects; provision of services and amenities; layout visualization methods.

Note: A project forms a substantial proportion of the assessment for this subject.

18.380G Methods Engineering C4
18.461G Design Production  
Influence of manufacturing processes on design; design simplification and standardization; value engineering; economics of process selection; case studies.

18.464G Value Analysis and Engineering  
Cost reduction through value analysis/engineering illustrated by case studies. Selection of projects to be studied, collection of information, creative problem solving, development of alternatives, functional analysis system technique, functional evaluation, cost-function relationship, decision making, communication and implementation of the proposal. Applications to engineering design and services.

18.465G Computer-Aided Manufacturing  

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

18.571G Operations Research 1  
Excluded: 6.646, 18.503, 18.551, 18.580G.

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

18.574G Management Simulation  

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

18.580G Operations Research  
Excluded: 6.646, 18.503, 18.551, 18.571G.

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

18.671G Decision Theory  
Excluded: 18.672G.

Theories of choice, value, risk and uncertainty for the individual and for multi-person situations. Statistical decision theory. Bayes and minimax rules. Optimum sampling.

18.672G Decision Theory for Industrial Management  
Excluded: 18.671G.


18.673G Energy Modelling, Optimization and Energy Accounting  
The analysis of energy systems using computer models. Applications of such models range from policy analysis at government level investment analysis within individual industries. Covers both the formulation of energy models and the techniques used to obtain optimized solutions, with examples from actual studies. Effects of uncertainty and the use of energy accounting as an analytical tool.

18.675G Economic Decisions in Industrial Management  
Excluded: 18.603.

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

18.681G Engineering Economics Analysis

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

18.760G Discrete-Event Simulation Languages

Assumed knowledge: 18.503 or 6.646 or 18.761G or equivalent.

Basic elements of simulation languages: random number generation, process generation, list and set processing, data structures, time advance and event scanning, gathering and resetting statistics, graphics, Simulation language world views. Comparative review of commercially available simulation languages such as Simscript, GPSS, ECSL, and Simula, and a study of one of them in depth. Simulation using personal computers. Simulation language preprocessors.

18.761G Simulation in Operations Research

Excluded: 18.503, 6.646.


18.763G Variational Methods in Operations Research

The variational problem and its history. The modern formulations. Mathematical Theory. Application to a wide range of problem areas such as production and inventory control, advertising, machine maintenance and natural resource utilization.

18.764G Management of Distribution Systems

Assumed knowledge: 18.503.

The distribution system: single depot location, multi-depot location, vehicle scheduling, vehicle loading, fleet size, case studies.

18.765G Optimization of Networks

Prerequisite: 18.551.


18.770G Stochastic Control


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

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

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

Basic concepts. Application of Hamiltonian paths, Euler cycles, tress, 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

Excluded: 18.004

Overview of the basic issues in Production and Inventory control. Material Requirements Planning: the Master Production Schedule; structuring Bills of Materials for MRP; Capacity planning and control; shop floor scheduling and lead time reduction; cycle counting; lot sizing techniques; implementation of MRP.
systems in practice. Just-in-Time (JIT) production; the Kan Ban system; production planning and control in Flexible Manufacturing Systems (FMS); the relation between MRP, JIT and FMS.

18.777G Time Series Forecasting C2

18.778G Scheduling and Sequencing C2

18.779G Game Theory C2

18.780G Production Control C2
Modes of manufacture; information flow in multi-stage production systems; classical production and inventory models and control techniques; Material Requirements Planning; Just-in-Time Production; Flexible Manufacturing Systems and their control.

18.862G Linear Programming C2

18.863G Nonlinear Programming C2

18.864G Applied Geometric Programming C2
Optimization concepts developed for function of polynomial form. Solution techniques for such problems, sensitivity of solution. Applications of geometric programming to problems from engineering and operations research.

18.868G Industrial Applications of Mathematical Programming C3

18.870G Large Scale Optimization in Industry C3
Excluded: 5.1245.
Large-scale linear programming: sparse constraint matrices, updating basis factorizations. Large-scale nonlinear programming: the limitations of classical quasi-Newton and conjugate gradient methods, sparse Hessian approximations, superbasic variables, augmented Lagrangian methods for sparse nonlinear constraints. Applications, examples and case studies from industry: optimal power flow, steam and power plant design, pipeline network optimization and other.

18.871G Mathematics of Operations Research C2

18.874G Dynamic Programming C2

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

18.876G Advanced Mathematics for Operations Research C2
A survey of mathematical ideas which are of value in operations research. Topics will be selected from the following areas: set theory, real analysis, matrix theory, topology, function spaces, linear operatory theory, inequalities, stability, complex analysis, convex analysis, distribution theory, group theory and measure-theoretic probability theory.

18.879G Mathematical Programming Analysis C3
Co-requisites: 18.871G; Linear Programming section of 18.571G.
Methods for the analysis of mathematical programs. Analysis of the properties of linearity, separability, convexity, quasi-convex-
ity and duality, providing the basis of the conversion of mathematical programs to potentially simpler formulations. Includes the areas of geometric programming, convex programming and quasi-convex programming.

**18.909G Project**  
C9

**18.918G Project Report**  
C18

**18.936G Thesis**  
C36

**18.965G Seminar (Industrial Management)**  
C0

**18.967G Advanced Topic in Production Engineering**  
C2

**18.968G Advanced Topic in Production Engineering**  
C2

**18.969G Advanced Topic in Production Engineering**  
C2

Allows the presentation of special topics, particularly by visiting academics.

**18.970G Seminar (Operations Research)**  
C0

**18.975G Advanced Topic in Industrial Engineering**  
C3

**18.976G Advanced Topic in Industrial Engineering**  
C3

**18.977G Advanced Topic in Operations Research**  
C2

**18.978G Advanced Topic in Operations Research**  
C2

**18.979G Advanced Topic in Operations Research**  
C2

Department of Applied Geology

**25.704G Environmental Geology**  
S1 L1½T1½ C3


**25.707G Geopollution Management**  
S1 L1½T1½ C3


**25.715G Sources of Waste and Landfill Disposal**  
S1, C3 L2T1; S1, external C3

Sources of solid and liquid wastes, design and operation of landfills, processes within landfills, re-use and planning of sites, transport of waste.

**25.816G Geological Remote Sensing**  
S1† L4

The physics of various remote sensing techniques; interpretation of conventional aerial photography in exploration; Infra-red remote sensing techniques; side linking airborne radar; theory and applications of Landsat imagery; enhancement techniques for satellite imagery; interpretation of Landsat photographic products and application to several case history areas. Integration of remote sensing information with the overall data base as applied to exploration.
Geography

27.043G Remote Sensing Applications  S1 L1T2 C3
The application of remotely-sensed data and information in the description, classification and assessment of earth resources and environmental conditions. Different types of remote sensing data and imagery, their attributes, acquisition and uses. Relevance of remote-sensing data and imagery to a range of applications, including assessment of conditions of terrain, soils and surface materials; multitemporal monitoring and inventory of rangelands, croplands and forests; rural and urban land use assessment; surveillance of surface water resources and sedimentation; appraisal of changes in the coastal zone. Use of remote sensing in environmental management and in environmental impact assessment.

27.644G Computer Mapping and Data Display  C3
Introduction to automated cartography and thematic mapping; theoretical and practical problems in displaying and mapping data by computer; review and application of selected computer mapping packages. INFO is used for database management, and ARC-INFO for cartographic manipulation and output.

27.672G Geographic Information Systems  C3
Study of selected geographic information systems; problems of data capture and display, data storage and manipulation, system design and development; cartographic displays and computer mapping. INFO is used for database management, and ARC-INFO for spatial data manipulation and display.

27.715G

27.911G Soil Erosion and Conservation  S1 or S2 L2T4 C6

Marketing

28.913G Marketing Management  S1 L3
Prerequisites: 28.911G and 28.912G.
Conceptual framework relevant to the practice of marketing management developing an understanding of the market function. Emergence of a broader concept of marketing; relationship between corporate and marketing strategy; the marketing environment; market segmentation; marketing planning; determination of product, price channel, advertising and salesforce policies; marketing control.

Surveying

29.101G Aspects of Electromagnetic Distance Measurement  SS L2T1 C3

29.102G Characteristics of Optical Surveying Instrumentation  SS L2T1 C3
Sources of error in modern optical surveying instruments. Methods of testing and calibration. Observational techniques for reducing effects of errors. Developments in circle reading and level sensing systems. Design of instrument testing facilities.

29.103G Precise Engineering Surveys  SS L2T1 C3
Techniques and instrumentation for precise surveys. Applications in industry and engineering; deformation and settlement surveys, surveys for large constructions, optical tooling, special measurement problems.

29.106G Special Topic In Surveying A  C3
A special subject to be lectured on by visiting professors or other visiting staff.

29.107G Special Topic In Surveying B  C3
A special subject taken by an individual student or a small group of students by private study in conjunction with tutorial sessions with the member(s) of staff in charge of the subject.

29.151G Adjustment of Control Surveys  SS L2T1 C3

29.210G Satellite Surveying  SS L2T1 C3
Concepts of satellite surveying: nomenclature, TRANSIT system, GPS for point and relative positioning, vertical control. Surveying with GPS: planning a survey, field and office procedures, case studies. Considerations for high-precision applications.
aspects of satellite geodesy, modelling the observable, dual frequency observations, orbit determination, short-arc techniques.

29.212G Doppler Positioning  SS L2T1 C3


29.217G Gravimetric Geoid Evaluations  SS L2T1 C3


29.530G Analytical Photogrammetry  SS L2T1 C3

Fundamental relationships, image and object space. Interior orientation, deviations from collinearity, use of reseau. General orientation of one and two images by collinearity and coplanarity conditions. Calibration of metric and non-metric cameras. Principles of analytical plotters, software design. Special applications of photogrammetry.

29.531G Photogrammetric Block Adjustment  SS L2T1 C3


29.532G Computer-Assisted Mapping  SS L2T1

Introduction to principles of computer-assisted mapping. Sources of data, ground survey maps, images. Collection and editing of feature coded digital terrain data, points, lines and areas. Digital elevation models, acquisition and interpolation, breaklines, contouring. Accuracy of heights from digital elevation models. Design of mapping programs based on computer-assisted techniques.

29.600G Principles of Remote Sensing  S1 L2T1 C3


29.601G Remote Sensing Principles and Procedures  S1 L2T1 and S2 L1¾T1¼ C6


29.603G Statutory Controls of Land Development  SS L2T1 C3

Detailed examination of the subdivision and development process in N.S.W., with particular emphasis on the statutory procedures and controls at the local government level. The Local Government Appeals Tribunal and its major relevant decisions. Local Government and land development law. Case studies in land development.

29.604G Land Information Systems  SS L2T1 C3


29.605G Ground Investigations for Remote Sensing  S1 L2T1 C3

The spectral, temporal and spatial characteristics of various surfaces, and the available sensors to effect maximum differentiation. Ground and image comparisons. Instruments available for field measurements. Field investigation procedures including positioning and sampling considerations.

29.606G Cadastral Systems  SS L2T1 C3


29.909G Project  C9

29.918G Project Report  C18

29.936G Thesis  C36
Organizational Behaviour

30.935G Organization Behaviour S1 L3
Prerequisite: Nil.

Relationships between individuals and organizations. Individual behaviour—personality, perception, motivation, learning, performance. Organizations as settings for individual behaviour—types of organization, work organizations. Interaction, groups and work groups. Organizational influences on work behaviour: structural factors and the design of work; reward systems; organizational cultures and social influences. The development of individual-organization relationships: participation, socialization, careers; conflict, stress and adaptation; organizational effectiveness.

Librarianship

55.815G Economics of Information Systems S1

55.817G Information Storage and Retrieval Systems

55.823G Files and Database Systems

Biomedical Engineering

32.009G Project C9

32.010G Biomedical Engineering Practice S2 L2 C2
Introduction to clinical situations in hospitals. Presentation of guest lectures by eminent people working in this field. Lecture topics include cardiology, neurology, orthopaedics, rehabilitation, etc. Visits to various biomedical engineering units.

32.012G Biomedical Statistics S2 L2½ T1½ C4
Statistical assessment of normal and diseased states. Statistical relationships between multiple variables used to assess disease; analysis of variance, regression, factor analysis, discriminant analysis. Progression of diseases over time. Diagnosis and assessment of treatments. Experimental design and sampling. Computation methods.

32.018G Project Report C18

32.025G Radiation Physics S1 L3 T2 C5
Sources, effects and uses of radiation on human tissues. Ultrasonic, X-ray and nuclear radiations are included together with ultraviolet, infrared, laser, microwave and longer wavelength electromagnetic effects.

32.030G Project Report C30

32.040G Analogue Electronics for Biomedical Engineers S1 L2 T2 C4
Basic theory of passive components, simple network analysis, small signal amplifiers, feedback and oscillators, operational amplifiers and their uses, analogue integrated circuits. Transistors as logic devices, gates. Safety requirements for medical instruments, circuit diagram analysis and component identification. Laboratory work involves both design and construction of analogue circuits.

32.050G Microprocessors and Circuit Design for Biomedical Engineers S2 L2 T2 C4
Prerequisite: 32.040G and 32.501G or equivalents.
Examination of the fundamental digital and analogue signal conditioning circuits commonly found in medical applications. Emphasis is given to project-oriented practical experience involving aspects of biological signal acquisition by microcomputers. Fundamentals of microprocessor hardware and software.

32.060G Biomedical Systems Analysis S1 L2 T1 C3
Compartmental analysis serves to unify modelling and analysis in many diverse fields. It has wide application in pharmacokinetics, metabolic, ecosystem and chemical kinetic modelling, and in the future will be applied increasingly to engineering systems. Classes of compartmental structure; fundamental properties; rate processes; inferred parameters; input-dependent kinetics; optimal input design; algorithms for identification and control.

32.101G Mathematical Modelling for Biomedical Engineers S1 L3 T1 C4
Model formulation and validation, solution of ordinary and partial differential equations by analytical and numerical techniques.
32.31IG Mass Transfer in Medicine S2 L2T2 C4

Material and energy balances, modelling of intrabody mass transfer, elementary treatment of diffusion, convection, hydraulic permeability and osmosis in biological and synthetic membranes. Applications to hemodialysis, blood oxygenators, artificial pancreas and slow release drug delivery systems.

32.32IG Physiological Fluid Mechanics S2 L2T2 C4

Fundamentals of biological fluid flow by way of the governing equations. Kinematics and dynamics, viscous and inertial flow, boundary layers, separation, physiological flows (cardiac, vascular, pulmonary, urinary, etc.) and flow in artificial organs.

32.33IG Biocompatibility S2 L2T1 C3

Interaction of biological fluids and cells with foreign surfaces, in vitro tests to assess biocompatibility and thrombogenicity, current status of biocompatible materials as applied to extracorporeal systems, surgical implants and prosthetic devices.

32.50IG Computing for Biomedical Engineers S1 L2T2 C4

Algorithm design and documentation, printer plotting, editing, using the VAX/VMS systems. Overview of computing in biomedical engineering and hospitals, including aspects of automated patient monitoring, laboratory testing, data storage and information retrieval.

32.51IG Introductory Biomechanics S1 L2T1 C3

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

32.54IG Mechanics of the Human Body SS L2T1 C3

Prerequisite: 32.510G or equivalent.

Statics and dynamics of the musculoskeletal system: mathematical modelling and computer simulation, analysis of pathological situations.

32.55IG Biomechanics of Physical Rehabilitation SS L2T1 C3

Prerequisite: 32.510G or equivalent.

The application of biomechanics principles to the areas of: performance testing and assessment, physical therapy, design of rehabilitation equipment, design of internal and external prostheses and orthoses.

32.56IG Mechanical Properties of Biomaterials SS L2T1 C3

Prerequisite: 32.510G or equivalent.

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

32.60IG Biomedical Applications of Microprocessors 1 S1 L3 C3

Prerequisite: 32.050G or equivalent.


32.602IG Biomedical Applications of Microprocessors 2 S2 L3 C3

The aim of this subject is to obtain the microcomputer-developed system from the previous subject (32.601G) and to produce a stand-alone printed circuit board. Use of logic analyzer and debugging techniques for machine language programs and hardware design. Exposure to different types of microprocessors by use of simulators and emulators. Definition and selection of microprocessor. Transfer of microcomputer-developed system to specified microprocessor. Implementation of hardware on printed circuit board. Testing of stand-alone device.

32.603IG Static and Flow Cytometry S2 L3 C3

Technology, techniques and uses of flow and static cytometry. Flow cytometers (analysis and cell sorting), image analysis and cell counting from slides. Preparation and staining of cells. Data acquisition and analysis. Applications in medical research and diagnosis.

32.61IG Medical Instrumentation S2 L2T1 C3

Prerequisite: 32.040G or equivalent.

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

32.62IG Biological Signal Analysis S1 L3C3

Use of digital computers to extract information from biological signals. Signal processing using filtering, averaging, curve-fitting and related techniques, and analysis using model simula-
tions, correlation, spectral analysis etc.

32.701G Dynamics of the Cardiovascular System S1 L2T1 C3
Structure of the heart; organization of the mammalian vasculature; mechanical, electrical and metabolic aspects of cardiac pumping; the solid and fluid mechanics of blood vessels; rheology of blood.

Graduate School of the Built Environment

39.908G Community Noise Control S1 L1T1 C2
Introduction; sound and sound propagation, sound power, sound pressure, decibels; sound perception, psychoacoustics loudness, annoyance, phon and dBA; hearing conservation; acoustic measuring and analysing instruments — sound level meters, filters, analysers, recorders; sound sources; community noise assessment; the NSW Noise Control Act; practical exercises in sound recording, analysis and assessment; noise control — source noise reduction, use of barriers, enclosures, distance, sound absorbing materials; sound transmission through building elements; noise components of environmental impact statements.

Biotechnology

42.211G Principles of Biology SS L3
A study of the characteristics of living systems, including a functional treatment of cytology, metabolism, bioenergetics; structure, function and characteristics of single and multicellular systems; growth; cell division; reproduction; heredity and evolution.

42.212G Principles of Biochemistry SS L3
A condensed treatment of biochemistry comprising the following aspects: the elemental and molecular composition of living organisms; the chemistry and roles of the biological elements and molecules; the thermodynamics and enzymatic catalysis of metabolism; catabolic, anabolic, amphibolic and anaerobic processes, with emphasis on hydrolysis and synthesis of polymers, glycolysis and gluconeogenesis of glucose. Oxidation and synthesis of fatty acids, deamination and decarboxylation of amino acids, the tricarboxylic acid cycle, electron transport and oxidative phosphorylation; metabolic regulation and integration.

Safety Science

47.030G Computing for Safety Science C3
Nature and description of information in digital form, processing of information with special reference to the computer, microprocessor and microcomputer. Identification and statement of information flow problems, construction of models for computer solution, flow charts and control node diagrams, basis of a computer high-level language. Programming in BASIC, fundamental statements, loops and arrays, character strings and word processing, graphs, histograms and tables. Peripheral hardware, storage and filing, examples of operating systems. Spread sheets and data base systems with application to health and safety monitoring.

47.051G Principles of Engineering Mechanics C3
Solid mechanics: force systems, equilibrium, friction, frames and beams; stress-strain relationships, bending stress, buckling, safe loads; applications in safety and biomechanics. Fluid flow: static pressure, continuity of flow, Bernoulli's equation, laminar and turbulent flow, sound wave propagation in air; applications in ventilation and acoustics.

47.052G Introduction to Safety Engineering C3
Basic safety practice; management of dangerous materials; fire and explosion; ventilation; occupational toxicology; noise control; radiation protection; electrical safety; biological safety; machine dangers and machine guarding; construction safety; plant safety assessment.

47.054G Machines and Structures Safety C3
Prerequisite: 47.051G or equivalent.
Machinery contact dangers; machine guarding; safety during maintenance. Deformation failures; fracture; failure of pressure vessels, lifting equipment, excavations, scaffolding. Deterioration due to wear, corrosion, fire. Inspection and control (including non-destructive testing). Maintenance and reliability.

47.060G Electrical Safety C3
Electric current; effects of current flow and electric fields; elementary circuit representation, typical supply situations; likely dangerous conditions; static electricity; hazardous location; some special problem areas: codes of safe working; treatment of electric shock.

47.061G Principles of Ergonomics C3
Applied anatomy and kinesiology, anthropometry; application to work place arrangement, seating and bench design, tool and equipment design, lifting techniques, consumer product and architectural design. Physiological and psychological aspects of work and fatigue; measurement of energy consumption, limits to energy expenditure at work, static muscular fatigue, boredom. Environment effects; natural and artificial lighting arrangements,
problems of perception, colour; noise and vibration, preventive measures; heat and ventilation, thermal regulation in humans, criteria for comfort, effects of pollutants, Man-machine interface. Displays, machine controls, reaction times, vigilance. Applications of ergonomics to occupational safety and health. Ergonomic research methodology.

Note: A project forms a substantial proportion of the assessment for this subject.

47.062G Applied Ergonomics C3
Prerequisite: 47.061G at credit level or equivalent.

Cognitive ergonomics. Decision making, vigilance, effects of workload and stress, applications to screen-based equipment. Work systems: the systems approach, practical evaluation and re-design of work systems. Experimental methodology: experimental design in ergonomics, critical evaluation of the literature.

47.070G Ventilation C3
Prerequisite: 47.051G or equivalent.


47.090G Introduction to Occupational Health and Safety Law C3
The concept of law; the creation and interpretation of statutes; the judicial and court systems; locus standi; common law and equity; basic principles of legal liability (civil and criminal); basic principles of administrative law and the liability of the Crown; the common law of employment; statutory regulation of employment; compulsory arbitration of industrial disputes. Outline of occupational health, safety and compensation legislation of the Australian States. Actions under the common law.

47.120G Human Behaviour and Safety Science C3
Industrial relations and implementation of a safety program. Learning and safety programs. Attitudes and attitude change. Safety compliance — individual and group factors affecting compliance. Work motivation and safety practice. Accident proneness and personnel selection. Individual differences in attitudes to work.

47.180G Management for Safety C3
Prerequisite: 47.120G.

Accounting; risk management; safety management and loss control; organization and management for safety; cost effective-ness of safety programs. Selection and training of personnel. Communication; modes of communication; preparation of safety and accident reports; presentation of evidence. Management of occupational health problems through prevention, early reporting and rehabilitation.

47.230G Radiation Protection C3
Radiation physics; radiation dosimetry; radiation biology; shielding and control of radiation; administration; waste management; emergency procedures; environmental impact, non-ionizing radiation. Special topics; practical work and site visit.

47.330G The Accident Phenomenon C3
Assumed knowledge: 10.331 or equivalent.

Causes of accidents and defensive strategies; energy storage and transfer; risk benefit concepts; epidemiology of accidents; reduction of loss from accidental injury; human factors; the environment and accidents; system reliability and fault-tree analysis in the study and control of accidents; study of some major accidents; accident investigation and analysis; case studies in transport, industry, recreation and the home.

47.480G Fire and Explosion C2
Chemistry and physics of combustion reactions; types of flames; deflagration and detonation; ignition; fire point; flammable limits. Industrial fuel-fired appliances; fire risks in buildings; fire fighting equipment; flame proofing; fire and explosive risks in chemical process industries; case studies. Use of appropriate standards and legislation. Fire prevention and extinguishing, explosion relief. Fire research; insurance.

47.481G Management of Dangerous Materials C3

47.903G Special Report in Safety Science C3
Only for students enrolled in the Graduate Diploma course in Safety Science.

47.909G Project C9
47.918G Research Project C18
Anatomy

70.201G Introductory Functional Anatomy

An overview of basic human anatomy and physiology with an emphasis on structures and systems such as the eye, ear and skin, which are most vulnerable to chemical and physical trauma under industrial conditions. Other systems studied include the musculo skeletal system, central and peripheral nervous systems, circulatory, respiratory, gastrointestinal, endocrine and urogenital systems.

Pathology

72.402G Principles of Disease Processes S1 L3 C3

Prerequisites: 73.111 or equivalent, 70.011C or equivalent.

Not offered in 1988.

The reaction of cells to injury, the inflammatory reaction; necrosis-vascular changes and infarction; reparative processes; fracture healing; neoplasia; reaction to implants; specific processes requiring prosthetic assistance.

Physiology and Pharmacology

73.111 Physiology 1 F L2T4

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

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

Medicine

80.701G Occupational Disease S2L3 C3

Prerequisite: 70.201G or equivalent.

Physical environment and disease: Musculoskeletal system, physical trauma; heat and cold, burns, electric shock; radiation; pressure, vibration, noise, hearing. Chemical environment and disease: Metallic poisons, toxic compounds, gaseous poisons, carcinogens, allergens. Microbial environment and disease. Systems approach: Gastrointestinal tract; renal system; central and peripheral nervous systems; visual system, respiratory system, airborne particulates; skin.

80.702G Occupational Health Control S1L3 C3

Prerequisite: 80.701G or equivalent.

Introduction; dose response; risk, codes of safe practice; protection of the worker; design of safe workplace; protective equipment; occupational health surveillance; epidemiology; occupational safety program; emergency arrangements; environmental health; non-occupational safety; safety services.

Faculty of Engineering

97.580G Image Analysis in Remote Sensing C3

Prerequisite: 10.361 or similar.

Techniques for extracting information from remotely sensed data with particular emphasis on satellite imagery. Topics taken from: nature and characteristics of earth resources and related satellites; satellite sensors and data formats; image enhancement techniques; image classification methods, including clustering, classification and feature selection; image classification methodologies; new horizons in remote sensing image analysis.

97.581G Microwave Remote Sensing C3

Use of passive and active (radar) microwave techniques in remote sensing of earth resources. Topics include: real and synthetic aperture radar systems; passive microwave radiometry; energy-surface interactions; interpretation of microwave image data: applications in agriculture, geology, oceanography
and hydrology; issues in signal and image processing; characteristics of airborne and spaceborne microwave sensors.

97.601G Computer Aided Design for Manufacture C3

Principles underlying the interactive computer graphics packages such as AUTOCADE, CADAM, CATIA. Applications to design and engineering processes. Projects on building packages for design or upgrading the existing packages.

97.602G Computer Integrated Manufacturing C3

Prerequisite: 18.465G

Systems analysis and design of computer integrated manufacturing, including flexible manufacturing systems and automated factories.

97.603G Product Design and Technological Innovation C3

Graduate Study

Conditions for the Award of Higher Degrees

First Degrees

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

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

Higher Degrees

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

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

For the statements Preparation and Submission of Project Reports and Theses for Higher Degrees and Policy with respect to the Use of Higher Degree Theses see later in this section.

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Graduate Diplomas

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*Faculty of Science.
§Faculty of Biological Sciences.

Higher Degrees

Doctor of Philosophy (PhD)

1. The degree of Doctor of Philosophy may be awarded by the Council on the recommendation of the Higher Degree Committee of the appropriate faculty or board (hereinafter referred to as the Committee) to a candidate who has made an original and significant contribution to knowledge.

2. (1) A candidate for the degree shall have been awarded an appropriate degree of Bachelor with Honours from the University of New South Wales or a qualification considered equivalent from another university or tertiary institution at a level acceptable to the Committee.

(2) In exceptional cases an applicant who submits evidence of such other academic and professional qualifications as may be approved by the Committee may be permitted to enrol for the degree.

(3) If the Committee is not satisfied with the qualifications submitted by an applicant the Committee may require the applicant to undergo such assessment or carry out such work as the Committee may prescribe, before permitting enrolment as a candidate for the degree.

Enrolment and Progression

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

(2) In every case, before permitting a candidate to enrol, the head of the school* in which the candidate intends to enrol shall be satisfied that adequate supervision and facilities are available.

(3) An approved candidate shall be enrolled in one of the following categories:

(a) full-time attendance at the University;
(b) part-time attendance at the University.

*Or department where a department is not within a school.
Graduate Study: Conditions for the Award of Higher Degrees

(4) A full-time candidate shall be fully engaged in advanced study and research except that the candidate may undertake not more than five hours per week or a total of 240 hours per year on work which is not related to the advanced study and research.

(5) Before permitting a part-time candidate to enrol, the Committee shall be satisfied that the candidate can devote at least 20 hours each week to advanced study and research for the degree which (subject to (8)) shall include regular attendance at the school* on an average of at least one day per week for 48 weeks each year.

(6) A candidate shall be required to undertake an original investigation on an approved topic. The candidate may also be required to undergo such assessment and perform such other work as may be prescribed by the Committee.

(7) The work shall be carried out under the direction of a supervisor appointed from the full-time academic members of the University staff.

(8) The work, other than field work, shall be carried out in a school* of the University except that the Committee:

(a) may permit a candidate to spend not more than one calendar year of the program in advanced study and research at another institution provided the work can be supervised in a manner satisfactory to the Committee;

(b) may permit a candidate to conduct the work at other places where special facilities not possessed by the University may be available provided the direction of the work remains wholly under the control of the supervisor;

(c) may permit a full-time candidate, who has been enrolled as a full-time candidate for at least six academic sessions, who has completed the research work and who is writing the thesis, to transfer to part-time candidature provided the candidate devotes at least 20 hours each week to work for the degree and maintains adequate contact with the supervisor.

(9) The progress of a candidate shall be reviewed annually by the Committee following a report by the candidate, the supervisor and the head of the school* in which the candidate is enrolled and a result of such review the Committee may cancel enrolment or take such other action as it considers appropriate.

(10) No candidate shall be awarded the degree until the lapse of six academic sessions from the date of enrolment in the case of a full-time candidate or eight academic sessions in the case of a part-time candidate. In the case of a candidate who has had previous research experience the committee may approve remission of up to two sessions for a full-time candidate and four sessions for a part-time candidate.

(11) A full-time candidate for the degree shall present for examination not later than ten academic sessions from the date of enrolment. A part-time candidate for the degree shall present for examination not later than twelve academic sessions from the date of enrolment. In special cases an extension of these times may be granted by the Committee.

4. (1) On completing the program of study a candidate shall submit a thesis embodying the results of the investigation.

(2) The candidate shall give in writing to the Registrar two months notice of intention to submit the thesis.

(3) The thesis shall comply with the following requirements:

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

(b) the greater proportion of the work described must have been completed subsequent to enrolment for the degree;

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

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

(e) it must consist of an account of the candidate's own research but in special cases work done conjointly with other persons may be accepted provided the Committee is satisfied about the extent of the candidate's part in the joint research.

(4) The candidate may not submit as the main content of the thesis any work or material which has previously been submitted for a university degree or other similar award but may submit any work previously published whether or not such work is related to the thesis.

(5) Four copies of the thesis shall be presented in a form which complies with the requirements of the University for the preparation and submission of theses for higher degrees.
Examination

5. (1) There shall be not fewer than three examiners of the thesis, appointed by the Professorial Board on the recommendation of the Committee, at least two of whom shall be external to the University.

(2) At the conclusion of the examination each examiner shall submit to the Committee a concise report on the thesis and shall recommend to the Committee that:

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

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

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

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

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

(3) If the performance at the further examination recommended under (2)(c) above is not to the satisfaction of the Committee, the Committee may permit the candidate to re-present the same thesis and submit to further examination as determined by the Committee within a period specified by it but not exceeding eighteen months.

(4) The Committee shall, after consideration of the examiners’ reports and the results of any further examination, recommend whether or not the candidate may be awarded the degree. If it is decided that the candidate be not awarded the degree the Committee shall determine whether or not the candidate be permitted to resubmit the thesis after a further period of study and/or research.

Fees

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

Master of Biomedical Engineering (MBiomedE)

1. The degree of Master of Biomedical Engineering may be awarded by the Council to a candidate who has satisfactorily completed a program of advanced study.

Qualifications

2. (1) A candidate for the degree shall have been awarded an appropriate degree of Bachelor from the University of New South Wales or a qualification considered equivalent from another university or tertiary institution at a level acceptable to the Higher Degree Committee of the Faculty of Engineering (hereinafter referred to as the Committee).

(2) In exceptional cases an applicant who submits evidence of such other academic and professional qualifications as may be approved by the Committee may be permitted to enrol for the degree.

(3) If the Committee is not satisfied with the qualifications submitted by an applicant the Committee may require the applicant to undergo such assessment or carry out such work as the Committee may prescribe, before permitting enrolment.

Enrolment and Progression

3. (1) An application to enrol as a candidate for the degree shall be made on the prescribed form which shall be lodged with the Registrar at least two calendar months before the commencement of the session in which the enrolment is to begin.

(2) A candidate for the degree shall be required to undertake such formal subjects and pass such assessment as prescribed, and shall submit a project report. The program of advanced study, including the preparation of the project report, shall total a minimum of 60 credits. The number of credits allocated for each subject shall be determined by the Committee on the recommendation of the Director of the Centre for Biomedical Engineering (hereinafter referred to as the head of the school).

*Or department where a department is not within a school.
Graduate Study: Conditions for the Award of Higher Degrees

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

(4) No candidate shall be awarded the degree until the lapse of two academic sessions from the date of enrolment in the case of a full-time candidate or five sessions in the case of a part-time candidate. The maximum period of candidature shall be five academic sessions from the date of enrolment for a full-time candidate and eight sessions for a part-time candidate. In special cases an extension of these times may be granted by the Committee.

4. (1) A candidate shall be required to undertake a project on an approved topic.

(2) The work shall be carried out under the direction of a supervisor appointed from the full-time academic members of the University staff.

(3) The candidate shall give in writing to the Registrar two months notice of intention to submit a report on the project.

(4) Three copies of the project report shall be presented in a form which complies with the requirements of the University for the preparation and submission of project reports for higher degrees.

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

5. (1) There shall be not fewer than two examiners of the project report, appointed by the Professorial Board on the recommendation of the Committee, at least one of whom shall be external to the University unless the Committee is satisfied that this is not practicable.

(2) At the conclusion of the examination each examiner shall submit to the Committee a concise report on the project report and shall recommend to the Committee that:

(a) the project report be noted as satisfactory; or

(b) the project report be noted as satisfactory subject to minor corrections being made to the satisfaction of the head of the school; or

(c) the project report be noted as unsatisfactory but that the candidate be permitted to resubmit it in a revised form after a further period of study and/or research; or

(d) the project report be noted as unsatisfactory and that the candidate be not permitted to resubmit it.

(3) The Committee shall, after considering the examiners' reports and the candidate's results of assessment in the prescribed formal subjects, recommend whether or not the candidate may be awarded the degree. If it is decided that the project report is unsatisfactory the Committee shall determine whether or not the candidate may resubmit it after a further period of study and/or research.

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

1. The degree of Master of Engineering or Master of Science by research may be awarded by the Council on 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 the thesis embodying the results of an original investigation.

2. (1) A candidate for the degree shall have been awarded an appropriate degree of Bachelor from the University of New South Wales or a qualification considered equivalent from another university or tertiary institution at a level acceptable to the Committee.

(2) An applicant who submits evidence of such other academic or professional attainments as may be approved by the Committee may be permitted to enrol for the degree.

(3) When the Committee is not satisfied with the qualifications submitted by an applicant the Committee may require the applicant, before being permitted to enrol, to undergo such examination or carry out such work the Committee may prescribe.
3. (1) An application to enrol as a candidate for the degree shall be made on the prescribed form which shall be lodged with the Registrar at least one calendar month before the commencement of the session in which enrolment is to begin.

(2) In every case, before permitting a candidate to enrol, the head of the school* in which the candidate intends to enrol shall be satisfied that adequate supervision and facilities are available.

(3) An approved candidate shall be enrolled in one of the following categories:
   (a) full-time attendance at the University;
   (b) part-time attendance at the University;
   (c) external - not in regular attendance at the University and using research facilities external to the University.

(4) A candidate shall be required to undertake an original investigation on an approved topic. The candidate may also be required to undergo such examination and perform such other work as may be prescribed by the Committee.

(5) The work shall be carried out under the direction of a supervisor appointed from the full-time members of the University staff.

(6) The progress of a candidate shall be reviewed annually by the Committee following a report by the candidate, the supervisor and the head of the school* in which the candidate is enrolled and as a result of such review the Committee may cancel enrolment or take such other action as it considers appropriate.

(7) No candidate shall be granted the degree until the lapse of three academic sessions in the case of a full-time candidate or four academic sessions in the case of a part-time or external candidate from the date of enrolment. In the case of a candidate who has been awarded the degree of Bachelor with Honours or who has had previous research experience the Committee may approve remission of up to one session for a full-time candidate and two sessions for a part-time or external candidate.

(8) A full-time candidate for the degree shall present for examination not later than six academic sessions from the date of enrolment. A part-time or external candidate for the degree shall present for examination not later than ten academic sessions from the date of enrolment. In special cases an extension of these times may be granted by the Committee.

4. (1) On completing the program of study a candidate shall submit a thesis embodying the results of the original investigation.

(2) The candidate shall give in writing two months notice of intention to submit the thesis.

(3) The thesis shall present an account of the candidate's own research. In special cases work done conjointly with other persons may be accepted, provided the Committee is satisfied about the extent of the candidate's part in the joint research.

(4) The candidate may also submit any work previously published whether or not such work is related to the thesis.

(5) Three copies of the thesis shall be presented in a form which complies with the requirements of the University for the preparation and submission of higher degree theses.

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

5. (1) There shall be not fewer than two examiners of the thesis, appointed by the Professorial Board on the recommendation of the Committee, at least one of whom shall be external to the University unless the Committee is satisfied that this is not practicable.

(2) At the conclusion of the examination each examiner shall submit to the Committee a concise report on the merits of the thesis and shall recommend to the Committee that:
   (a) the candidate be awarded the degree without further examination; or
   (b) the candidate be awarded the degree without further examination subject to minor corrections as listed being made to the satisfaction of the head of the school*; or
   (c) the candidate be awarded the degree subject to further examination on questions posed in the report, performance in this further examination being to the satisfaction of the Committee; or

*Or department where a department is not within a school.
(d) the candidate be not awarded the degree but be permitted to resubmit the thesis in a revised form after a further period of study and/or research; or
(e) the candidate be not awarded the degree and be not permitted to resubmit the thesis.

(3) If the performance at the further examination recommended under (2)(c) above is not to the satisfaction of the Committee, the Committee may permit the candidate to re-present the same thesis and submit to a further oral, practical or written examination within a period specified by it but not exceeding eighteen months.

(4) The Committee shall, after consideration of the examiners' reports and the reports of any oral or written or practical examination, recommend whether or not the candidate may be awarded the degree. If it is decided that the candidate be not awarded the degree the Committee shall determine whether or not the candidate may resubmit the thesis after a further period of study and/or research.

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

1. The degree of Master of Engineering or Master of Science or Master of Surveying without supervision may be awarded by the Council on the recommendation of the Higher Degree Committee of the appropriate faculty (hereinafter referred to as the Committee) to a candidate who has demonstrated ability to undertake research by the submission of a thesis embodying the results of an original investigation.

2. A candidate for the degree shall have been awarded an appropriate degree of Bachelor from the University of New South Wales with at least three years relevant standing in the case of Honours graduates and four years relevant standing in the case of Pass graduates, and at a level acceptable to the Committee.

3. An application to enrol as candidate for the degree without supervision shall be made on the prescribed form which shall be lodged with the Registrar not less than six months before the intended date of submission of the thesis. A graduate who intends to apply in this way should, in his or her own interest, seek at an early stage the advice of the appropriate head of school with regard to the adequacy of the subject matter and its presentation for the degree. A synopsis of the work should be available.

4. (1) A candidate shall submit a thesis embodying the results of the investigation.
(2) The candidate shall give in writing to the Registrar two months notice of intention to submit the thesis.
(3) The thesis shall present an account of the candidate's own research. In special cases work done conjointly with other persons may be accepted, provided the Committee is satisfied about the extent of the candidate's part in the joint research.
(4) The candidate may also submit any work previously published whether or not related to the thesis.
(5) Three copies of the thesis shall be presented in a form which complies with the requirements of the University for the preparation and submission of theses for higher degrees.
(6) It shall be understood that the University retains the three copies of the thesis submitted for examination and is free to allow the thesis to be consulted or borrowed. Subject to the provisions of the Copyright Act, 1968, the University may issue the thesis in whole or in part, in photostat or microfilm or other copying medium.

5. (1) There shall be not fewer than two examiners of the thesis, appointed by the Professorial Board on the recommendation of the Committee, at least one of whom shall be external to the University unless the Committee is satisfied that this is not practicable.
(2) Before the thesis is submitted to the examiners the head of the school* in which the candidate is enrolled shall certify that it is prima facie worthy of examination.
(3) At the conclusion of the examination each examiner shall submit to the Committee that:

*Or department where a department is not within a school.
Engineering

(a) the candidate be awarded the degree without further examination; or
(b) the candidate be awarded the degree without further examination subject to minor corrections as listed being made to the satisfaction of the head of the school*; or
(c) the candidate be awarded the degree subject to a further examination on questions posed in the report, performance in this further examination being to the satisfaction of the Committee; or
(d) the candidate be not awarded the degree but be permitted to resubmit the thesis in a revised form after a further period of study and/or research; or
(e) the candidate be not awarded the degree and be not permitted to resubmit the thesis.

(4) If the performance at the further examination recommended under (3)(c) above is not to the satisfaction of the Committee, the Committee may permit the candidate to re-present the same thesis and submit to further examination as determined by the Committee within a period specified by it but not exceeding eighteen months.

(5) The Committee shall, after consideration of the examiners’ reports and the results of any further examination, recommend whether or not the candidate may be awarded the degree. If it is decided that the candidate be not awarded the degree the Committee shall determine whether or not the candidate may resubmit the thesis after a further period of study and/or research.

Fees

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

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

Qualifications

1. The degree of Master of Engineering Science or Master of Surveying Science may be awarded by the Council to a candidate who has satisfactorily completed a program of advanced study.

2. (1) A candidate for the degree shall have been awarded an appropriate degree of Bachelor from the University of New South Wales or a qualification considered equivalent from another university or tertiary institution at a level acceptable to the Higher Degree Committee of the Faculty of Engineering (hereinafter referred to as the Committee).

(2) In exceptional cases an applicant who submits evidence of such other academic and professional qualifications as may be approved by the Committee may be permitted to enrol for the degree.

(3) If the Committee is not satisfied with the qualifications submitted by an applicant the Committee may require the applicant to undergo such assessment or carry out such work as the Committee may prescribe, before permitting enrolment.

Enrolment and Progression

3. (1) An application to enrol as a candidate for the degree shall be made on the prescribed form which shall be lodged with the Registrar two calendar months before the commencement of the session in which the enrolment is to begin.

(2) A candidate for the degree shall:
(a) undertake such formal subjects and pass such assessment as prescribed, or
(b) demonstrate ability to undertake research by the submission of a thesis embodying the results of an original investigation of an approved topic, or
(c) undertake an approved combination of the above in which case the thesis component shall be referred to as a project report.

(3) The program of advanced study shall total a minimum of 36 credits. The number of credits allocated for each subject shall be determined by the Committee on the recommendation of the appropriate head of school*. A 9 credit project report shall be submitted for examination in accordance with the requirements of the appropriate head of the school* and shall be assessed as a formal subject.

(4) A candidate’s proposed program shall be approved by the appropriate head of school* prior to enrolment. For the purposes of this requirement the appropriate head of school* shall normally be the head of the school* providing supervision of the project report or thesis or, if there is no project report or thesis, the major field of study.

*Or department where a department is not within a school.
(5) The progress of a candidate shall be reviewed at least once annually by the Committee and as a result of its review the Committee may cancel enrolment or take such other action as it considers appropriate.

(6) No candidate shall be awarded the degree until the lapse of two academic sessions from the date of enrolment in the case of a full-time candidate or four sessions in the case of a part-time candidate. The maximum period of candidature shall be four academic sessions from the date of enrolment for a full-time candidate and eight sessions for a part-time candidate. In special cases an extension of these times may be granted by the Committee.

4. (1) A candidate who undertakes an 18 credit project or a 36 credit thesis shall carry out the work on an approved topic under the direction of a supervisor appointed from the full-time academic members of the University staff.

(2) The candidate shall give in writing to the Registrar two months notice of intention to submit a project report or thesis.

(3) The project report or thesis shall present an account of the candidate's own research. In special cases work done conjointly with other persons may be accepted, provided the Committee is satisfied about the extent of the candidate's part in the joint research.

(4) The candidate may also submit any work previously published whether or not such work is related to the thesis.

(5) Three copies of the project report or thesis shall be presented in a form which complies with the requirements of the University for the preparation and submission of project reports and theses for higher degrees.

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

5. (1) There shall be not fewer than two examiners of the project report, appointed by the Professorial Board on the recommendation of the Committee, at least one of whom shall be external to the University unless the Committee is satisfied that this is not practicable.

(2) At the conclusion of the examination each examiner shall submit to the Committee a concise report on the project report and shall recommend to the Committee that:

(a) the project report be noted as satisfactory; or

(b) the project report be noted as satisfactory subject to minor corrections being made to the satisfaction of the head of the school*; or

(c) the project report be noted as unsatisfactory but that the candidate be permitted to resubmit it in a revised form after a further period of study and/or research; or

(d) the project report be noted as unsatisfactory and that the candidate be not permitted to resubmit it.

(3) The Committee shall, after considering the examiners' reports and the candidate's results of assessment in the prescribed formal subjects, recommend whether or not the candidate may be awarded the degree. If it is decided that the project report is unsatisfactory the Committee shall determine whether or not the candidate may resubmit it after a further period of study and/or research.

6. (1) There shall be not fewer than two examiners of the thesis, appointed by the Professorial Board on the recommendation of the Committee, at least one of whom shall be external to the University unless the Committee is satisfied that this is not practicable.

(2) At the conclusion of the examination each examiner shall submit to the Committee a concise report on the thesis and shall recommend to the Committee that:

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

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

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

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

*Or department where a department is not within a school.
(e) the candidate be not awarded the degree and be not permitted to resubmit the thesis.

(3) If the performance at the further examination recommended under (2)(c) above is not to the satisfaction of the Committee, the Committee may permit the candidate to re-present the same thesis and submit to further examination as determined by the Committee within a period specified by it but not exceeding eighteen months.

(4) The Committee shall, after consideration of the examiners' reports and the results of any further examination, recommend whether or not the candidate may be awarded the degree. If it is decided that the candidate be not awarded the degree the Committee shall determine whether or not the candidate may resubmit the thesis after a further period of study and/or research.

Fees

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

Master of Safety Science (MSafetySc)

1. The degree of Master of Safety Science may be awarded by the Council to a candidate who has satisfactorily completed a program of advanced study.

Qualifications

2. (1) A candidate for the degree shall have been awarded an appropriate degree of Bachelor from the University of New South Wales or a qualification considered equivalent from another university or tertiary institution at a level acceptable to the Higher Degree Committee of the Faculty of Engineering (hereinafter referred to as the Committee).

(2) In exceptional cases an applicant who submits evidence of such other academic and professional qualifications as may be approved by the Committee may be permitted to enrol for the degree.

(3) If the Committee is not satisfied with the qualifications submitted by an applicant the Committee may require the applicant to undergo such assessment or carry out such work as the Committee may prescribe, before permitting enrolment.

Enrolment and Progression

3. (1) An application to enrol as a candidate for the degree shall be made on the prescribed form which shall be lodged with the Registrar at least two calendar months before the commencement of the session in which enrolment is to begin.

(2) A candidate for the degree shall be required to undertake such formal subjects and pass such assessment as prescribed. The program of advanced study shall total a minimum of 54 credits. The number of credits allocated for each subject shall be determined by the Committee on the recommendation of the Course Director (hereinafter referred to as the head of the school).

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

(4) No candidate shall be awarded the degree until the lapse of two academic sessions from the date of enrolment in the case of a full-time candidate or four sessions in the case of a part-time candidate. The maximum period of candidature shall be four academic sessions from the date of enrolment for a full-time candidate and eight sessions for a part-time candidate. In special cases an extension of these times may be granted by the Committee.

18 Credit Project Report

4. (1) The program of advanced study may include an 18 credit project on an approved topic.

(2) The work shall be carried out under the direction of a supervisor appointed from the full-time academic members of the University staff.

(3) The candidate shall give in writing to the Registrar two months notice of intention to submit a report on the project.

(4) Three copies of the project report shall be presented in a form which complies with the requirements of the University for the preparation and submission of project reports for higher degrees.

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

Examination of 18 Credit Project Report

5. (1) There shall be not fewer than two examiners of the project report, appointed by the Professorial Board on the recommendation of the Committee.
(2) At the conclusion of the examination each examiner shall submit to the Committee a concise report on the project and shall recommend to the Committee that:

(a) the project report be noted as satisfactory; or
(b) the project report be noted as satisfactory subject to minor corrections being made to the satisfaction of the head of the school; or
(c) the project report be noted as unsatisfactory but that the candidate be permitted to resubmit it in a revised form after a further period of study and/or research; or
(d) the project report be noted as unsatisfactory and that the candidate be not permitted to resubmit it.

(3) The Committee shall, after considering the examiners' reports and the candidate's results of assessment in the prescribed formal subjects, recommend whether or not the candidate may be awarded the degree. If it is decided that the project report is unsatisfactory the Committee shall determine whether or not the candidate may resubmit it after a further period of study and/or research.

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

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

2. (1) A candidate for the degree shall have been awarded an appropriate degree of Bachelor from the University of New South Wales or a qualification considered equivalent from another university or tertiary institution at a level acceptable to the Committee.

(2) In exceptional cases an applicant who submits evidence of such other academic and professional qualifications as may be approved by the Committee may be permitted to enrol for the degree.

(3) When the Committee is not satisfied with the qualifications submitted by an applicant the Committee may require the applicant, before being permitted to enrol, to undergo such examination or carry out such work as the Committee may prescribe.

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

(2) In every case, before permitting a candidate to enrol, the Head of the School of Surveying (hereinafter referred to as the head of the school) shall be satisfied that adequate supervision and facilities are available.

(3) An approved candidate shall be enrolled in one of the following categories:
(a) full-time attendance at the University;
(b) part-time attendance at the University;
(c) external - not in regular attendance at the University and using research facilities external to the University.

(4) A candidate shall be required to undertake an original investigation on an approved topic. The candidate may also be required to undergo such examination and perform such other work as may be prescribed by the Committee.

(5) The work shall be carried out under the direction of a supervisor appointed from the full-time members of the University staff.

(6) The progress of a candidate shall be reviewed annually by the Committee following a report by the candidate, the supervisor and the head of the school and as a result of such review the Committee may cancel enrolment or take such other action as it considers appropriate.

(7) No candidate shall be granted the degree until the lapse of three academic sessions in the case of a full-time candidate or four academic sessions in the case of a part-time or external candidate from the date of enrolment. In the case of a candidate who has been awarded the degree of Bachelor with Honours or who has had previous research experience the Committee may approve remission of up to one session for a full-time candidate and two sessions for a part-time or external candidate.
(8) A full-time candidate for the degree shall present for examination not later than six academic sessions from the date of enrolment. A part-time or external candidate for the degree shall present for examination not later than ten academic sessions from the date of enrolment. In special cases an extension of these times may be granted by the Committee.

Thesis

4. (1) On completing the program of study a candidate shall submit a thesis embodying the results of the original investigation.

(2) The candidate shall give in writing two months notice of intention to submit the thesis.

(3) The thesis shall present an account of the candidate’s own research. In special cases work done conjointly with other persons may be accepted, provided the Committee is satisfied about the extent of the candidate’s part in the joint research.

(4) The candidate may also submit any work previously published whether or not such work is related to the thesis.

(5) Three copies of the thesis shall be presented in a form which complies with the requirements of the University for the preparation and submission of higher degree theses.

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

Examination

5. (1) There shall be not fewer than two examiners of the thesis, appointed by the Professorial Board on the recommendation of the Committee, at least one of whom shall be external to the University unless the Committee is satisfied that this is not practicable.

(2) At the conclusion of the examination each examiner shall submit to the Committee a concise report on the merits of the thesis and shall recommend to the Committee that:

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

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

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

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

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

(3) If the performance at the further examination recommended under (2)(c) above is not to the satisfaction of the Committee, the Committee may permit the candidate to re-present the same thesis and submit to a further oral, practical or written examination within a period specified by it but not exceeding eighteen months.

(4) The Committee shall, after consideration of the examiners’ reports and the reports of any oral or written or practical examination, recommend whether or not the candidate may be awarded the degree. If it is decided that the candidate be not awarded the degree the Committee shall determine whether or not the candidate may resubmit the thesis after a further period of study and/or research.

Fees

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

Master of Surveying without supervision (MSurv)

See Master of Engineering.

Master of Surveying Science (MSurvSc)

See Master of Engineering Science.
1. A Graduate Diploma may be awarded by the Council to a candidate who has satisfactorily completed a program of advanced study.

2. (1) A candidate for the diploma shall have been awarded an appropriate degree of Bachelor from the University of New South Wales or a qualification considered equivalent from another university or tertiary institution at a level acceptable to the Higher Degree Committee of the appropriate faculty (hereinafter referred to as the Committee).

(2) An applicant who submits evidence of such other academic or professional attainments as may be approved by the Committee may be permitted to enrol for the diploma.

(3) If the Committee is not satisfied with the qualifications submitted by an applicant the Committee may require the applicant to undergo such assessment or carry out such work as the Committee may prescribe, before permitting enrolment.

3. (1) An application to enrol as a candidate for the diploma shall be made on the prescribed form which shall be lodged with the Registrar at least two calendar months before the commencement of the session in which enrolment is to begin.

(2) A candidate for the diploma shall be required to undertake such formal subjects and pass such assessment as prescribed.

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

(4) No candidate shall be awarded the diploma until the lapse of two academic sessions from the date of enrolment in the case of a full-time candidate or four sessions in the case of a part-time candidate. The maximum period of candidature shall be four academic sessions from the date of enrolment for a full-time candidate and six sessions for a part-time candidate. In special cases an extension of these times may be granted by the Committee.

4. A candidate shall pay such fees as may be determined from time to time by the Council.
Scholarships and Prizes

The scholarships and prizes listed below are available to students whose courses are listed in this handbook. Each faculty handbook contains in its Scholarships and Prizes section the scholarships and prizes available with that faculty. The General Information section of the Calendar contains a comprehensive list of scholarships and prizes offered throughout the University.

Scholarships

Undergraduate Scholarships

Listed below is an outline only of a number of scholarships available to students. Full information may be obtained from Room G20, located on the Ground Floor of the Chancellery.

Unless otherwise indicated in footnotes, applications for the following scholarships should be made to the Registrar by 14 January each year. Please note that not all of these awards are available every year.

<table>
<thead>
<tr>
<th>Donor</th>
<th>Value</th>
<th>Years of Tenure</th>
<th>Conditions</th>
</tr>
</thead>
<tbody>
<tr>
<td>General</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Bursary Endowment Board*</td>
<td>$200 pa</td>
<td>Minimum period of approved degree/</td>
<td>Merit in HSC and total family income not exceeding $6000</td>
</tr>
<tr>
<td></td>
<td></td>
<td>combined degree course</td>
<td></td>
</tr>
<tr>
<td>Sam Cracknell Memorial</td>
<td>Up to $3000 pa</td>
<td>1 year</td>
<td>Prior completion of at least 2 years of a degree or diploma course and enrolment in a full-time course during the year of application; academic merit; participation in sport both directly and administratively; and financial need</td>
</tr>
<tr>
<td></td>
<td>payable in fortnightly instalments</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*Apply to The Secretary, Bursary Endowment Board, PO Box 460, North Sydney 2060, immediately after sitting for HSC.
<table>
<thead>
<tr>
<th>Donor</th>
<th>Value</th>
<th>Year/s of Tenure</th>
<th>Conditions</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>General (continued)</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Girls Realm Guild</td>
<td>Up to $1500 pa</td>
<td>1 year renewable for the duration of the course subject to satisfactory progress and continued demonstration of need</td>
<td>Available only to female students under 35 years of age who are permanent residents of Australia enrolling in any year of a full-time undergraduate course on the basis of academic merit and financial need.</td>
</tr>
<tr>
<td>W.S. and L.B. Robinson**</td>
<td>Up to $4200 pa</td>
<td>1 year renewable for the duration of the course subject to satisfactory progress</td>
<td>Available only to students who have completed their schooling in Broken Hill or whose parents reside in Broken Hill; for a course related to the mining industry. Includes courses in mining engineering, geology, electrical and mechanical engineering, metallurgical process engineering, chemical engineering and science.</td>
</tr>
<tr>
<td>Universities Credit Union</td>
<td>$500 pa</td>
<td>1 year with the possibility of renewal</td>
<td>Prior completion of at least 1 year of any undergraduate degree course. Eligibility limited to members of the Universities Credit Union Ltd of more than one year's standing of members of the family of such members.</td>
</tr>
</tbody>
</table>

**Engineering**

**Electrical Engineering and Computer Science**

They Tyree Westinghouse Electrical Company Pty Ltd

- Up to $6720 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 and Industrial Engineering**

James Howden & Co Australia Pty Ltd

- Up to $1000 pa
- 1 year
- Permanent residence in Australia and eligibility for admission to the full-time degree course in Mechanical Engineering

Shell Refining Australia Pty Ltd

- Up to $1500 pa
- 1 year renewable for the duration of the course, subject to satisfactory progress
- Eligibility for admission to Year 2 of the full-time degree course in Mechanical Engineering

**Surveying**

The Institution of Surveyors, NSW Incorporated

- Up to $500 pa
- 1 year renewable for the duration of the course, subject to satisfactory progress
- Permanent residence in Australia and eligibility for admission to the full-time degree course in Surveying. Selection is based on academic merit, personal qualities and financial need

**Applications close 30 September each year.**
Graduate Scholarships

Application forms and further information are available from the Student Enquiry Counter, located on the Ground Floor of the Chancellery unless an alternative contact address is provided. Information is also available on additional scholarships which may become available from time to time, mainly from funds provided by organizations sponsoring research projects.

The following publications may also be of assistance: 1. Awards for Postgraduate Study in Australia and Awards for Postgraduate Study Overseas, published by the Graduate Careers Council of Australia, PO Box 28, Parkville, Victoria 3052; 2. Study Abroad, published by UNESCO; 3. Scholarships Guide for Commonwealth Postgraduate Students, published by the Association of Commonwealth Universities.

Details of overseas awards and exchanges administered by the Department of Employment and Education and Training can be obtained from: Awards and Exchanges Section, Department of Employment Education and Training, PO Box 826, Woden, ACT 2606.

Where possible, the scholarships are listed in order of faculty.

*Available for reference in the University Library.

<table>
<thead>
<tr>
<th>Donor</th>
<th>Value</th>
<th>Years of Tenure</th>
<th>Conditions</th>
</tr>
</thead>
<tbody>
<tr>
<td>University of New South Wales Postgraduate Scholarships</td>
<td>Living allowance of $7000 pa. Other allowances may also be paid.</td>
<td>1-2 years; minimum duration of course</td>
<td>Applicants must be honours graduates (or equivalent). Applications to Dean of relevant Faculty.</td>
</tr>
<tr>
<td>Commonwealth Postgraduate Research Awards</td>
<td>Living allowance of $8882 pa. Other allowances may also be paid.</td>
<td>1-2 years for a Masters and 3-4 years for a PhD degree</td>
<td>Applicants must be honours graduates (or equivalent) or scholars who will graduate with honours in current academic year, and who are domiciled in Australia. Applications to Registrar by 31 October.</td>
</tr>
<tr>
<td>Commonwealth Postgraduate Course Awards</td>
<td>Living allowance of $8882 pa. Other allowances may also be paid.</td>
<td>1-2 years; minimum duration of course</td>
<td>Applicants must be graduates or scholars who will graduate in current academic year, and who have not previously held a Commonwealth Post-graduate Award. Applicants must be domiciled in Australia. Preference is given to applicants with employment experience. Applications to Registrar by 30 September.</td>
</tr>
<tr>
<td>Australian American Educational Fulbright Award*</td>
<td>Travel expenses and $A2000 as establishment allowance.</td>
<td>1 year, renewable</td>
<td>Applicants must be graduates who are domiciled in Australia and wish to undertake research or study for a higher degree in America.</td>
</tr>
<tr>
<td>Australian Federation of University Women</td>
<td>Amount varies, depending on award</td>
<td>Up to 1 year</td>
<td>Applicants must be female graduates who are members of the Australian Federation of University Women</td>
</tr>
<tr>
<td>Commonwealth Scholarship and Fellowship Plan</td>
<td>Varies for each country. Generally covers travel, living, tuition fees, books and equipment, approved medical expenses. Marriage allowance may be payable.</td>
<td>Usually 2 years, sometimes 3</td>
<td>Applicants must be graduates who are Australian citizens and who are not older than 35 years of age. Applications close with Registrar in September or October each year.</td>
</tr>
<tr>
<td>The English-Speaking Union (NSW Branch)</td>
<td>$5000</td>
<td>1 year</td>
<td>Applicants must be residents of NSW or ACT. Awarded to young graduates to further their studies outside Australia. Applications close mid-April.</td>
</tr>
</tbody>
</table>

*Application forms are available from The Secretary, Department of Employment Education and Training, AAEF Travel Grants, PO Box 826, Woden, ACT 2606.
Graduate Scholarships (continued)

<table>
<thead>
<tr>
<th>Scholarship</th>
<th>Details</th>
</tr>
</thead>
<tbody>
<tr>
<td>Frank Knox Memorial Fellowship tenable at Harvard University</td>
<td>Stipend of US$7000 pa plus tuition fees 1, sometimes 2 years</td>
</tr>
<tr>
<td>Robert Gordon Menzies Scholarship* to Harvard</td>
<td>Up to US$15,000 1 year</td>
</tr>
<tr>
<td>Gowrie Scholarship Trust Fund</td>
<td>$4000 pa. Under special circumstances this may be increased. 2 years</td>
</tr>
<tr>
<td>Harkness Fellowships of the Commonwealth Fund of New York**</td>
<td>Living and travel allowances, tuition and research expenses, health insurance, book and equipment and other allowances for travel and study in the USA 12 to 21 months</td>
</tr>
<tr>
<td>The Packer, Shell and Barclays Scholarships to Cambridge***</td>
<td>Living and travel allowances, tuition expenses. 1-3 years</td>
</tr>
<tr>
<td>The Rhodes Scholarship§</td>
<td>Approximately L3600 stg pa 2 years, may be extended for a third year</td>
</tr>
<tr>
<td>Rothmans Fellowships Award††</td>
<td>$25000 pa plus up to $3500 for equipment and fees 1 year, renewable up to 3 years</td>
</tr>
</tbody>
</table>

*Application forms are available from The Registrar, A.N.U. GPO Box 4 Canberra.
**Application forms must be obtained from the Australian representative of the Fund, Mr. J. T. Larkin, Department of Trade, Edmund Barton Building, Kings Avenue, Barton, ACT 2600. These must be submitted to the Registrar by 15 August.
***Application forms are available from The Honorary Secretary, Cambridge Commonwealth Trust, PO Box 252. Cambridge CB2 1TZ U.K.
§Application to The Honorary Secretary of the NSW Committee, University of Sydney, NSW 2006
††Applications to the Secretary, Rothmans University Endowment Fund, University of Sydney, NSW 2006.
## Graduate Scholarships (continued)

<table>
<thead>
<tr>
<th>Donor</th>
<th>Value</th>
<th>Year/s of Tenure</th>
<th>Conditions</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Engineering</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Australian Institute of Nuclear Science and Engineering Studentships</td>
<td>Basic stipend $10158 pa plus allowances and some University expenses.</td>
<td>1-3 years</td>
<td>Applicants must be honours graduates in Science or Engineering. At least one quarter of the period of tenure must be spent at the Institute at Lucas Heights, NSW. Applications close late October with the Registrar.</td>
</tr>
<tr>
<td>Harold G. Conde Memorial Fellowship</td>
<td>$5000 pa</td>
<td>Maximum of 3 years</td>
<td>Applicants should be honours graduates permanently domiciled in Australia. The Fellowship is a supplementary award to be held in conjunction with another scholarship and is for graduate study or research in a field related to the electricity industry. Applications close with the Registrar by 31 March.</td>
</tr>
<tr>
<td>IBM Research Scholarship in Microelectronics</td>
<td>$12000 pa where only scholarship held. $5000 pa where it supplements another scholarship.</td>
<td>Up to 3 years</td>
<td>To enable a suitable graduate to undertake a research degree in the Joint Microelectronics Research Centre. Applications close 31 October.</td>
</tr>
<tr>
<td>The Joseph Barling Fellowship</td>
<td>Not less than $8500</td>
<td>Maximum of 3 years</td>
<td>Candidates should be electrical engineering graduates of the University of New South Wales (in special circumstances mechanical and industrial engineering graduates may apply.) The Fellowship is for full-time study for the award of the degree of Master of Business Administration or Doctor of Philosophy at the University. Applications close 31 December.</td>
</tr>
<tr>
<td>Medical Engineering Research Association*</td>
<td>Variable</td>
<td>1-3 years</td>
<td>Awarded for postgraduate study or research in the field of Biomedical Engineering.</td>
</tr>
<tr>
<td>Shell Scholarship in Science or Engineering</td>
<td></td>
<td></td>
<td>See under Science</td>
</tr>
<tr>
<td>Australian Telecommunications and Electronics Research Board</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Science Research Scholarship of the Royal Commission of the Exhibition of 1851</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

## Prizes

### Undergraduate University Prizes

The following table summarizes the undergraduate prizes awarded by the University. Prizes which are not specific to any School are listed under General. All other prizes are listed under the Faculty or Schools in which they are awarded.

Information regarding the establishment of new prizes may be obtained from the Examinations Section located on the Ground Floor of the Chancellery.
### Undergraduate University Prizes (continued)

<table>
<thead>
<tr>
<th>Donor/Name of Prize</th>
<th>Values</th>
<th>Awarded for</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>General</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sydney Technical College Union Award</td>
<td>300.00 and medal</td>
<td>Leadership in the development of student affairs, and academic proficiency throughout the course</td>
</tr>
<tr>
<td>University of New South Wales Alumni Association</td>
<td>Statuette</td>
<td>Achievement for community benefit — students in their final or graduating year</td>
</tr>
<tr>
<td><strong>Faculties of Engineering</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Institution of Engineers, Australia</td>
<td>Medal and 200.00</td>
<td>The most proficient final year (or last 2 years part-time) student in the Bachelor of Engineering (or Bachelor of Science (Engineering)) degree courses offered by the following Schools:</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Civil Engineering</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Electrical Engineering and Computer Science</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Mechanical and Industrial Engineering</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Chemical Engineering and Industrial Chemistry</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Mining Engineering</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Textile Technology (Engineering option only)</td>
</tr>
<tr>
<td>The John Fraser Memorial Award</td>
<td>130.00</td>
<td>Excellence in the first year or equivalent part-time years of a bachelor degree course offered by the Faculty of Engineering</td>
</tr>
<tr>
<td><strong>School of Chemical Engineering and Industrial Chemistry</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Abbott Laboratories Pty Ltd</td>
<td>150.00</td>
<td>Bachelor of Engineering degree course in Chemical Engineering — Year 4</td>
</tr>
<tr>
<td>Australasian Corrosion Association (NSW Branch)</td>
<td>150.00 and one year's membership of the Association</td>
<td>Best performance in 48.121 Corrosion in the Chemical Industry</td>
</tr>
<tr>
<td>AGL Sydney Limited — in Chemical Engineering</td>
<td>200.00</td>
<td>Subject selected by Head of School</td>
</tr>
<tr>
<td>Australian Paper Manufacturers Ltd</td>
<td>100.00</td>
<td>48.163 Instrumentation and Process Control in Industrial Engineering</td>
</tr>
<tr>
<td></td>
<td>100.00</td>
<td>48.163 Instrumentation and Process Control in Chemical Engineering</td>
</tr>
<tr>
<td>Chemical Technology Society</td>
<td>25.00</td>
<td>Best graduate in Bachelor of Science degree course in Industrial Chemistry</td>
</tr>
<tr>
<td></td>
<td>25.00</td>
<td>Best graduate in Bachelor of Science degree course in Industrial Chemistry, Years 1 and 2 or Stages 1 to 4</td>
</tr>
</tbody>
</table>
### Undergraduate University Prizes (continued)

<table>
<thead>
<tr>
<th>Donor/Name of Prize</th>
<th>Value $</th>
<th>Awarded for</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>School of Chemical Engineering and Industrial Chemistry (continued)</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>CSR Limited</td>
<td>50.00</td>
<td>Subject with the discipline of Industrial Chemistry, selected by Head of School</td>
</tr>
<tr>
<td>Esso Australia Ltd</td>
<td>200.00</td>
<td>Best performance in Year 2 Chemical Engineering</td>
</tr>
<tr>
<td>Institution of Chemical Engineers</td>
<td>100.00</td>
<td>Best result for the thesis in the final year, or equivalent part time stage, of the Bachelor of Engineering degree course and medal</td>
</tr>
<tr>
<td>Shell</td>
<td>100.00</td>
<td>General proficiency in Year 2 or its part-time equivalent in either the Chemical Engineering course or the Industrial Chemistry course</td>
</tr>
<tr>
<td></td>
<td>100.00</td>
<td>General proficiency in Year 3 or its part-time equivalent in either the Chemical Engineering course or the Industrial Chemistry course</td>
</tr>
<tr>
<td></td>
<td>100.00</td>
<td>General proficiency in Year 4 or its part-time equivalent in either the Chemical Engineering course or the Industrial Chemistry course</td>
</tr>
<tr>
<td></td>
<td>100.00</td>
<td>For a student who, in the opinion of the Head of School, has performed some meritorious activity of note either inside or outside the University</td>
</tr>
<tr>
<td>Simon-Carves Australia</td>
<td>21.00</td>
<td>48.135 Thermodynamics</td>
</tr>
<tr>
<td>Stauffer Australia Limited</td>
<td>100.00</td>
<td>Subject selected by Head of School</td>
</tr>
<tr>
<td>Western Mining Corporation Ltd</td>
<td>150.00</td>
<td>48.036 Chemical Engineering Laboratory 1</td>
</tr>
<tr>
<td></td>
<td>150.00</td>
<td>48.044 Chemical Engineering Laboratory 2</td>
</tr>
</tbody>
</table>

### Department of Fuel Technology

<table>
<thead>
<tr>
<th>Donor/Name of Prize</th>
<th>Value $</th>
<th>Awarded for</th>
</tr>
</thead>
<tbody>
<tr>
<td>Australian Institute of Energy</td>
<td>50.00</td>
<td>For a fuel subject or allied subject project</td>
</tr>
<tr>
<td>Fuel Technology Staff</td>
<td>200.00</td>
<td>Best performance in Year 3 or 4 Fuel Technology subject in the Bachelor of Engineering degree course in Chemical Engineering</td>
</tr>
<tr>
<td>Shell</td>
<td>200.00</td>
<td>Subject selected by Head of School</td>
</tr>
</tbody>
</table>

### School of Civil Engineering

<table>
<thead>
<tr>
<th>Donor/Name of Prize</th>
<th>Value $</th>
<th>Awarded for</th>
</tr>
</thead>
<tbody>
<tr>
<td>Association of Consulting Structural Engineers of New South Wales</td>
<td>225.00</td>
<td>Best performance in 8.4430 Structural Design 4 in the Bachelor of Engineering degree course in Civil Engineering</td>
</tr>
<tr>
<td></td>
<td>175.00</td>
<td>Best performance in 8.3440 Structural Design 3 in the Bachelor of Engineering degree course in Civil Engineering</td>
</tr>
</tbody>
</table>
## Undergraduate University Prizes (continued)

<table>
<thead>
<tr>
<th>Donor/Name of Prize</th>
<th>Value $</th>
<th>Awarded for</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>School of Civil Engineering (continued)</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Australian Conservation Foundation</td>
<td>50.00</td>
<td>Best performance in the subjects which develop environmental management concepts for the Civil Engineer</td>
</tr>
<tr>
<td>Australian Welding Institute</td>
<td>Books to the value of 30.00</td>
<td>Best design which incorporates a welding process for students in Years 2, 3 or 4 of the Bachelor of Engineering degree course in Civil Engineering</td>
</tr>
<tr>
<td>Crawford Munro Memorial</td>
<td>150.00</td>
<td>Best performance in 8.3640 Engineering Hydrology in the Bachelor of Engineering degree course in Civil Engineering</td>
</tr>
<tr>
<td>James Hardie &amp; Co. Pty Ltd</td>
<td>225.00</td>
<td>Best performance in 8.2610 Hydraulics 1 in the Bachelor of Engineering degree course in Civil Engineering</td>
</tr>
<tr>
<td>Baulderstone Hornibrook</td>
<td>500.00</td>
<td>Best performance in Engineering Construction and Management in the Bachelor of Engineering degree course in Civil Engineering</td>
</tr>
<tr>
<td>Hardie's Pipeline Award</td>
<td>250.00 and Plaque</td>
<td>Best performance in 8.3630 Water Supply and Waste-water Disposal</td>
</tr>
<tr>
<td>Jeffrey and Katauskas</td>
<td>500.00</td>
<td>Best performance in 8.4310 Materials Major in the Bachelor of Engineering degree course in Civil Engineering</td>
</tr>
<tr>
<td>Water Board Gold Medal</td>
<td>Medal</td>
<td>Highest aggregate in 8.3630 Water Supply and Waste-water Disposal and 8.4620 Water Resources Engineering in the Bachelor of Engineering degree course in Civil Engineering</td>
</tr>
<tr>
<td><strong>School of Electrical Engineering and Computer Science</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Austral Crane</td>
<td>37.50</td>
<td>Bachelor of Engineering degree course in Electrical Engineering, Year 3</td>
</tr>
<tr>
<td></td>
<td>37.50</td>
<td>Power or Control elective</td>
</tr>
<tr>
<td>Electricity Supply Engineers Association of New South Wales</td>
<td>100.00</td>
<td>Overall performance including proficiency in Electric Power Distribution in Year 3 full-time or equivalent part-time degree course</td>
</tr>
<tr>
<td>IBM</td>
<td>150.00</td>
<td>Best performance in 6.611 Computing 1</td>
</tr>
</tbody>
</table>
### Undergraduate University Prizes (continued)

<table>
<thead>
<tr>
<th>Donor/Name of Prize</th>
<th>Value $</th>
<th>Awarded for</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>School of Electrical Engineering and Computer Science (continued)</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Institution of Electrical Engineers</td>
<td>100.00</td>
<td>Best performance in Year 3 Electrical Engineering</td>
</tr>
<tr>
<td>J. Douglas Maclurcan</td>
<td>60.00</td>
<td>Outstanding performance in the field of control systems</td>
</tr>
<tr>
<td>Lionel Singer Corporation — in Computer Science</td>
<td>1500.00</td>
<td>Best performance in core subjects in Year 3 leading to Honours degree</td>
</tr>
<tr>
<td><strong>School of Geography</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Jack Mabbutt Medal</td>
<td>Medal</td>
<td>Best performance in Fourth Year Project in Applied Geography by a student proceeding to Bachelor of Science</td>
</tr>
<tr>
<td>Jack Mabbutt Prize</td>
<td>150.00</td>
<td>Best performance by a third year student proceeding to Honours in Geography</td>
</tr>
<tr>
<td><strong>School of Mathematics</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Amatil Limited</td>
<td>200.00</td>
<td>Best performance in Theory of Statistics 3 or Higher Theory of Statistics 3</td>
</tr>
<tr>
<td>Applied Mathematics</td>
<td>50.00</td>
<td>Excellence in Level III Applied Mathematics subjects</td>
</tr>
<tr>
<td>C. H. Peck</td>
<td>50.00</td>
<td>Best performance in Year 2 Mathematics proceeding to Year 3 in the School of Mathematics</td>
</tr>
<tr>
<td>Head of School's</td>
<td>50.00</td>
<td>Excellence in 4 or more Mathematics units in Year 2</td>
</tr>
<tr>
<td>IBM</td>
<td>200.00</td>
<td>Final year of an honours degree course</td>
</tr>
<tr>
<td>ICI Theory of Statistics IV</td>
<td>100.00</td>
<td>Best performance in 10.323 Theory of Statistics 4</td>
</tr>
<tr>
<td>I. P. Sharp Associates</td>
<td>75.00</td>
<td>Excellence in Higher Theory of Statistics 2</td>
</tr>
<tr>
<td>J. R. Holmes</td>
<td>75.00</td>
<td>Excellent performance in at least 4 pass-level (up to 1 pass-level unit may be replaced by a higher-level unit) Pure Mathematics Level III units taken over no more than two consecutive years</td>
</tr>
<tr>
<td>Michael Mihailavitch Erihman</td>
<td>750.00</td>
<td>Best performance by a student enrolled in a Mathematics Program, in examinations conducted by the School of Mathematics in any one year</td>
</tr>
</tbody>
</table>
## Undergraduate University Prizes (continued)

<table>
<thead>
<tr>
<th>Donor/Name of Prize</th>
<th>Value $</th>
<th>Awarded for</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>School of Mathematics (continued)</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pure Mathematics</td>
<td>50.00</td>
<td>Best performance in Level III Pure Mathematics subjects</td>
</tr>
<tr>
<td>School of Mathematics</td>
<td>50.00</td>
<td>Best performance in 10.011 Higher Mathematics 1</td>
</tr>
<tr>
<td></td>
<td>50.00</td>
<td>Best performance in basic Year 2 Higher Mathematics units</td>
</tr>
<tr>
<td></td>
<td>50.00</td>
<td>Excellence in 4 or more Mathematics units in Year 2</td>
</tr>
<tr>
<td>Statistical Society of Australia (New South Wales Branch)</td>
<td>100.00</td>
<td>General proficiency — Theory of Statistics subjects</td>
</tr>
<tr>
<td><strong>School of Materials Science and Engineering</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Alcan Australia Ltd</td>
<td>150.00</td>
<td>Subject selected by Head of School</td>
</tr>
<tr>
<td>Austral Crane</td>
<td>150.00</td>
<td>Best performance in 4.623B Metallurgical Engineering by a Metallurgical Engineering student</td>
</tr>
<tr>
<td>Australasian Corrosion Association (NSW Branch)</td>
<td>150.00</td>
<td>Subject selected by Head of School</td>
</tr>
<tr>
<td>Australian Institute of Metals</td>
<td>100.00</td>
<td>Best performance in the final year practical examination or an outstanding effort in Metallography</td>
</tr>
<tr>
<td></td>
<td>and one years' membership of the Institute</td>
<td></td>
</tr>
<tr>
<td>Australian Welding Institute</td>
<td>30.00</td>
<td>Best performance in the final year seminar class or, by a student who in the Head of School's opinion has contributed most to the corporate life of the School of Materials Science and Engineering</td>
</tr>
<tr>
<td></td>
<td>Book order</td>
<td></td>
</tr>
<tr>
<td>The Broken Hill Proprietary Co Ltd</td>
<td>150.00</td>
<td>Best overall performance in Year 3 full-time (or its equivalent part-time) in Bachelor of Engineering (or Bachelor of Science (Technology)) degree course</td>
</tr>
<tr>
<td>The Max Hatherly</td>
<td>275.00</td>
<td>Best overall performance in Year 4 full-time (or its equivalent part-time) in Bachelor of Engineering (or Bachelor of Science (Technology)) degree course</td>
</tr>
<tr>
<td>The Hugh Muir</td>
<td>275.00</td>
<td>Subject selected by Head of School</td>
</tr>
<tr>
<td>Western Mining Corporation Ltd</td>
<td>150.00</td>
<td></td>
</tr>
<tr>
<td></td>
<td>150.00</td>
<td></td>
</tr>
<tr>
<td>The Z.C. Mines</td>
<td>200.00</td>
<td></td>
</tr>
<tr>
<td><strong>School of Mechanical and Industrial Engineering</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Ansett Airlines of Australia</td>
<td>200.00</td>
<td>Best overall performance in the Bachelor of Engineering degree course in Aeronautical Engineering</td>
</tr>
<tr>
<td></td>
<td>and bronze medal</td>
<td></td>
</tr>
<tr>
<td>Atlas Copco</td>
<td>125.00</td>
<td>General proficiency in Bachelor of Engineering degree course in Mechanical Engineering</td>
</tr>
</tbody>
</table>
### Undergraduate University Prizes (continued)

<table>
<thead>
<tr>
<th>Donor/Name of Prize</th>
<th>Value $</th>
<th>Awarded for</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>School of Mechanical and Industrial Engineering (continued)</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Austral Crane</td>
<td>75.00</td>
<td>General proficiency in full-time Year 3 Mechanical Engineering</td>
</tr>
<tr>
<td>Australian Institute of Refrigeration, Air Conditioning and Heating</td>
<td>Student membership of the Institute for 1 year plus Design Aid and Data Book</td>
<td>Best performance in subject selected by Head of School in field of refrigeration and air conditioning</td>
</tr>
<tr>
<td>Babcock Aust Ltd</td>
<td>100.00</td>
<td>Subject selected by Head of School</td>
</tr>
<tr>
<td>Carrier Air Conditioning</td>
<td>250.00</td>
<td>Best performance by a Mechanical Engineering student in a subject selected by Head of School</td>
</tr>
<tr>
<td>David Carment Memorial</td>
<td>500.00 and medal</td>
<td>Highest proficiency in final year of year of Naval Architecture degree course</td>
</tr>
<tr>
<td>Hawker de Havilland Victoria Limited</td>
<td>300.00 and medal</td>
<td>Best performance in Year 4 of the Aeronautical Engineering degree course</td>
</tr>
<tr>
<td>Computer-Based Engineering Design</td>
<td>100.00</td>
<td>Best undergraduate or graduate thesis making a contribution to Computer-Based Engineering Design in the School of Mechanical and Industrial Engineering</td>
</tr>
<tr>
<td>Harbin Polytechnical Alumni Association</td>
<td>100.00</td>
<td>Subject selected by Head of School</td>
</tr>
<tr>
<td>Jeremy Hirschhorn</td>
<td>100.00</td>
<td>Best performance by a final year student in theory of machines</td>
</tr>
<tr>
<td>The John Harrison</td>
<td>100.00</td>
<td>Best performance in 5.301 Mechanics of Machines 1</td>
</tr>
<tr>
<td>The Hawker de Havilland Ltd</td>
<td>500.00</td>
<td>Best thesis in aeronautical engineering in the Bachelor of Engineering degree course</td>
</tr>
<tr>
<td>Royal Institution of Naval Architects</td>
<td>200.00</td>
<td>Best ship design in the final year</td>
</tr>
<tr>
<td>Shell Refining (Australia) Pty Ltd</td>
<td>100.00</td>
<td>General proficiency in Year 1 of full-time Mechanical Engineering degree course</td>
</tr>
<tr>
<td></td>
<td>100.00</td>
<td>Best undergraduate thesis in Year 4 of the Mechanical Engineering degree course</td>
</tr>
<tr>
<td></td>
<td>100.00</td>
<td>Best performance in 18.603 Management/Economics</td>
</tr>
<tr>
<td></td>
<td>100.00</td>
<td>Best performance in a subject selected by Head of School in an area relevant to refinery or oil industry practice.</td>
</tr>
<tr>
<td>Staedtler (Pacific) Pty Ltd</td>
<td>100.00 (open order)</td>
<td>General proficiency in Bachelor of Engineering degree course in Mechanical Engineering, year 2.</td>
</tr>
</tbody>
</table>
### Undergraduate University Prizes (continued)

<table>
<thead>
<tr>
<th>Donor/Name of Prize</th>
<th>Value $</th>
<th>Awarded for</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Department of Industrial Engineering</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Austral Crane</td>
<td>75.00</td>
<td>Bachelor of Engineering degree course in Industrial Engineering, Year 3</td>
</tr>
<tr>
<td>R. E. Jefferies Memorial</td>
<td>500.00</td>
<td>Performance in final year/stage of Bachelor of Engineering degree course in Industrial Engineering</td>
</tr>
<tr>
<td>Shell Refining (Australia) Pty Ltd</td>
<td>100.00</td>
<td>Best performance in the subject 18.603 Management/Economics in the Bachelor of Engineering degree course</td>
</tr>
<tr>
<td>TRW Australia Ltd</td>
<td>100.00</td>
<td>Bachelor of Science (Engineering) degree course in Industrial Engineering, Stage 6</td>
</tr>
<tr>
<td><strong>School of Mines</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Joint Coal Board</td>
<td>200.00</td>
<td>Bachelor of Engineering degree course in Mining Engineering, Year 2</td>
</tr>
<tr>
<td></td>
<td>200.00</td>
<td>Bachelor of Engineering degree course in Mining Engineering, Year 3</td>
</tr>
<tr>
<td></td>
<td>300.00</td>
<td>Bachelor of Engineering degree course in Mining Engineering — general proficiency throughout course</td>
</tr>
<tr>
<td>Western Mining Corporation Ltd</td>
<td>150.00</td>
<td>Best overall performance in final year of Bachelor of Engineering degree course</td>
</tr>
<tr>
<td></td>
<td>200.00</td>
<td>General proficiency throughout the Bachelor of Engineering degree course</td>
</tr>
<tr>
<td></td>
<td>150.00</td>
<td>Best overall performance in penultimate year of Bachelor of Engineering degree course</td>
</tr>
<tr>
<td><strong>School of Surveying</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Association of Consulting Surveyors NSW</td>
<td>150.00</td>
<td>Most outstanding student in the field of land studies</td>
</tr>
<tr>
<td>Australian Photogrammatic and Remote Sensing Society (NSW)</td>
<td>80.00</td>
<td>Subjects in photogrammetry including electives</td>
</tr>
<tr>
<td>Board of Surveyors Medal</td>
<td>Medal</td>
<td>Bachelor of Surveying degree course, Final year</td>
</tr>
<tr>
<td>R. S. Mather Memorial</td>
<td>100.00</td>
<td>Most outstanding student in Geodesy</td>
</tr>
</tbody>
</table>
Graduate University Prizes

The following table summarizes the graduate prizes awarded by the University.

<table>
<thead>
<tr>
<th>Donor/Name of Prize</th>
<th>Value $</th>
<th>Awarded for</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Faculty of Engineering</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Grace Bros Safety Science Merit</td>
<td>250.00</td>
<td>Best performance in 47.330G The Accident Phenomenon, in the Graduate Diploma course in Safety Science</td>
</tr>
<tr>
<td></td>
<td>250.00</td>
<td>Best performance in 47.330G The Accident Phenomenon, in the Master of Safety Science degree course</td>
</tr>
<tr>
<td>National Safety Council</td>
<td>100.00</td>
<td>Best performance in 47.052G Introduction to Safety Engineering in the Master Degree course or Graduate Diploma course in Safety Science</td>
</tr>
<tr>
<td>Safety Institute of Australia (NSW Division)</td>
<td>150.00 book order</td>
<td>Best overall performance in the Master of Safety Science degree course</td>
</tr>
<tr>
<td></td>
<td>150.00 book order</td>
<td>Best overall performance in the Graduate Diploma course in Safety Science</td>
</tr>
<tr>
<td><strong>School of Chemical Engineering and Industrial Chemistry</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>The Clean Air Society of Australia and New Zealand</td>
<td>100.00</td>
<td>48.391G Atmospheric Pollution Control and 48.392G Practical Aspects of Air Pollution Measurement and Control</td>
</tr>
<tr>
<td><strong>School of Civil Engineering</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Institute of Advanced Motorists</td>
<td>50.00</td>
<td>Traffic Planning and Control</td>
</tr>
<tr>
<td><strong>School of Fibre Science and Technology</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Department of Textile Technology</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Malcolm Chaikin</td>
<td>200.00 and bronze medal</td>
<td>For the most outstanding thesis for the degree of Doctor of Philosophy in the Department of Textile Technology</td>
</tr>
</tbody>
</table>
The University of New South Wales Kensington Campus

Thesb
Biomedical Theatres E27
Central Lecture Block E19
Classroom Block (Western Grounds) H3
Rex Vowels Theatre F17
Keith Burrows Theatre J14
Main Building Theatrette K14
Mathews Theatres D23
Parade Theatre E3
Science Theatre F13
Sir John Clancy Auditorium C24

Buildings
Affiliated Residential Colleges
New (Anglican) L6
Shalom (Jewish) N9
Warrane M7
Applied Science F10
Architecture H14
Arts (Morven Brown) C20
Bank F22
Barker Street Gatehouse N11
Basser College C18
Biological Sciences D26
Central Store B13
Chancellery C22
Chemistry
Dalton F12
Robert Heffron E12
Civil Engineering H20
Commerce (John Goodsell) F20
Dalton (Chemistry) F12
Electrical Engineering G17
Geography and Surveying K17
Goldstein College D16
Golf House A27
Gymnasium B5
House at Pooh Corner N8
International House C6
Io Myers Studio D9
John Goodsell (Commerce) F20
Kanga’s House O14
Kensington Colleges C17 (Office)
Basser C18
Goldstein D16
Philip Baxter D14
Main Building K15
Maintenance Workshop B13
Mathews F23

Mechanical and Industrial Engineering J17
Medicine (Administration) B27
Menzies Library E21
Metallurgy E8
Morwen Brown (Arts) C20
New College (Anglican) L6
Newton J12
NIDA D2
Parking Station H25
Philip Baxter College D14
Robert Heffron (Chemistry) E12
Sam Cracknell Pavilion H8
Shalom College (Jewish) N9
Sir Robert Webster (Textile Technology) G14
Squash Courts B7
Swimming Pool B4
Unisearch House L5
University Regiment, J2
University Union (Roundhouse) – Stage I E6
University Union (Blockhouse) – Stage II G6
University Union (Squarehouse) – Stage III E4
Wallace Wurth School of Medicine C27
Warrane College M7
Wool Science B8

Botany D26
Building H14
Careers and Employment F15
Cashier’s Office C22
Centre for Biomedical Engineering A28
Centre for Medical Education Research and Development C27
Centre for Remote Sensing K17
Chaplains E15a
Chemical Engineering and Industrial Chemistry F10
Chemistry E12
Child Care Centres N8, O14
Civil Engineering H20
Commerce (Faculty Office) F20
Committee in Postgraduate Medical Education B27
Community Medicine D26
Computing Services Department F21, D26
Continuing Education Support Unit F23
Economics F20
Education G2
Education Testing Centre E15d
Electrical Engineering and Computer Science G17
Energy Research, Development and Information Centre F10
Engineering (Faculty Office) K17
English C20
Examinations C22
Fees Office C22
Food Science and Technology F10
French C20
General Staff Office C22
General Studies C20
Geography K17
German Studies C20
Graduate School of the Built Environment H14
Health Administration C22
History C20
History and Philosophy of Science C20
Industrial Arts H14
Industrial Engineering J17
Institute of Rural Technology B8b
Japanese Economic Management Studies Centre G14
Kanga’s House O14
Kindergarten (House at Pooh Corner) N8
Landscape Architecture K15
Law (Faculty Office) F21

Law Library F21
Librarianship F23
Library E21
Lost Property C22
Marketing F20
Mathematics F23
Mechanical Engineering J17
Medicine (Faculty Office) B27
Metallurgy E8
Microbiology D26
Mining Engineering K15
Music B11b
National Institute of Dramatic Art D2
Off-campus Housing C22
Optometry J12
Organizational Behaviour F20
Pathology C27
Patrol and Cleaning Services C22
Petroleum Engineering D11
Philosophy C20
Physics K16
Physiology and Pharmacology C27
Political Science C20
Printing Unit B22
Psychology F23
Public Affairs Unit C22
Publications Section B22
Regional Teacher Training Centre C27
Russian C20
Science and Mathematics Course Office F23
Social Work G2
Sociology C20
Spanish and Latin American Studies C20
Sport and Recreation Centre B6
Student Counselling and Research F15
Student Health E15b
Student Records C22
Students’ Union E4 and C21
Surveying K17
Tertiary Education Research Centre E15d
Textile Technology O14
Theatre Studies B10
Town Planning K15
Union Shop (Upper Campus) D19
University Archives E21
University Press A28
University Union (Blockhouse) G6
Wool Science B8a
Zoology D26
This Calendar has been specifically designed as a summary volume of the University’s academic and administrative procedures. It contains detailed information about the University — its organization, staff membership, description of disciplines, scholarships and prizes. 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).

The Calendar and Handbooks are available from the Cashier’s Office.

The Calendar costs $6.00 (plus postage $1.40, interstate $1.80). The Handbooks vary in cost: Applied Science, Architecture, Arts, Commerce, Engineering, Professional Studies, and Sciences are $4.00. Postage is $1.40 in each case ($1.80 interstate). Law, Medicine and AGSM are $3.00. Postage is $1.00 in each case ($1.10 interstate). A set of books is $43.00. Postage is $3.00 ($7.00 interstate).